# Project Manual & Technical Specifications

# NEW FACILITY for the <u>CARVER</u> POLICE DEPARTMENT 3 CENTER STREET CARVER, MA

# October 2, 2019



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# **October 2, 2019**

**PREPARED BY:** 

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# **TABLE OF CONTENTS**

# NEW FACILITY for the CARVER POLICE DEPARTMENT 3 CENTER STREET CARVER, MA

### **PROJECT MANUAL**

Title Page Table of Contents List of Drawings Invitation to Bid

#### **Bidding Documents**

ITB - Instructions to Bidders Supplemental Instructions to Bidders for Electronic Bid Projects (E-Bid) Form for Filed Sub-Bid Form for General Bid

#### **Contract Conditions and Forms:**

Owner – Contractor Agreement
General Conditions for Contract for Construction, AIA A201-2007
SGC - Supplementary General Conditions
Form of Performance Bond
Form of Payment Bond
Commonwealth of Massachusetts - Prevailing Wage Rates, dated September 23, 2019 (42 pages)
Geotechnical Investigation Report, dated August 5, 2019, as prepared by Briggs Engineering & Testing, Rockland, MA (24 pages)
Field Permeability Tests – June 26 and 27, 2019, dated July 5, 2019, as prepared by Briggs Engineering & Testing, Rockland, MA (2 pages)
Title V Field Percolation Tests – June 26, 2019, dated August 7, 2019, as prepared by Briggs Engineering & Testing, Rockland, MA (6 pages)

## **SPECIFICATIONS**

#### **DIVISION 1 - GENERAL REQUIREMENTS**

- 01 10 00 SUMMARY OF WORK
- 01 23 00 ALTERNATES
- 01 29 00 PAYMENT PROCEDURES
- 01 31 00 PROJECT COORDINATION
- 01 32 00 CONSTRUCTION PROGRESS DOCUMENTATION
- 01 33 00 SUBMITTAL PROCEDURES
- 01 40 00 QUALITY REQUIREMENTS
- 01 41 04 SPECIAL INSPECTIONS AND STRUCTURAL TESTING
- 01 42 00 REFERENCES
- 01 42 16 STANDARD SITEWORK REFERENCES
- 01 43 00 SITEWORK QUALITY ASSURANCE
- 01 50 00 TEMPORARY FACILITIES
- 01 71 23 FIELD ENGINEERING
- 01 73 00 EXECUTION
- 01 77 00 CLOSEOUT PROCEDURES
- 01 78 39 OPERATIONS AND MAINTENANCE DATA
- 01 79 00 DEMONSTRATION AND TRAINING
- 01 91 13 GENERAL COMMISSIONING REQUIREMENTS

#### **DIVISION 02 – SITEWORK**

02 41 13 SELECTIVE SITE DEMOLITION

#### **DIVISION 03 – CONCRETE**

- 03 10 04 CONCRETE FORMWORK
- 03 20 04 CONCRETE REINFORCEMENT
- 03 30 04 CAST-IN-PLACE CONCRETE

#### **DIVISION 4 - MASONRY**

04 20 00 UNIT MASONRY

(FILED SUB-BID)

#### **DIVISION 5 - METALS**

05 12 04 STRUCTURAL STEEL
---------------------------

- 05 50 00 METAL FABRICATIONS
- 05 51 33 ALUMINUM SHIPS LADDER

#### **DIVISION 6 - WOOD AND PLASTICS**

- 06 10 00 ROUGH CARPENTRY (JH)
- 06 17 54 WOOD TRUSSES
- 06 40 00 COMPOSITE COLUMNS
- 06 44 00 ORNAMENTAL WOODWORK
- 06 60 00 PLASTIC FABRICATIONS

#### **DIVISION 7 - THERMAL AND MOISTURE PROTECTION**

- 07 21 00 BUILDING INSULATION
- 07 21 13 SPRAY CELLULOSE INSULATION
- 07 21 19 THERMAL FOAM INSULATION
- 07 31 13 ASPHALT SHINGLES
- 07 46 00 RESIDENTIAL SIDING AND ACCESSORIES
- 07 46 46 FIBER CEMENT SIDING
- 07 53 23 EPDM MEMBRANE ROOFING
- 07 84 00 FIRESTOPPING
- 07 92 00 JOINT SEALERS

#### **DIVISION 8 - OPENINGS**

- 08 11 13 STEEL DOORS AND FRAMES
- 08 14 00 FLUSH WOOD DOORS
- 08 31 13 ACCESS DOORS
- 08 33 26 SIDE FOLDING SECURITY GRILLES
- 08 36 13 OVERHEAD SECTIONAL DOORS
- 08 41 13 ALUMINUM ENTRANCES & STOREFRONT
- 08 54 00 FIBERGLASS CLAD WOOD WINDOWS
- 08 71 00 DOOR HARDWARE AND DOOR SCHEDULE
- 08 71 13 AUTOMATIC DOOR OPERATORS
- 08 80 00 GLASS AND GLAZING
- 08 91 19 LOUVERS AND VENTS

#### **DIVISION 9 - FINISHES**

- 09 21 00 GYPSUM BOARD ASSEMBLIES
- 09 30 00 CERAMIC TILE
- 09 40 00 INDUSTRIAL FLOOR SYSTEMS
- 09 51 13 ACOUSTICAL CEILINGS

09 65 00 RESILIENT FLOORING AND BASE

- 09 68 10 CARPETING
- 09 72 00 WALLCOVERINGS
- 09 90 00 PAINTING

(FILED SUB-BID)

(FILED SUB-BID)

(FILED SUB-BID)

(FILED SUB-BID)

(PART OF FSB 07 31 13)

(FILED SUB-BID)

(FILED SUB-BID)

#### **DIVISION 10 - SPECIALTIES**

- 10 11 00 VISUAL DISPLAY BOARDS
- 10 12 00 DISPLAY CASE
- 10 14 19 CAST METAL SIGNS
- 10 14 23 PANEL ROOM SIGNS
- 10 14 53 TRAFFIC SIGNS
- 10 21 13 TOILET COMPARTMENTS
- 10 22 13 WIRE MESH PARTITIONS
- 10 28 00 TOILET AND BATH ACCESSORIES
- 10 44 16 FIRE EXTINGUISHERS
- 10 51 00 PERSONAL PROPERTY LOCKERS
- 10 51 13 WARDROBE LOCKERS
- 10 55 00 HIGH SECURITY KEY BOX
- 10 55 16 POSTAL SPECIALTIES
- 10 75 16 FLAGPOLES

#### **DIVISION 11 - EQUIPMENT**

- 11 19 00 DETENTION EQUIPMENT
- 11 19 16 EVIDENCE AND PISTOL LOCKERS
- 11 50 00 CANOPY HOOD
- 11 52 13 PROJECTION SCREEN

#### **DIVISION 12 - FURNISHINGS**

- 12 06 20 WINDOW TREATMENT
- 12 32 16 MANUFACTURED ARCHITECTURAL CASEWORK
- 12 93 13 BICYCLE RACKS

#### **DIVISION 13 - SPECIAL CONSTRUCTION**

13 47 00 BULLET RESISTANT PROTECTION

#### **DIVISION 21 - FIRE SUPPRESSION**

21 00 00 FIRE PROTECTION

#### **DIVISION 22 - PLUMBING**

22 00 00 PLUMBING

(FILED SUB-BID)

(FILED SUB-BID)

#### **DIVISION 23 - HEATING, VENTILATING, AND AIR CONDITIONING (HVAC)**

23 00 00 HVAC

(FILED SUB-BID)

#### **DIVISION 26 - ELECTRICAL**

26 00 00 ELECTRICAL

(FILED SUB-BID)

#### **DIVISION 31 - EARTHWORK**

- 31 20 00 EARTH MOVING
- 31 23 14 STRUCTURAL EXCAVATION
- 31 23 24 STRUCTURAL FILL
- 31 25 00 EROSION CONTROL
- 31 50 04 EARTHWORK PROTECTION

#### **DIVISION 32 – EXTERIOR IMPROVEMENTS**

- 32 01 90 TREE PROTECTION
- 32 11 00 PAVEMENT BASE COURSES
- 32 12 16 HOT MIX ASPHALT PAVEMENT
- 32 13 13 CEMENT CONCRETE PAVEMENT
- 32 16 13 PRECAST CONCRETE CURB
- 32 31 05 WOOD POST AND BEAM GUIDE
- 32 31 13 CHAIN LINK FENCE
- 32 31 23 PLASTIC (PVC) FENCE
- 32 39 13 STEEL PIPE BOLLARDS
- 32 91 13 TOPSOIL
- 32 92 00 SEEDING
- 32 93 00 TREES, PLANTS, AND GROUNDCOVERS

#### **DIVISION 33 - UTILITIES**

33 00 00 SITE UTILITIES

END OF TABLE OF CONTENTS

# **LIST OF DRAWINGS**

# NEW FACILITY for the CARVER POLICE DEPARTMENT 3 CENTER STREET CARVER, MA

#### TITLE SHEET

#### **CODE DRAWINGS**

R-0.1	CODE INFORMATION
R-1.1	CODE REFERENCE PLANS

#### **CIVIL DRAWINGS**

EXISTING CONDITI	ONS SURVEY
------------------	------------

- C-0.1 SITE LEGEND, NOTES & DETAILS
- C-0.2 SITE DETAILS
- C-0.3 SITE DETAILS
- C-0.4 SITE DETAILS
- C-0.5 SITE SEPTIC NOTES & DETAILS
- C-1.0 SITE UTILITY DEMOLITION PLAN
- C-1.1 SITE UTILITY PLAN

#### **LANDSCAPE DRAWINGS**

- L-1.0 OVERALL SITE PLAN AND BUILDING LOCATION
- L-1.1 SITE DEMOLITION PLAN
- L-1.2 SITE LAYOUT PLAN
- L-1.3 SITE GRADING PLAN
- L-1.4 SITE PLANTING PLAN
- L-1.5 EROSION AND SEDIMENTATION CONTROL PLAN
- L-2.0 ENLARGED SITE PLAN DETAILS
- L-3.0 SITE DETAILS
- L-3.1 SITE DETAILS

#### STRUCTURAL DRAWINGS

- S-0.1 GENERAL NOTES & TYPICAL DETAILS
- S-0.2 TYPICAL DETAILS
- S-1.1 FOUNDATION PLAN
- S-1.2 ROOF FRAMING PLAN
- S-2.1 OUTBUILDING FOUNDATION & ROOF FRAMING PLANS
- S-3.0 FOUNDATION SECTIONS
- S-3.1 FOUNDATION SECTIONS
- S-4.0 MAIN BUILDING STRUCTURAL SECTIONS
- S-4.1 MAIN BUILDING STRUCTURAL SECTIONS
- S-4.2 OUTBUILDING STRUCTURAL SECTIONS
- S-5.0 COLUMN SCHEDULE

#### ARCHITECTURAL DRAWINGS

A-0.1	ARCH. GENERAL INFORMATION AND ABBREVIATIONS
A-0.2	FLOOR, WALL, AND CEILING TYPES
A-1.1	MAIN BUILDING FLOOR PLAN
A-1.2	MAIN BUILDING ATTIC FLOOR PLAN
A-1.3	OUTBUILDING FLOOR, REFLECTED CEILING, AND ROOF PLANS
A-2.1	MAIN BUILDING REFLECTED CEILING PLAN
A-2.2	CEILING DETAILS
A-3.1	MAIN BUILDING EXTERIOR ELEVATIONS
A-3.2	MAIN BUILDING EXTERIOR ELEVATIONS AND DETAILS
A-3.3	OUTBUILDING EXTERIOR ELEVATIONS
A-4.0	SECTION AND DETAIL KEY PLANS
A-4.1	BUILDING SECTIONS
A-4.2	BUILDING SECTIONS
A-4.3	BUILDING SECTION
A-4.4	MAIN BULIDING BASE OF WALL SECTIONS
A-4.5	MAIN BUILDING SECTION DETAILS
A-4.6	MAIN BUILDING DOOR #138A CANOPY SECTIONS
A-4.7	MAIN BUILDING ROOF EDGE WALL SECTIONS
A-4.8	MAIN BUILDING SECTION DETAILS
A-4.9	MAIN BUILDING CUPOLA SECTIONS
A-4.10	OUTBUILDING WALL SECTIONS
A-5.1	MOUNTING HEIGHTS AND DETAILS
A-5.2	LARGE SCALE FLOOR PLAN
A-5.3	LARGE SCALE FLOOR PLANS
A-6.1	MISC. DETAILS
A-6.2	MISC. DETAILS
A-6.3	SIGNAGE DETAILS
A-6.4	WIRE MESH PARTITION DETAILS
A-6.5	MISC. DETAILS
A-7.1	MAIN BUILDING ROOF PLAN

- A-7.3 ROOF DETAILS
- A-8.1 MAIN BUILDING COLUMN PLAN DETAILS
- A-8.2 MAIN BUILDING COLUMN DETAILS
- A-8.3 MAIN BUILDING COLUMN DETAILS
- A-9.1 DOOR AND FRAME SCHEDULE (PART I)
- A-9.2 DOOR AND FRAME SCHEDULE (PART II) AND DETAILS
- A-9.3 FRAME, LEAF, LOUVER, AND WINDOW TYPES
- A-9.4 FRAME DETAILS
- A-9.5 FRAME DETAILS
- A-9.6 FRAME DETAILS
- A-9.7 FRAME DETAILS
- A-9.8 LOUVER, THRESHOLD, AND MISC. DOOR AND WINDOW DETAILS
- A-10.1 CASEWORK ELEVATIONS
- A-10.2 CASEWORK ELEVATIONS
- A-10.3 CASEWORK ELEVATIONS
- A-10.4 CASEWORK ELEVATIONS
- A-10.5 CASEWORK SECTIONS
- A-10.6 CASEWORK SECTIONS
- A-10.7 CASEWORK SECTIONS
- A-10.8 CASEWORK AND MILLWORK SECTIONS
- A-11.1 LARGE SCALE DETENTION AREA PLANS
- A-11.2 DETENTION AREA ELEVATIONS
- A-11.3 DETENTION AREA DETAILS
- A-11.4 DETENTION AREA DETAILS
- A-11.5 DETENTION AREA DETAILS
- A-12.1 APPLIANCE AND ACCESSORIES FLOOR PLAN

#### FINISH DRAWINGS

- F-0.1 FINISH KEY AND ROOM SCHEDULE
- F-1.1 MAIN BUILDING FINISH PLAN
- F-1.2 OUTBUILDING FINISH PLAN ADD. ALT. #1
- F-2.1 INTERIOR ELEVATIONS
- F-2.2 INTERIOR ELEVATIONS
- F-3.1 FURNITURE PLANS (FOR REFERENCE ONLY)

#### PLUMBING DRAWINGS

- P-0.0 PLUMBING LEGEND AND SCHEDULES
- P-0.1 PLUMBING DETAILS
- P-1.0 PLUMBING UNDERSLAB PLAN
- P-2.0 PLUMBING FLOOR PLAN
- P-3.0 PLUMBING FLOOR PLAN (OUTBUILDING)

#### FIRE PROTECTION DRAWINGS

- FP-0.0 FIRE PROTECTION LEGEND AND DETAILS
- FP-1.0 FIRE PROTECTION FLOOR PLAN
- FP-2.0 FIRE PROTECTION ATTIC PLAN
- FP-3.0 FIRE PROTECTION SITE PLAN

#### MECHANICAL DRAWINGS

- M-0.0 MECHANICAL LEGEND, SCHEDULES AND NOTES
- M-0.1 MECHANICAL SCHEDULES
- M-1.0 MECHANICAL DUCTWORK FLOOR PLAN
- M-1.1 MECHANICAL DUCTWORK ATTIC PLAN
- M-2.0 MECHANICAL PIPING FLOOR PLAN
- M-2.1 MECHANICAL PIPING ATTIC PLAN AND OUTBUILDING
- M-3.0 MECHANICAL DETAILS
- M-3.1 MECHANICAL DETAILS
- M-3.2 MECHANICAL VRF SYSTEM DIAGRAM

#### ELECTRICAL DRAWINGS

- E-0.0 ELECTRICAL LEGEND, FIXTURE SCHEDULE AND NOTES
- ES-1.0 ELECTRICAL SITE PLAN
- ES-1.1 ELECTRICAL SITE DETAILS
- ES-1.2 ELECTRICAL SITE DETAILS
- E-1.0 ELECTRICAL FLOOR PLAN LIGHTING
- E-2.0 ELECTRICAL FLOOR PLAN POWER
- E-2.1 ELECTRICAL PART PLANS
- E-2.2 ELECTRICAL FLOOR PLAN MECHANICAL POWER
- E-2.3 MAIN BUILDING ATTIC ELECTRICAL PLAN
- E-2.4 ELECTRICAL (OUTBUILDING) PLANS POWER AND LIGHTING
- E-3.0 ELECTRICAL RISER DIAGRAM AND SCHEDULES
- E-3.1 ELECTRICAL DETAILS AND SCHEDULES
- E-4.0 ELECTRICAL FLOOR PLAN SECURITY
- E-4.1 ELECTRICAL (OUTBUILDING) PLAN SECURITY, SECURITY LEGEND

AND DETAILS

#### FIRE ALARM DRAWINGS

- FA-0.0 ELECTRICAL FIRE ALARM LEGEND, RISER DIAGRAM AND NOTES
- FA-1.0 ELECTRICAL FLOOR PLAN FIRE ALARM
- FA-1.1 MAIN BUILDING ATTIC FIRE ALARM PLAN
- FA-2.0 ELECTRICAL (OUTBUILDING) PLAN FIRE ALARM

END OF DRAWING LIST

## **INVITATION TO BID**

# NEW FACILITY for the CARVER POLICE DEPARTMENT 3 CENTER STREET CARVER, MA

**Project Location:** 3 Center Street, Carver, MA

General Desc	ription of the Worl	K: New construction and related sitework to provide a new facility for the Carver Police Department, Carver, MA. Work includes clearing and sitework, utilities, one-story slab-on-grade police facility and storage outbuilding.		
Qualifications of Contractors:		Eligible General Bidders shall be General Contractors. All <u>General Bidders and Filed Sub-bidders shall submit the</u> following data with the bid:		
1.	A Certificate of Eli Division of Capital approved to bid on	gibility issued by the Commonwealth of Massachusetts - Asset Management showing that the Contractor has been projects of the size and nature of this project.		
2.	An Update Stateme between the last DO	nt summarizing the Contractor's Record for the period CAM Certification and the date the Contractor submits the Bid.		
Failure be cau	e of the General Bide se for the rejection of	ler and Filed Sub-bidders to submit this above information will f the bid.		
Owner:TownAwarding Authority:Town		n of Carver, Massachusetts		
		of Carver, 108 Main Street, Carver, MA 02330		
Architect: Jacuns Berlin		ski Humes Architects, LLC, 15 Massirio Drive, Suite 101, , CT, (860)-828-9221, FAX: (860)-828-9223		

#### **INVITATION TO BID (CONTINUED)**

**Place for Receiving Bids:** This project is being Electronically Bid (E-Bid). All bids shall be submitted online at <u>www.Projectdog.com</u>. Hard copy bids will not be accepted by the Awarding Authority. E-Bid tutorials and instructions are available within the specifications and online at <u>www.Projectdog.com</u>. For assistance, call Projectdog, Inc at (978) 499-9014, M-F 8:30AM-5PM.

Electronic bids for General Construction will be received until **2:00 p.m**., local time on **Thursday, November 14, 2019**.

Electronic Filed Sub-bids for the trades listed below will be received until **2:00pm** local time on **Tuesday, October 29, 2019**.

Bids are subject to applicable public bidding laws, including, but not limited to, M.G.L. c. 149 Sections. 44A through 44-J, as amended.

Attention is directed to the minimum wage rates to be paid as determined by the Commissioner of Labor and Workforce Development and the weekly payroll record submittal requirements under the provisions of Massachusetts General Laws, Chapter 149, Section 26 through 27D inclusive.

#### The following Filed Sub-bids will be received according to the Invitation to Bid:

Unit Masonry: To include section:

• 04 20 00 UNIT MASONRY

Roofing and Flashing: To include sections:

- 07 31 13 ASPHALT SHINGLES
- 07 53 23 EPDM MEMBRANE ROOFING

Caulking: To include sections:

• 07 92 00 JOINT SEALERS

Tile: To include section:

• 09 30 00 CERAMIC TILE

Acoustical Tile: To include section:

• 09 51 13 ACOUSTICAL CEILINGS

**Resilient Flooring:** To include section:

• 09 65 00 RESILIENT FLOORING AND BASE

**Painting:** To include sections:

• 09 90 00 PAINTING

#### **INVITATION TO BID (CONTINUED)**

Fire Suppression: To include sections:

• 21 00 00 FIRE PROTECTION

**Plumbing:** To include sections:

• 22 00 00 PLUMBING

**HVAC:** To include sections:

• 23 00 00 HVAC

**Electrical:** To include sections:

• 26 00 00 ELECTRICAL

#### **Place for Obtaining Bidding Documents:**

Copies of the contract documents (electronic sets) may be obtained during normal business hour on, or after, **Wednesday, October 2, 2019**, at:

- a. Bid forms and contract documents will be available at <u>www.Projectdog.com</u> or for pick-up at: Projectdog, Inc, 18 Graf Road, Suite 8 Newburyport, MA (978)499-9014, M-F 8:30AM-5PM. Go to <u>www.Projectdog.com</u> and login with an existing account or click <u>Sign Up</u> to register for free. Enter Project Code 834454 in the project locator box. Select "Acquire Documents" to download documents, review a hard copy at Projectdog's physical location, or request a free project CD.
- b. All Addenda must be acquired electronically at <u>www.Projectdog.com</u>. Each individual or firm recorded as having requested a set of Contract Documents will be electronically notified via email when addenda are issued. It is the sole responsibility of the bidder to review all ADDENDA prior to bid opening at <u>www.Projectdog.com</u> or at Projectdog's physical location.

<b>Bid Instructions and Forms:</b>	Full instructions and forms are included in the Bidding
	Documents.

- **Bid Security:** Bid Security shall be issued payable to the "**Town of Carver**" in the form of certified check, cashier's check, or bid bond in the amount of 5% of the Base Bid.
- **Required Bonds:** Performance Bond and Labor and Material Payment Bond for 100% of the Contract price with a surety company satisfactory to the Awarding Authority.

#### **INVITATION TO BID (CONTINUED)**

Withdrawal of Bids:	No bid may be withdrawn for a period of thirty (30) days (Saturday, Sunday and Legal Holidays excluded) after the opening of General Bids. In accordance with G.L. c.149, Sections 44A and 44B, if an award of the general contract is made within such 30- day period, the three lowest general bidders shall not be permitted to withdraw their bids until such time as a general contract has been executed.
Rejection of Bids:	The Town of Carver reserves the right to accept or reject any or all bids and waive any formalities in its sole discretion.
Applicable Laws:	The bidding shall be done in accordance with the by-laws of the Town of Carver, and the relevant laws of the Commonwealth of Massachusetts. To the extent applicable, the following sections of the Massachusetts General Laws are incorporated herein by reference.
	M.G.L. Chapter 30, Sections 39A, 39B and 39F-R, as amended M.G.L. Chapter 149, Sections 26, 27, 29, 3 5 and 44A-44M, as amended.

# A pre-bid conference and walk-through will be held at 10:00 a.m., on Thursday, October 17, 2019 at the Carver Town Hall, 108 Main Street, Carver, Massachusetts. All bidders are encouraged to attend.

The Bid Documents may be examined during regular office hours at the following places:

- Jacunski Humes Architects, LLC: 15 Massirio Drive, Suite 101, Berlin, CT
- Office of the Town Administrator: 108 Main Street, Carver, MA
- **Projectdog,** 18 Graf Road, Suite 8 Newburyport, MA

END OF INVITATION TO BID

#### **SECTION ITB - INSTRUCTIONS TO BIDDERS**

#### 1.1 <u>GENERAL; DEFINITIONS</u>

- A. In accordance with an Advertisement for Bids or Invitation to Bid, a copy of which is bound herewith, the Town of Carver, Massachusetts (the "Town" or the "Awarding Authority") has invited bids for a New Facility for the Carver Police Department, for the Town of Carver, MA.
- B. These Instructions to Bidders ("Instructions") are intended to assist bidders (which term as used in these Instructions shall include general bidders and sub-bidders as applicable) in the preparation of their bids, to call attention to various legal requirements and to set forth certain conditions upon which bids are submitted and received.
- C. The award of the Contract is governed by Sections 44A-44J of Chapter 149 of the Massachusetts General Laws, as amended. Certain provisions of the foregoing statute and of other applicable statutes are summarized or referred to in these Instructions. Whenever these Instructions or any other Contract Documents set forth or summarize applicable statutory provisions, whether or not the statutes have been specifically referred to, such summaries are for convenience only, do not purport to be complete or correct as summaries in any material particular, and shall in no respect supersede, expand or limit rights or duties of the Town or bidders in matters governed by statute.
- D. Filed sub-bids are requested for the classes of work stated in the Invitation to Bid.
- E. The following definitions shall apply in these Instructions and in the other Contract Documents:
  - (1) The term "bidding documents" shall include the Invitation to Bid, these Instructions, the Geotechnical Data, the Hazardous Materials Survey, the bid forms, bond forms, contract forms and other Contract Documents bound herewith, the Drawings, the Specifications, and all Addenda issued prior to receipt of bids.
  - (2) The term "Contract Documents" shall mean the contract entered into between the Town and the successful general bidder, including all documents enumerated as Contract Documents in the Agreement between Owner and Contractor, and all Modifications (as defined in the General Conditions of the Contract for Construction) issued after execution of the Contract.
  - (3) The terms "Addenda" and "Addendum" shall mean written documents and/or drawings issued by the Town prior to execution of the Contract which supplement, modify, correct, explain or interpret the bidding documents.
  - (4) The term "Architect" means the Architect identified in the Invitation to Bid.
  - (5) All definitions set forth in the Conditions of the Contract or the other Contract Documents as therein defined are applicable to these Instructions and to the other

ITB-2

bidding documents.

#### 1.2 AVAILABILITY OF BIDDING DOCUMENTS

- A. Each person requesting bidding documents shall proceed as directed in the Invitation to Bid.
- B. Bidders shall use complete sets of bidding documents in preparing bids; neither the Town nor the Architect assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of bidding documents.
- C. The Town in making copies of the bidding documents available does so only for the purpose of obtaining bids on the work of this contract, and does not expressly or impliedly confer a license or permission of any kind to any person for any other use thereof.
- D. The Town, through its Owner's Project Manager (OPM), shall prepare and update daily a list of persons who have requested bidding documents for the project, which list shall be sent each week to the Central Register published by the Massachusetts Secretary of State.

#### 1.3 EXAMINATION OF SITE AND BIDDING DOCUMENTS

- A. Before submitting a bid, each bidder must: (a) thoroughly examine the Contract Documents and other bidding documents, (b) visit the site to fully examine and acquaint itself with local conditions that may in any manner affect cost, progress or performance of the Work, (c) familiarize itself with federal, state and local laws, ordinances, rules and regulations that may in any manner affect cost, progress or performance of the Work, and (d) carefully correlate its observations with the requirements of the Contract Documents. Failure of a bidder to visit the site and acquaint itself with the bidding documents or to attend the pre-bid conference, if any, shall in no way relieve the bidder from any obligation with respect to its bid.
- B. Before submitting a bid each bidder may, at its own expense, make such additional investigations and tests as the bidder may deem necessary to prepare its bid. On request, the Town will provide each bidder access to the site to conduct such investigations and tests.
- C. The property upon which the work is to be performed, rights-of-way for access thereto, and other property designated for use by the contractor in performing the work are identified in the Contract Documents.
- D. Each bidder shall promptly notify the Architect of any ambiguity, inconsistency or error it may discover upon examination of the bidding documents, the site or other local conditions. The submission of a bid will constitute a representation by the bidder that it has complied with every requirement of this Section 1.3 and that the Contract Documents are sufficient in scope and detail to indicate and convey understanding of all terms and conditions for performance of the work of this contract.

- E. A pre-bid conference will be held at the time and place specified in the Invitation to Bid.
- F. To the extent applicable, **the Owner will be responsible for payment of any building permit fees and related municipal inspection fees.** The Contractor(s) shall be responsible for applying and obtaining all required permits pertaining to their scope of work.

#### 1.4 ADDENDA AND INTERPRETATION OF BIDDING DOCUMENTS

CARVER POLICE CARVER, MA

- A. All questions and requests for clarification or interpretation of the meaning of the bidding documents shall be in writing, addressed to the Architect at the address stated in the Invitation to Bid, and to be given consideration must be received at least seven days prior to the date fixed for opening of sub-bids, in the case of questions and requests for clarification or interpretation affecting sub-bids, or at least seven days prior to the date fixed for opening of general bids in the case of questions and requests for clarification and interpretation affecting general bids.
- B. Clarifications or interpretations and any supplemental instructions or forms, if issued, will be issued in the form of written Addenda not later than two business days before the date fixed for opening of bids. Addenda will be sent by U.S. mail or by express delivery service or other method determined by the Town, to all parties who, according to the Architect's records, have obtained or requested bidding documents and have furnished an address for such purposes. Copies of Addenda will be made available for inspection at all locations where bidding documents are on file for that purpose. Each bidder shall be responsible for determining that it has received all Addenda issued, and shall acknowledge receipt of all Addenda on its bid form, and failure of any bidder to receive any Addendum shall not relieve such bidder from any obligation under its bid as submitted. All Addenda so issued shall become part of the bidding documents.
- C. Oral clarifications or interpretations will be of no legal effect. The Town will not be responsible for, and no bidder may rely upon or use as the basis of a claim against the Town or the Architect, any information, explanation or interpretation of the bidding documents rendered in any fashion except as herein provided.

#### 1.5 CERTIFICATION BY DIVISION OF CAPITAL ASSET MANAGEMENT

- A. <u>General Bids and Filed Sub-bids</u> on this contract must be accompanied by a copy of a Certificate of Eligibility issued by the Massachusetts Division of Capital Asset Management ("DCAM") showing that the bidder has the classification and capacity rating to perform the work required. In order to be eligible to bid on this contract, a general bidder must be certified by DCAM for the estimated project cost stated in the Invitation to Bid and for the category of work specified in the Invitation to Bid.
- B. Each <u>General Bid and Filed Sub-bid</u> must also be accompanied by an Update Statement in the form issued by DCAM. The bidder shall include on the Update Statement a list of all building projects completed by the bidder since the date of the bidder's Certificate of

Eligibility, and all construction projects the bidder has under contract, and all other information called for on the Update Statement in full compliance with all of the instructions contained on the Update Statement. The Town or the Architect will furnish copies of the Update Statement form to bidders on request. <u>Any General Bid and Filed</u> <u>Sub-bid</u> submitted without the appropriate Certificate of Eligibility and Update Statement shall be invalid and will not be accepted by the Town.

- C. A bidder's bid shall not be rejected because of mistakes or omissions of form in its Update Statement, provided the bidder promptly corrects those mistakes or omissions upon request, by the Town. The Town may, in its discretion, give a bidder notice of defects, other than mistakes or omission of form, in the bidder's Update Statement, and an opportunity to correct such defects, provided the correction of such defects is not prejudicial to fair competition. The Town may reject a bid if the corrected Update Statement contains unfavorable information about the bidder that was omitted from the Update Statement filed with the bidder's bid.
- D. The Town will consider the information contained in the Update Statement, which it may verify by its own investigation, and any information obtained from DCAM pursuant to 810 CMR 4.03(12), in determining whether the apparent low general bidder is responsible and eligible for contract award pursuant to M.G.L. C. 149, s. 44A(2). The Town's review of the responsibility and eligibility of the low bidder will concentrate on, among other things, the bidder's performance since its last certification by DCAM, provided, however, that the Town may bring information to DCAM's attention concerning a contractor's certification, if DCAM was not aware of such information when it certified the contractor. In determining who is the lowest responsible and eligible bidder, pursuant to M.G.L. Chapter 149, Sections 44D(6), the Town may consider the bidder's past performance on projects undertaken or completed within the past five years.
- E. The low bidder may not be awarded a contract which, when the annualized value thereof is added to the annualized cost to complete all other currently held contracts, would exceed the contractor's aggregate rating limit as stated in the contractor's Certificate of Eligibility. The Town will use the information provided in the Update Statement to compute the amount of work the bidder has under contract. If the bidder provides the Town with evidence that its outstanding annualized balance of contracts (plus the annualized value of its bid for this project) will be within its aggregate rating limit by the start date of the project for which it is low bidder, the Town may, at its discretion, make the contract award.
- F. Should the low bidder be determined not to be responsible or eligible, the Town shall review the next low bidder's responsibility and eligibility, in accordance with these instructions and applicable law until a bidder is determined to be responsible and eligible for contract award.
- G. The contract shall not be awarded to any bidder whose background information, when investigated and verified by the Town, raises significant question as to its ability to successfully complete the project in question due to past or current problems with its skill, ability and integrity.

#### 1.6 WAGE RATES

A. Minimum rates of wages for work performed under this contract will be as determined by the Division of Occupational Safety of the Massachusetts Department of Labor and Work Force Development in accordance with the provisions of Sections 26 to 27.H, inclusive, of Chapter 149 of the Massachusetts General Laws. Attention is called to serious penalties established under law for violation of these provisions. The schedule of wage rate determinations applicable to this contract is included in the bidding documents.

#### 1.7 <u>SALES TAX</u>

A. Section 6(f) of Chapter 64H of the Massachusetts General Laws exempts from Massachusetts sales tax building materials and supplies to be used in the Project, and bidders shall not include in their bids any amount therefore. The words "building materials and supplies" shall include all materials and supplies consumed, employed or expended in the construction, reconstruction, alteration, remodeling or repair of any building, structure, public highway, bridge, or other such public work, as well as such materials and supplies physically incorporated therein. Said words shall also include rental charges for construction vehicles, equipment and machinery rented specifically for use on the site of the project or while being used exclusively for the transportation of materials for the project. The number of the certificate granted by the Commissioner of Revenue for use in obtaining the exemption will be given to the successful general bidder.

#### 1.8 PREPARATION AND SUBMISSION OF BIDS

- A. This project is being Electronically Bid (E-Bid). All bids shall be submitted online at <u>www.Projectdog.com</u>. Hard copy bids will not be accepted by the Awarding Authority. E-Bid tutorials and instructions are available within the specifications and online at <u>www.Projectdog.com</u>. For assistance, call Projectdog, Inc. at (978) 499-9014, M-F 8:30AM-5PM.
  - a. All required bid forms must be submitted in **PDF** format only. The bidder must complete all required signatures either digitally (using Adobe Acrobat) or manually (print, sign and scan as a PDF file).
  - b. Bid Bonds issued by a surety company shall be submitted on the E-Bid page. Bid bonds in the form of cash or check shall be completed and delivered as outlined on the Bid Bond Affidavit form. Click here to download the Bid Bond Affidavit form.
  - c. The bidder must enter bid price on the E-Bid form as a whole dollar value only with no punctuation. Sums shall be expressed in both words and figures on the bid form. Note: The E-Bid form will automatically match the word value to the numeric figure entered by the bidder.

- d. Bidders may save, submit or modify an E-Bid at any time prior to bid close. Once submitted, a bid cannot be edited. To modify a bid the bidder must retract the bid, make any necessary changes, and then submit the bid again. Upon submitting or retracting the bidder will receive a convenience email for informational purposes only. Bidders are encouraged to contact Projectdog, Inc at (978)499-9014, M-F 8:30AM-5PM, if an email is not received.
- e. If a bid is submitted prior to an Addendum being issued, the bidder will receive an automated email for informational purposes only. The bidder must review the addendum, retract the bid, acknowledge all addenda, and submit the bid again. If a bidder fails to acknowledge addenda their bid may be rejected by the Awarding Authority.
- f. Timely submission of an E-Bid shall be the full responsibility of the Bidder. The server clock is the time of record. It is the bidder's responsibility to review and confirm online that a bid has been submitted and/or retracted and that the bid is 100% true, complete and accurate. All bidders are required to review their submitted E-Bid via the **"View My Bid Package"** link.
- B. The Form for General Bid requires the general bidder to indicate whether performance and payment bonds will be required by the general bidder to be furnished by one or more filed sub-bidders. If the general bidder requests one or more filed sub-bidders to furnish such bonds, the general bidder must pay the premiums for all such bonds requested, and must include the costs of such premiums in its general bid.

#### 1.9 <u>RECEIPT OF BIDS</u>

CARVER POLICE CARVER, MA

A. All bidders are cautioned to allow ample time for transmittal of bids. Bidders are solely responsible for electronic receipt of bids. Bids received after the specified time will not be accepted or recognized. The electronic time of receipt will determine the acceptability of bids.

#### 1.10 BID DEPOSIT

A. Each bid must be accompanied by a bid deposit in the form of a bid bond, or cash, or a certified check on, or a treasurer's or cashier's check issued by, a responsible bank or trust company, payable to the "**Town of Carver**". A bid bond shall be (a) in form satisfactory to the Town substantially conforming to the sample contained in the Contract Documents, (b) with a surety company qualified to do business in the Commonwealth of Massachusetts and satisfactory to the Town, and (c) conditioned upon the faithful performance by the principal of the agreements contained in the bid. The bid deposit shall be in the amount of five percent (5%) of the value of the bid. The bid deposit shall be sealed in a separate envelope from the bid and then attached to the envelope containing the bid.

#### **INSTRUCTIONS TO BIDDERS**

#### CARVER POLICE CARVER, MA

- All bid deposits of general bidders, except those of the three lowest responsible and B. eligible general bidders, shall be returned within five (5) business days after the opening of the general bids. The bid deposits of the three (3) lowest responsible and eligible general bidders shall be returned upon the execution and delivery of the contract or, if no award is made, upon the expiration of the time prescribed in Section 44A of Chapter 149 of the Massachusetts General Laws for making an award; except that, if any general bidder to whom the contract is awarded fails to perform its agreement to execute the contract and furnish a performance bond and also a labor and materials payment bond as stated in its bid in accordance with Section 44E of said Chapter 149, the Town may determine that such general bidder has abandoned the proposed contract, and thereupon the proposal made by such general bidder in its bid and the acceptance thereof by the Town shall be null and void and the bid deposit of such general bidder shall become and be the property of the Town as liquidated damages for such failure and to indemnify the Town for any loss, cost or damage sustained by the Town as a result of such failure of the general bidder to execute the contract and furnish the required bonds as aforesaid; provided that the amount of the bid deposit which becomes the property of the Town shall not, in any event, exceed the difference between the bid price of such general bidder and the bid price of the next lowest responsible and eligible general bidder; and provided further that, in case of death, disability, bona fide clerical or mechanical error of a substantial nature, or other similar unforeseen circumstances affecting the general bidder, its bid deposit shall be returned to it.
- C. All bid deposits of sub-bidders, except (i) those of the sub-bidders named in the general bids of the three lowest responsible and eligible general bidders and (ii) those of the three lowest responsible and eligible sub-bidders for each sub-trade, shall be returned within five (5) business days, after the opening of the general bids. The bid deposits of subbidders not returned pursuant to the provisions of the preceding sentence shall be returned within five business days after the execution of the general contract; except that, if a selected sub-bidder fails to perform its agreement to execute a subcontract with the general bidder selected as the general contractor, contingent upon the execution of the general contract, and, if requested to do so in the general bid by such general bidder, to furnish a performance and payment bond as stated in its sub-bid in accordance with Section 44F(2) of said Chapter 149, the bid deposit of such sub-bidder shall become and be the property of the Town as liquidated damages, provided that, the amount of the bid deposit which becomes the property of the Town shall not, in any event, exceed the difference between the sub-bid price of such sub-bidder and the sub-bid price of the next lowest responsible and eligible sub-bidder; and provided further that, in case of death, disability, bona fide clerical or mechanical error of a substantial nature, or other unforeseen circumstances affecting any such sub-bidder, its bid deposit shall be returned to it.
- D. In addition to the provisions for the return of bid deposits in the foregoing Paragraphs B and C, and subject to G.L. c.149, Sections 44A and 44B, upon receipt of a bid bond in an amount not less than the amount of the required bid deposit from a bidder that has already submitted a bid deposit in another form, the Town shall return any bid deposit of a bidder forthwith after public opening of bids. The bid bond shall be in an amount and in the form provided in Paragraph A.

#### 1.11 <u>REJECTION OF BIDS</u>

- A. The Town reserves the right to reject any or all general bids if it be in the public interest to do so. The Town reserves the right to reject any sub-bid on any sub-trade, if it determines that such sub-bid does not represent the sub-bid of a person competent to perform the work as specified or that less than three such sub-bids were received and that the prices are not reasonable for acceptance without further competition.
- B. Within two (2) business days after opening of sub-bids, the Town will reject every subbid which is not accompanied by the required bid deposit or which otherwise does not conform to statutory requirements, or which is on a form not completely filled in, or which is incomplete, conditional or obscure, or which contains any addition not called for; provided, however, that the failure of the Town to reject such a sub-bid within such period shall not validate such a sub-bid nor preclude the Town from subsequently rejecting it.
- C. Every general bid which is not accompanied by the required bid deposit, or which otherwise does not conform to statutory requirements, or which is on a form not completely filled in, or which is incomplete, conditional or obscure, or which contains any addition not called for, shall be considered invalid and the Town shall reject any such bid.
- D. In addition, the Town may consider informal and may reject any general bid or sub-bid which is not prepared and submitted in accordance with all requirements of the bidding documents, or which contains erasures, alterations, additions, errors or irregularities of any kind, or which contains proposed prices for any class or item of work which are, in the judgment of the Town, substantially less or more than the actual cost to complete the work; provided, however, that the Town reserves the right to waive any and all informalities or non-statutory requirements.
- E. No general bid or sub-bid shall be rejected because of the failure to submit prices for, or information relating to, any item or items for which no space is provided in the bid form furnished by the Town, but this sentence shall not be applicable to any failure to furnish prices or information required by Section 44E (in the case of general bids) or Section 44F (in the case of sub-bids) of Chapter 149 of the Massachusetts General Laws. No general bid shall be rejected (1) because the sum of the prices for all work of the general contractor and sub-bids does not equal the general bid price set forth on the bid form for that purpose or (2) because of error in setting forth the name, the sub-bid price of a sub-bidder, or the total sub-bids as long as the sub-bidder or sub-bidders designated are clearly identifiable, or (3) because the plans and specifications do not accompany the bid or are not submitted with the bid.
- F. Subject to the foregoing, if the bid forms, specifications, or any other bid documents require submission of special information or data to accompany bids, or sub-bids for any trade, if applicable, and any bidder neglects to furnish such information or data with its bid, the Town may reject the bid of such bidder as incomplete; provided, however, that

the Town reserves the right to deem any such omission which is not an omission of substance as an informality for which such bid will not be rejected, and to subsequently receive such information or data prior to award of the contract.

G. See also Section 1.5 as to the Town's right to reject the bid of any bidder who is not qualified, competent and responsible.

#### 1.12 AWARD OF CONTRACT

- A. The general contract will be awarded to the lowest responsible and eligible general bidder complying with the conditions and requirements provided in these Instructions, the bid forms and the other bidding documents. A "responsible" bidder is a bidder demonstrably possessing the skill, ability and integrity necessary to faithfully perform the work called for by the contract, based upon a determination of competent workmanship and financial soundness in accordance with the provisions of Section 44D of Massachusetts General Laws Chapter 149. An "eligible" bidder is a bidder who is able to meet the requirements for bidders set forth in Sections 44A through 44H of said Chapter 149 and not debarred from bidding under section 44C of said Chapter 149 or any other applicable law, and who shall certify that it is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work.
- B. Award of the contract will be made within thirty (30) business days after (i) the opening of the general bids or (ii) the receipt by the Town of any approvals necessary from federal agencies in connection with the project, whichever is later.
- C. The successful bidder will be notified in writing, by mail or otherwise, that its bid has been accepted and that it has been awarded the contract. The successful bidder shall execute the contract and furnish the required bonds, at the offices of the Town if requested, within five (5) business days after presentation of the contract to the bidder or notice to the bidder that the contract is ready for execution.
- D. The Town shall not enter into a contract with, and shall not approve as a subcontractor furnishing labor and materials for a part of any work of this contract, a foreign corporation which has not filed with the Town a certificate of the Secretary of State of the Commonwealth of Massachusetts stating that such corporation has complied with Sections 3 and 5 of Chapter 181 of the Massachusetts General Laws and the date of such compliance. The Town shall report to said Secretary of State and to the Department of Corporations and Taxation of the Commonwealth of Massachusetts any foreign corporation performing any work under this contract or any such subcontract, and any person, other than a corporation, performing work under this contract or any such subcontract, and residing or having a principal place of business outside the Commonwealth of Massachusetts.
- E. If the bidder selected as the general contractor fails to perform its agreement to execute the contract in accordance with the terms of its bid and furnish a performance bond and also a labor and materials payment bond as stated in its bid, the award will be made to the next lowest responsible and eligible general bidder, subject to the provisions of Sections

**CARVER POLICE** CARVER, MA

44A-44J, inclusive, of said Chapter 149. The thirty-business-day time limit shall not be applicable to a second or subsequent award made after the expiration of the time limit with the consent of said next lowest responsible and eligible general bidder, and made because the original award made within the time limit was invalid, or because the general bidder failed to execute the contract or to provide a performance bond and a labor and materials payment bond.

#### 1.13 CERTIFICATES AND DOCUMENTS TO BE FURNISHED UPON EXECUTION OF CONTRACT

- A. If the amount or the estimated amount of this contract is greater than \$100,000, then, pursuant to Section 39R of Chapter 30 of the Massachusetts General Laws, the Contract Documents require the general contractor to make and keep books, records and accounts pertaining to the contractor's financial affairs and to file with DCAM and the Town the statements and certificates described below in Paragraphs Band C. Records and statements required under Section 39R are not public records and are not open to public inspection, but shall be made available as provided in said Section 39R. Words used in Paragraphs B and C below shall have the meanings assigned to them in said Section 39R.
- B. Prior to the execution of the contract the general contractor shall file with the Town:
  - 1. A statement of management as to whether the system of internal accounting controls of the contractor and its subsidiaries reasonably assures that:
    - transactions are executed in accordance with management's general and a. specific authorization;
    - b. transactions are recorded as necessary
      - (i) to permit preparation of financial statements in conformity with generally accepted accounting principles, and
      - to maintain accountability for assets; (ii)
    - access to assets is permitted only in accordance with management's c. general or specific authorization; and
    - d. the recorded accountability for assets is compared with the existing assets at reasonable intervals and appropriate action was taken with respect to any difference.
  - 2. A statement prepared and signed by an independent certified public accountant, stating that s/he has examined the statement of management on internal accounting controls, and expressing an opinion as to:
    - whether the representations of management are consistent with the result a. of management's evaluation of the system of internal accounting controls; and

- b. whether such representations of management are, in addition, reasonable with respect to transactions and assets in amounts which would be material when measured in relation to the applicant's financial statements.
- C. Prior to execution of the contract, and annually during the term of the contract, the general contractor shall file with DCAM a financial statement prepared by an independent certified public accountant on the basis of an audit by such accountant. All statements shall be accompanied by an accountant's report.
- D. Pursuant to Section 49A of Chapter 62C of the Massachusetts General Laws the contractor must certify that it has complied with all laws of the Commonwealth of Massachusetts relating to taxes. This certification is contained in the Agreement to be executed by the general contractor.
- E. Prior to commencement of work, the general contractor must furnish to the Town certificates evidencing required insurance coverage in accordance with the provisions of the insurance requirements contained in the Conditions of the Contract. The Town shall have no obligation to execute the Contract, and may award the Contract to the next lowest eligible and responsible bidder, if such insurance certificates have not been provided to the Town within five business days after presentation of the Contract to the general contractor for execution.
- F. Evidence of compliance with laws of the Commonwealth relating to corporations, and evidence of corporate authority with respect to execution of the contract documents on behalf of the general contractor, in form acceptable to the Town, must be furnished by the general contractor to the Town at the time of execution of the contract.
- G. A performance bond and a labor and materials payment bond, each in the amount of the contract sum, must be furnished by the general contractor as stated in the bid form. Such bonds must be on the forms contained in the bidding documents and must be executed and delivered to the Town at the time of execution of the contract. Each attorney-in-fact who executes such a bond on behalf of the surety must affix thereto a certified and current copy of its power of attorney.
- H. A performance and payment bond furnished by a subcontractor, at the request of the general contractor set forth in the Form For General Bid, shall be for the benefit of the general contractor; shall secure the performance of the subcontract by the subcontractor; and shall indemnify and hold harmless the general contractor and the surety or sureties under the labor and materials or payment bond furnished by such general contractor to the Town against (1) any and all loss and expense arising out of any and all claims in connection with the performance of said subcontract which would be required to be paid under the labor and materials payment bond furnished by the general contractor to the Town and (2) attorney's fees in the event that the subcontractor, after notice, fails to assume the defense of and defend such claims.

#### 1.14 FILED SUB-BID PROCEDURES

- A. As stated in the Invitation to Bid, the Town has requested filed sub-bids on certain subtrade(s) specified therein. Certain sub-bid procedures are required by Section 44F of Chapter 149 of the Massachusetts General Laws, summarized in part below in this Section 1.14.
- B. Every sub-bidder duly filing a sub-bid with the Town shall be bound thereby to every general bidder not excluded therein from the use thereof; and any variance from such sub-bid communicated to a general bidder shall be of no effect.
- C. Each sub-bidder shall list in the sub-bid form the name and bid price of each person, firm or corporation performing each class of work or part thereof for which the section of the Specifications for that sub-trade requires such listing; provided that, in the absence of a contrary provision in the Specifications, any sub-bidder may, without listing any bid price, list its own name for any such class of work or part thereof and perform that work with persons on its own payroll, if such sub-bidder, after sub-bid opening, shows to the satisfaction of the Town that it does customarily perform such class of work or part thereof with employees on its own payroll who are mechanics or laborers as referred to in Section 26 of said Chapter 149, and is qualified so to do.
- D. Not later than the second business day before the day fixed by the Town for the opening of general bids, the Town shall mail to every person on record as having taken a set of plans and specifications a list of sub-bidders arranged by sub-trades and listing for each sub-trade the name, address and sub-bid price of every sub-bidder submitting a sub-bid thereon not rejected by the Town and the general bidders excluded from using such subbid. A person shall not be named by a general bidder as a sub-bidder for a sub-trade on the general bid form unless such person is included for such sub-trade in said list. If a general bidder not excluded in said list from doing so names as a sub-bidder for a subtrade on the general bid form a person included for such sub-trade in said list at the subbid price stated in said list, neither the general bid of such general bidder nor the general contract executed on the basis of such general bid shall be invalid or rejected because of the invalidity of such sub-bid, or because of error in said list, nor shall such general bid be rejected nor shall such general contract be invalid because of any invalid action taken by the Town in connection with any sub-bid or sub-bids; but there shall be substitution of sub-bidders and adjustment of contract price as if paragraph (c) of subsection (4) of said Section 44F were applicable.
- E. (a) If no sub-bid is filed for a sub-trade designated in the general bid form or if the only sub-bids which are filed are restricted to the use of one or more general bidders, the Town may state, in an addendum issued with the list of sub-bidders referred to in Paragraph D above, that the general bidder shall include in the cost of its own work an amount to cover all the work required for any such sub-trade. The general contractor shall cause the work covered by such sub-trade to be done by a qualified and responsible sub-contractor, subject to the written approval of the Town. If the Town determines that any sub-contractor chosen by the general contractor as provided in this paragraph is not qualified or responsible, the general contractor shall obtain another sub-contractor who is satisfactory to the Town with no adjustment in the general contractor's price.

(b)If a rejection of all sub-bids, other than as set forth above, for such a sub-trade occurs pursuant to subsection (1) of Section 44E of M.G.L., Chapter 149, or subsection (3) of Section 44F of said Chapter 149, the Town shall state, in an addendum issued with the list of sub-bidders referred to in Paragraph D above, the amount to be included by a general bidder on the general bid form for such sub-trade; and without in any way affecting other sub-bidders who have conformed to the prescribed bidding procedure, new sub-bids for such sub-trade shall be requested forthwith by written invitation to three or more qualified sub-bidders and shall be publicly opened and read by the Town at a time and place to be specified in such invitation. The general contractor shall cause the work covered by such sub-trade to be done by the lowest responsible and eligible subbidder against whose standing and ability the general contractor makes no objection or, if there is no such sub-bidder, by such sub-contractor against whose standing and ability the general contractor makes no objection and for such sum as the general contractor and the Town may agree upon; and the contract price shall be adjusted by the difference between the sub-contract sum and the amount stated in the addendum. The general bidder shall include in the cost of its own work on the general bid form all expenses and profits on account of such adjustments.

- F. If, after the selection of the lowest responsible and eligible general bidder, it be decided to consider sub-bidders other than the ones named by such general bidder in its general bid, the Town and such general bidder shall jointly consider all filed sub-bids not rejected under Section 44F(3) of said Chapter 149. Any agreement to substitute a sub-bid for the one named in the selected general bid shall result in an adjustment of the general bid price by the difference between the amount of the sub-bid originally named and the amount of the sub-bid substituted therefore. If by such substitutions the total adjusted general bid price of the general bidder first selected becomes greater than the original general bid price of the second lowest responsible and eligible general bidder, then the latter shall be selected and its sub-bidders similarly considered. If, by substitutions as hereinbefore provided, the total adjusted general bid price of the second selected general bidder becomes greater than the total adjusted general bid price of the general bidder first selected or greater than the original general bid price of the third lowest responsible and eligible general bidder, then the bidder having the lower of these two general bids shall be selected; provided, that if the third lowest responsible and eligible general bidder is selected, its sub-bidders shall be similarly considered. The general bidder finally selected by the aforementioned process of substitutions shall be the general bidder to whom the contract shall be awarded.
- G. If a selected sub-bidder fails, within five business days after presentation of a subcontract by the general bidder selected as the general contractor, to perform its agreement to execute a subcontract in the form set forth in the Contract Documents with such general bidder, contingent upon the execution of the, general contract, and, if requested so to do by such general bidder in the general bid to furnish a performance and payment bond as stated in its sub-bid, such general bidder and the Town shall select, from the other subbids duly filed with the Town for such sub-trade and not rejected under Section 44H of said Chapter 149, the lowest responsible and eligible sub-bidder at the amount named in its sub-bid as so filed against whose standing and ability the general contractor makes no

objection, and the contract price shall be adjusted by the difference between the amount of such sub-bid and the amount of the sub-bid of the delinquent sub-bidder.

- H. All sub-bidders when finally selected shall be notified in writing of their selection within 48 hours thereafter by the general bidder. Not later than ten business days after the general bidder selected as the general contractor is notified by the Town of its selection as the general contractor, the general bidder so selected shall present subcontract agreements to each of the filed sub-bidders finally selected. The selected general bidder and each of the selected sub-bidders shall promptly execute the subcontract agreements, and fully executed copies of all subcontract agreements shall be delivered to the Town not later than twenty-five business days after award of the contract to the selected general bidder. The subcontract agreement between the general contractor and each filed subcontract or shall be in the form contained in the Contract Documents bound with these Instructions, as required by Section 44F(4) of said Chapter 149.
- I. In each case of substitution of a sub-bidder for a sub-bidder listed in the general bid of the selected general contractor, the selected general contractor may require the substituted sub-bidder to furnish a performance and payment bond, and the premiums for same shall be added to the general bidder's price for work to be performed by it except where the selected general contractor had indicated in its general bid that the original sub-bidder designated for that sub-trade, in which substitution was made, would be required to furnish such bond.
- J. In certain instances enumerated in Section 44F of said Chapter 149, the general bidder's price for work to be performed by the general bidder shall also be adjusted by the amount of the change in the premium for the general contractor's performance bond and its labor and materials or payment bond caused by the substitution.
- K. If a general bidder customarily performs, with employees on its own payroll who are mechanics or laborers as referred to in Section 26 of said Chapter 149, a sub-trade for which the Town has invited filed sub-bids, the general bidder may submit a sub-bid for such sub-trade which shall be considered on a par with other sub-bids, and it shall also list under the appropriate sub-bid category in its general bid its own name and sub-bid price for such sub-trade. No such sub-bid shall be considered unless the general bidder can show (a) it does so customarily perform such sub-trade, and (b) it is qualified to do the sub-trade work. In lieu of listing its name and sub-bid price in its general bidder may list the name and amount of the lowest responsible and eligible sub-bidder for that sub-trade if (a) such sub-bidder's price is lower than such general bidder's, (b) such sub-bid is available for the general bidder's use; and (c) such sub-bid is not restricted to the general bidder's use alone or to its use and that of another general bidder, or bidders.
  - L. For information and requirements with respect to performance and payment bonds furnished by subcontractors for the benefit of the general contractor, see Section 1.13 of these Instructions.

#### END OF INSTRUCTIONS TO BIDDERS

# Projectdog, Inc

# Supplemental Instructions to Bidders for Electronic Bid Projects (E-Bid)

# Table of Contents

	Page
Sign Up	2
Login	2
Logoff	2
Forgotten Password	2
Account Information	2
Project Details	3
Acquire Documents	3
Document Recipients	3
Electronic Bid (E-Bid)	4
Attachment	

Bid Bond Affidavit



# Sign Up

Every user of <u>Projectdog.com</u> has a unique username and password for their account. <u>MANDATORY</u>: All users must keep usernames and passwords PRIVATE and SECURE. Do not share accounts.

- 1. Go to <u>www.Projectdog.com</u>.
- 2. Select the "Sign Up" (Fig 1).
- 3. Complete all required form fields and press Submit. An automatic email will be sent to the registered email.
- 4. Select the confirmation link in the email to complete the registration.

# Login

- 1. Go to **<u>www.Projectdog.com</u>**.
- 2. Enter a registered email address and password (Fig 1).
- 3. Press Login.

# <u>Logoff</u>

- 1. Hover over Home (Fig 2).
- 2. Select "Logoff".

# Forgotten Password

- 1. Select "Forgot your password?" (Fig 3).
- 2. Enter the e-mail address.
- 3. Select "Send Info". An automated e-mail will be sent with the password.

# Account Information

View and edit user contact information. To change an email address, users must register a new account. Call Projectdog to have the old account removed.

- 1. Hover over Home (Fig 4).
- 2. Click "My Information".
- 3. Edit information as needed.
- 4. Click "Save" to finalize edits.









# **Project Details**

Utilize the search page (Fig 5) or enter a Project Code (Fig 6) to view a project's "Project Details" page (Fig 7).

Search Project Calendar			
Search ALL Projects			0 Pack/Balance I
Refine Search:			
City :	State: A	× 10	
Project Details Key Word :			
Limit search by date.			
Frank .			
From :	3/28/2016 To: E		
From :	3/28/2016 To:		
Amount : No Preference	3/28/2016 To:	~	
Amount : No Preference Refine your search by choosin	3/28/2016 To: ] ] g only the divisions tha	at you are intereste	rd in!
Amount : No Preference Refine your search by choosin Search All Projects	3/28/2016 To: ] g only the divisions the	at you are intereste	ed in!
Amount : No Preference Refine your search by choosin Search All Projects Division 1 Division 2	3/28/2016 To:	at you are intereste	rd in!
Amount : No Preference. Refine your search by choosin Search All Projects Division 1 Division 2 Division 5 Division 6	3/28/2016 To: g only the divisions that Division 3 [ Division 7 [	at you are intereste Division 4 Division 8	rd in!
Amount : No Preference Refine your search by choosin Ø Starch All Projects Division 1 Division 2 Division 5 Division 6 Division 9 Division 10	3/28/2016 To: g only the divisions the Division 3 [ Division 7 [ Division 11 ]	at you are intereste Division 4 Division 8 Division 12	rd in!
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# Acquire Documents

Download all project documents.

- 1. Click "Acquire Documents" link found on a project's "Project Details" page (Fig 7).
- 2. Respond to the Legal Notice after reviewing.
- 3. Click on any file description to open, review, or save a document (Fig 8).

Users are automatically added to the project's "Document Recipients" list to receive update notifications upon viewing any document online.

# **Document Recipients**

Review all plan holders who have acquired documents.

- 1. Click "Document Recipients" link found on a project's "Project Details" page (Fig 7).
- 2. All potential bidders are listed and sorted by company type (Fig 9). Click on a column title to sort alphabetically.







# Electronic Bid (E-Bid)

This project is being **Electronically Bid** at <u>www.Projectdog.com</u>. Hard copy bids <u>will not</u> be accepted by the Awarding Authority. Go to www.Projectdog.com and Login with an existing account or click Sign Up to register for free. Enter a project code or search by keyword to access the "Project Details" page. Select "Acquire Documents" to download all bidding documents.

•64	Home	Project Central	Company	-
				Add to my Project Calend
		Projec	t Details	
Code: 799090 Project Title: Ebid Location: Newburyport, M	A	-		
Timeline Plans/ Specifications Avail	able: 05/2	2/13 10:00 AM		
General Bid Deadline:	06/2	1/13 04:00 PM		
Sub Bid Deadline:	06/1	9/13 04:00 PM		
Estimated Cost:	Nego	tiated		
Project Owner				
Sales Department				at
Projectdog				Phone: 978-499-9014
Suite 8				Email: sales@projectdog.com
Newburyport MA US, 019	50			
Document Manager				
Online Orders				Phone: 978-499-9014
Projectoog 18 Graf Road, Suite 8				Fax: 978-499-9016
Newburyport MA US, 019	50			Email: orders@projectdog.com
Contract Information				
Project: Ebid Test Demo for Sales	Departmer	t.		
Additional Information: THIS PROJECT IS BEING E prepared and submitted a documents are available	LECTRONIC It www.Pro	ALLY BID AND HARD ojectdog.com . Tutori g with all project doo	COPY BIDS WIL als and instructi cumentation.	L NOT BE ACCEPTED. The bids are to be ions on how to complete the electronic bid
Project Documents				
Acquire Documents				
Document Recipients				
GC E-Bid				
Sub E Bid				

	Plea	3.	Sel sub			
	Section#	Description	Status	Bidding		Bic
	220000	Plumbing	Incomplete	GO		
	230000	HVAC	Incomplete	GO		
	260000	Electrical	Incomplete	GO		
sı	You will not be able to ufficient time to upload a DH(	o Submit your bid unless all man Il information. You will receive a for your rec 2D 016128 Roof Replacement & '	datory fields are complete. I n automated email once cor ords. Vinyl Siding, Project <b>#8115</b> 4	Please allow yourself npleted. Please save 41	You will not sufficient time t	be able o upioac D
	۵	cknowledge Addendum 0,	🔍 Yes 🔍 No			Ack
	В	id Price (Whole Dollar)	.00			Bid
	F	orm for General Bid (Signature pa	ge) Add File -			For
	B	id Bond idders Reference Form	Add File - Add File -		<b>_  </b> •	Bid Bid
		Item 2 Sub-hids as	follows:			

#### How to Submit an E-Bid

Complete and save all required forms as PDF files. Please be sure to sign all required signatures either digitally or manually.

1. Select the GC E-Bid or Sub E-Bid link located on the "Project Details" page.

Subcontractors select a bidding trade;

General Contractors will not be able to submit an E-Bid until the official sub bid tabulation is released by the Awarding Authority.

- 2. Answer / enter / upload all required areas. Enter all dollar value amounts as a whole dollar values only.
- ect "Submit My E-Bid." Review the mitted bid package via the "View My Package" link.

#### It's that simple!





Bidders may save, submit or modify an Electronic Bid (E-Bid) at any time prior to bid close. Once submitted, a bid cannot be edited. To modify a bid the bidder must retract the bid, make any necessary changes, and then submit the bid again. Upon submitting or retracting the bidder will receive a convenience email for informational purposes only. Bidders are encouraged to contact Projectdog if an email is not received.

It is the bidder's responsibility to review and confirm online that a bid has been submitted and/or retracted and that the bid is 100% true, complete and accurate. All bidders are required to review their submitted E-Bid via the "<u>View My Bid Package</u>" link.

If a bid is submitted prior to an addendum being issued the bidder will receive an automated email for informational purposes only stating the bidder must review the addendum, retract the bid, acknowledge all addenda, and submit the bid again. If a bidder fails to acknowledge addenda their bid may be rejected by the Awarding Authority.

Once the bid deadline has closed the E-Bid links are no longer available. All E-Bids are compiled in real time upon bid close and published forthwith on the "Project Details" page titled as "List of Bids Received". Official bid tabulations are posted at the discretion of the Awarding Authority.

For additional assistance, call Projectdog at (978) 499-9014 (M-F, 9AM-5PM).

# Bid Bond Affidavit

This document is an affidavit form that is drafted to serve as a statement wherein the person (Bidder) who signs it swears under penalty of perjury that the facts and information that are identified in this affidavit are true. This affidavit is in lieu of an insurance Bid Bond certificate.

Bidders submitting the Bid Bond Affidavit form and the 5% Bid Deposit in the form of cash, certified check, treasurer's or cashier's check issued by a responsible bank or trust company shall ensure that these documents are received by the Awarding Authority prior to the closing of the electronic bid.

Both the completed Bid Bond Affidavit form and the Bid Deposit shall be enclosed in a sealed envelope with the following information plainly marked on the outside:

**DO NOT OPEN BEFORE:** [indicate DATE and TIME of bid opening]

Project Name:	
Project Number:	
Bidder's Name:	
Business Address:	
Phone Number:	

It is the Bidder's responsibility to ensure that the completed Bid Bond Affidavit form and Bid Deposit are submitted as stated above and received by the Awarding Authority prior to the closing of electronic bids. The completed Bid Bond Affidavit form must also be uploaded via the project E-bid "Bid Bond" link at www.Projectdog.com.

The Bidder understands and consents that any failure to do so whether his own or other fault may result in the rejection of said bid. The Bidder is solely responsible for the accuracy and value of the Bid Deposit. In the event that the Bid Deposit is less than the required amount as outlined in the project specifications the bid may be rejected.

Bid Deposit Amount (in figures):

CASH or Certified, Treasurer's, or Cashier's Check

Date:

Bidder's Name:

**Business Address:** 

Signature:
# NEW FACILITY for the <u>CARVER POLICE DEPARTMENT</u> CARVER, MA

# FORM FOR SUB-BID

From:	
	(Printed Name of Sub-Bidder
To all	General Bidders Except those Excluded
A.	The undersigned proposes to furnish of labor and materials required for completing, in accordance with the hereinafter described plans, specifications and addenda, all the work specified for the filed sub-bid titled:
	including Section(c) No.:
	of the Specifications and in my plans specified in such sections, prepared by Jacunski Humes Architects, LLC,15 Massirio Drive, Suite 101, Berlin, CT, for the New Facility for the Carver Police Department, Carver, MA for the contract sum of:
	Dollars (\$)

## **ALTERNATES:**

lter	rnate No. 1 – TBD	
	ADD: \$	Dollars, (\$
lter	rnate No. 2 – TBD	
	ADD: \$	Dollars, (\$
DD	DENDA:	
<b>.</b> .	This sub-bid includes Addenda numbered:	, dated
	This sub-bid	
	[] May be used by any general bidder except:	
	This sub-bid	
	[] May only be used by the following general b	pidders:
	(To exclude general bidders, insert "X" in one bi	ov only and fill in blank following that

(To exclude general bidders, insert "X" in one box only and fill in blank following that box. Do not answer C if no general bidders are excluded).

- D. The undersigned agrees that, if selected as a sub-bidder, he will, within five days, Saturdays, Sundays and legal holidays excluded, after presentation of a subcontract by the general bidder selected as the general contractor, execute with such general bidder a subcontract in accordance with the terms of this sub-bid, and contingent upon the execution of the general contract, and, if requested to do so in the general bid by such general bidder, who shall pay for the premiums thereof, furnish a performance and payment bond of a surety company qualified to do business under the laws of the Commonwealth and satisfactory to the awarding authority, in the full sum of the subcontract price.
- E. The names of all persons, firms and corporations furnishing to the undersigned labor or labor and materials for the class or classes or part thereof of work for which the provisions of the section of the specifications for this subtrade equire a listing in this paragraph, including the undersigned if customarily furnished by persons on his own payroll and in the absence of a contrary provision in the specification, the name of each such class of work or part thereto and the bid price for each class of work or part thereof are:

NAME	CLASS OF WORK	RIDPRICE
		<hr/>

(Do not give hid price for any class or part thereof furnished by undersigned)

- F. The undersigned agrees that the above list of bids to the undersigned represents bona fide bids based on the hereinberge described plans, specifications and addenda, and that, if the undersigned is awarded the Contract, they will be used for the work indicated at the amounts stated, it sat sfactory to the awarding authority.
- G. The undersigned further agrees to be bound to the General Contractor by the terms of the hereinbefore described plans, specifications (including all general conditions stated therein) and addenda, and to assume toward him all the obligations and responsibilities that the Contractor, by those documents, assumes toward the Owner.

- H. The undersigned offers the following information as evidence of his (or the undersigned) qualifications to perform the work as bid upon according to all the requirements of the plans and specifications:
  - 1. Have been in business under present business name for \_\_\_\_\_ years.
  - 2. Ever failed to complete any work awarded?
  - 3. List one or more recent buildings with names of the General Contractor and Architect on which you served as a subcontractor for work of similar character as required for the above named building:

BUILDING TYPE	ARCHITECT	GENERAL CONTRACTOR	AMOUNT OF CONTRACT
		$C \sim ($	2/2-
4. Bank Reference			

I. The undersigned hereby certified that he is able to furnish labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least to hours in duration at the time the employee begins work and who shalt furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that he will comply fully with all laws an oregulations applicable to awards of subcontracts subject to Section 44F of G.L, Chapter 149.

The undersigned further certifies under penalties of perjury that this sub-bid is in all respects bona fide, far and made without collusion or fraud with any other person. As used in this subsection, the work "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

The understaned further certifies under penalties of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of section twenty-nine F of chapter twenty-nine, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder.

|--|

(Name of Sub-Bidder)



(Affix corporate seal here if Bidder is a corporation.)

## **CERTIFICATE OF ELIGIBILITY**

(Attach a copy of Certificate of Eligibility, D.C.A.M. Form CQ7, to this FORM FOR FILED SUB-BID. Failure to do so small result in rejection of bid.)

## UPDATE STATEMENT

(Completely fill out and sign D.C.A.M. Form CO3, and attach to this FORM FOR FILED SUB-BID. Failure to to so shall result in rejection of bid.)

END OF FORM FOR SUB-BID

# NEW FACILITY for the <u>CARVER POLICE DEPARTMENT</u> CARVER, MA

# FORM FOR GENERAL BID

#### From:

(Printed Name of General Bidde

## To: Town of Carver (the Awarding Authority)

A. The Undersigned proposes to furnish all labor and materials required fon the New Facility for the Carver Police Department, Carver, MA, in accordance with the accompanying plans and specifications prepared by Jacuaski Humes Architects, LLC, 15 Massirio Drive, Suite 101, Berlin, CT 06037, for the contract price specified below subject to additions and deductions according to the terms of the specifications.

B.	This General Bid includes Addenda numbered	, dated	
		, dated	
		, dated	
C.	The proposed contract price is:		
			Dollars
		)	
		/	

## **ALTERNATES:**

Alternate No. 1 – TBD	
ADD: \$	Dollars, (\$)
Alternate No. 2 – TBD	
ADD: \$	Dollars, (\$)
ITEM 1: The work of the General Contractor, b	being all work other than that covered by ITEM 2:
	Dollars (\$)
ITEM 2: Sub-Bids as follows: Subtrade Name of Sub-bidder	Approvent Bonds Beq'd., Indicated by (Xes or No)
Unit Masonry	
Roofing / Flashing	\$
Caulking	
Tile	<u> </u>
Acoustic Tile	\$
Resilient Flooring	\$
Painting	\$
Fire Protection	\$
Plumbing	\$
HVAC	\$
Electrical	\$
Total of Item 2:	\$

The undersigned agrees that each of the above named sub-bidders will be used for the work indicated at the amount stated, unless a substitution is made. The undersigned further agrees to pay the premiums for the performance and payment bonds furnished by sub-bidders as requested herein and that all of the cost of all such premiums is included in the amount set forth in Item 1 of this bid.

The undersigned agrees that if he is selected as General Contractor, he will promptly confer with the awarding authority on the question of sub-bidders; and that the awarding authority may substitute for any sub-bid listed above a sub-bid filed with the awarding authority by another sub-bidder for the sub-trade against whose standing and ability the undersigned makes no objection; and that the undersigned will use all such finally selected sub-bidders at the amounts named in their respective sub-bids and be in every way as responsible for them and their work as if they had been originally named in this general bid, the total contract price being adjusted to conform thereto.

D. The undersigned agrees that, if he is selected as General Contractor, he will within five days, Saturdays Sundays and legal holidays excluded, after presentation thereof by the Awarding Authority execute a contract in accordance with the terms of this bid and furnish a performance bond and also a labor and materials or payment bond, each of a surety company qualified to do business under the laws of the commonwealth and satisfactory to the Awarding Authority and each in the sum of the contract price, the premiums for which are to be paid by the General Contractor and are included in the contract price.

The undersigned hereby certifies that he is able to times labor that can work in harmony with all other elements of labor employed or to be employed on the work; that all employees to be employed at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration that is at least 10 fours in duration at the time the employee begins work and who shah furnish documentation of successful completion of said course with the first certified payroll report for each employee; and that he will comply fully with all laws and regulations applicable to awards made subject to Chapter 149, Section 44A of the Massachusetts General Laws.

The undersigned bidder hereby certifies, under pains and penalties of perjury, that the foregoing bid is based upon the payment to laborers to be employed on the project of wages in an anount no less that the applicable prevailing wage rates established for the project by the Massachusetts Department of Labor and Workforce Development. The undersigned bidder agrees to indemnify the Awarding Authority for, from and against any loss, expense, damages, actions or claims, including any expense incurred in connection with any delay or stoppage of the project work arising out of or as a result of (1) the failure of the said bid to be based upon the payment of the said applicable prevailing wage rates or (2) the failure of the bidder, if selected as the contractor, to pay laborers employed on the project the said applicable prevailing wage rates.

The undersigned further certifies under the penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this subsection, the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity. The undersigned further certifies under penalty of perjury that the said undersigned is not presently debarred from doing public construction work in the Commonwealth under the provisions of Chapter 29, Section 29F of the General Laws, or any other applicable debarment provisions of any other chapter of the General Laws or any rule or regulation promulgated thereunder.

By signing and submitting this Form for General Bid, each bidder represents that in regard to the conditions affecting the work to be done and the labor and materials needed, his general bid is based on his own investigations and his familiarization with the site in conjunction with the plans and specifications and not on any oral or other representations of any employee, officer agent or consultant of the Awarding Authority.

Date:	
(Print Name of General Bidder)	
BY:	
(Signature)	
(Print Name of Person Signing Pid and Thie	e)
(Business Address)	
(City, State and Zip Code)	
Telephone: ( -	
Social Security Number	
Or Federal Identification Number:	
NOTE: If Bidder is a Corporation, indicate s	state of incorporation and give full names of officer

NOTE: If Bidder is a Corporation, indicate state of incorporation and give full names of officers; if a partnership, give full names and addresses of all partners; and if an individual, give residential addresses different from business address. Use the following spaces:

If a Corporation:

Incorporated in what state:	
President:	
Treasurer:	
Secretary:	
If a foreign corporation (incorporated or organized under laws other than the laws of the Commonwealth of Massachusetts), is the corporation registered with the Secretary of Stat Massachusetts?	e of
Yes No	
If the bidder selected for the work is a foreign corporation, it is required under M.S.C. c.3 § 39L to furnish to the awarding authority a certificate of the Secretary of State stating that corporation has complied with M.G.L. c. 181 §§ 2, 3 and the date of such compliance.	0 It the
If a Partnership: (Name all Partners)	
Name of Partner:	
Residence:	
Name of Partner:	
Residence:	
Name of Partner:	
Residence:	-
If an Individual:	
Name:	
Residence:	
If an Individual doing business under a firm name:	
Name of Firm:	
Name of Individual:	
Business Address:	
Residence:	

Other form of business organization:

# **CERTIFICATE OF ELIGIBILITY**

(Attach a copy of Certificate of Eligibility, D.C.A.M. Form CQ7, to this FORM FOR GENERAL BID. Failure to do so shall result in rejection of bid.)

## **UPDATE STATEMENT**

(Completely fill out and sign D.C.A.M. Form CQ3, and attach to this FORM FOR GENERAL BID. Failure to do so shall result in rejection of bid.)

END OF FORM FOR GENERAL BID

# OWNER – CONTRACTOR AGREEMENT NEW FACILITY for the CARVER POLICE DEPARTMENT CARVER, MA

THIS AGREEMENT, made this \_\_\_\_\_\_ day of \_\_\_\_\_\_ 2019, by and between the party of the first part, the Town of Carver, Carver, MA 02330 hereinafter called "OWNER," acting herein through its Board of Selectmen, and the party of the second part,

\_\_\_\_\_, \_\_\_\_, \_\_\_\_, MA doing business as a corporation located in the Town of \_\_\_\_\_, County of \_\_\_\_\_, and State of Massachusetts, hereinafter called "CONTRACTOR."

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by the OWNER, the CONTRACTOR hereby agrees with the OWNER to commence and complete the project described as follows: **NEW FACILITY FOR THE CARVER POLICE DEPARTMENT, Carver, MA**, hereinafter called the Project, for the sum of

\_\_\_\_\_\_\_and zero cents (\$\_\_\_\_\_\_) to include <u>Base Bid</u> amount and <u>Alternate #\_\_\_</u> and all extra work in connection therewith, under the terms as stated in the Contract Documents; and at their own proper cost and expense to furnish all the materials, supplies, machinery equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the said project in accordance with the conditions and prices stated in the FORM OF GENERAL BID, the GENERAL CONDITIONS, and SUPPLEMENTAL GENERAL CONDITIONS, the plans, which include all maps, plates, blue prints, and the specifications and Contract Documents as prepared by Jacunski Humes Architects, LLC, Berlin, CT, dated

The CONTRACTOR hereby agrees to commence work under this Contract on or before a date to be specified in written "Notice to Proceed" of the OWNER.

The CONTRACTOR further agrees to achieve Substantial Completion (as defined in AIA Document G704) within four hundred (400) consecutive calendar days from the date of the Notice to Proceed of the Owner.

The CONTRACTOR further agrees to pay as liquidated damages the sum of \$1,000 for each consecutive calendar day thereafter as provided in the <u>Liquidated Damages</u> Paragraph of Article 8 of the GENERAL CONDITIONS and Paragraph 1.6 of Summary of Work, Section 01 10 00.

The CONTRACTOR agrees not to discriminate against or exclude any person from participation herein on grounds of race, religion, color, sex, age or national origin; and that it shall take affirmative actions to ensure that applicants are employed, and that employees are treated during their employment, without regard to race, religion, color, sex, age, handicapped status, or national origin.

# OWNER – CONTRACTOR AGREEMENT NEW FACILITY for the CARVER POLICE DEPARTMENT CARVER, MA

The CONTRACTOR agrees not to participate in or cooperate with an international boycott, as defined in Section 999 (b)(3) and (4) of the Internal Revenue Code of 1986, as amended, or engage in conduct declared to be unlawful by Section 2 of Chapter 151E of the Massachusetts General Laws.

The OWNER agrees to pay the CONTRACTOR in current funds for the performance of the contract, subject to additions and deductions, as provided in the GENERAL CONDITIONS, and to make payments on account thereof as provided in Article 9 of the GENERAL CONDITIONS.

IN WITNESS WHEREOF, the parties to these presents have executed this contract in two (2) counterparts, each of which shall be deemed an original, in the year and day first above mentioned.

AGREED: TOWN OF CARVER, MASSACHUSETTS (Owner)

By\_\_\_\_\_

Michael Milanoski, Town Administrator Town of Carver 108 Main Street Carver, MA 02330

(Contractor)

By\_\_\_\_

\_\_\_\_\_, President

# OWNER – CONTRACTOR AGREEMENT NEW FACILITY for the CARVER POLICE DEPARTMENT CARVER, MA

## Approved as to Form:

By\_\_\_\_\_ (Owner's Counsel)

In accordance with M.G.L. C.44, Section 31C, this is to certify that an appropriation in the amount of this contract is available therefor and that the Town Administrator has been authorized to execute the contract and approve all requisitions and change orders.

By\_\_\_\_\_ (Owner's Accountant)

(Name)

END OF OWNER – CONTRACTOR AGREEMENT

# **▲IA** Document A201<sup>™</sup> – 2007

## General Conditions of the Contract for Construction

#### for the following PROJECT:

(Name and location or address) New Facility for the Carver Police Department Carver, MA

#### THE OWNER:

(Name, legal status and address) Town of Carver 108 Main Street Carver, MA 02330

#### THE ARCHITECT:

(Name, legal status and address) Jacunski Humes Architects, LLC 15 Massirio Drive, Suite 101 Berlin, CT 06037

#### **TABLE OF ARTICLES**

- 1 **GENERAL PROVISIONS**
- 2 **OWNER**
- 3 CONTRACTOR
- 4 ARCHITECT
- 5 **SUBCONTRACTORS**
- 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
- 7 CHANGES IN THE WORK
- TIME 8

1

- 9 PAYMENTS AND COMPLETION
- 10 PROTECTION OF PERSONS AND PROPERTY
- 11 **INSURANCE AND BONDS**
- 12 UNCOVERING AND CORRECTION OF WORK
- 13 **MISCELLANEOUS PROVISIONS**
- 14 **TERMINATION OR SUSPENSION OF THE CONTRACT**
- CLAIMS AND DISPUTES 15

#### ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An Additions and Deletions Report that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

INDEX

1

(Topics and numbers in bold are section headings.)

Acceptance of Nonconforming Work 9.6.6, 9.9.3, 12.3 Acceptance of Work 9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, 12.3 Access to Work 3.16, 6.2.1, 12.1 Accident Prevention 10 Acts and Omissions 3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5, 10.2.8, 13.4.2, 13.7, 14.1, 15.2 Addenda 1.1.1, 3.11 Additional Costs, Claims for 3.7.4, 3.7.5, 6.1.1, 7.3.7.5, 10.3, 15.1.4 **Additional Inspections and Testing** 9.4.2, 9.8.3, 12.2.1, 13.5 Additional Insured 11.1.4 Additional Time, Claims for 3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, 15.1.5 Administration of the Contract 3.1.3, 4.2, 9.4, 9.5 Advertisement or Invitation to Bid 1.1.1 Aesthetic Effect 4.2.13 Allowances 3.8, 7.3.8 All-risk Insurance 11.3.1, 11.3.1.1 **Applications for Payment** 4.2.5, 7.3.9, 9.2, 9.3, 9.4, 9.5.1, 9.6.3, 9.7, 9.10, 11.1.3 Approvals 2.1.1, 2.2.2, 2.4, 3.1.3, 3.10.2, 3.12.8, 3.12.9, 3.12.10, 4.2.7, 9.3.2, 13.5.1 Arbitration 8.3.1, 11.3.10, 13.1, 15.3.2, 15.4 ARCHITECT 4 Architect, Definition of 4.1.1 Architect, Extent of Authority 2.4, 3.12.7, 4.1, 4.2, 5.2, 6.3, 7.1.2, 7.3.7, 7.4, 9.2, 9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1, 13.5.1, 13.5.2, 14.2.2, 14.2.4, 15.1.3, 15.2.1 Architect, Limitations of Authority and Responsibility 2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4, 9.4.2, 9.5.3, 9.6.4, 15.1.3, 15.2 Architect's Additional Services and Expenses 2.4, 11.3.1.1, 12.2.1, 13.5.2, 13.5.3, 14.2.4

Architect's Administration of the Contract 3.1.3, 4.2, 3.7.4, 15.2, 9.4.1, 9.5 Architect's Approvals 2.4, 3.1.3, 3.5, 3.10.2, 4.2.7 Architect's Authority to Reject Work 3.5, 4.2.6, 12.1.2, 12.2.1 Architect's Copyright 1.1.7, 1.5 Architect's Decisions 3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3, 7.3.7, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1, 13.5.2, 15.2, 15.3 Architect's Inspections 3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.5 Architect's Instructions 3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.5.2 Architect's Interpretations 4.2.11, 4.2.12 Architect's Project Representative 4.2.10 Architect's Relationship with Contractor 1.1.2, 1.5, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5, 3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.2, 4.1.3, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3.7, 12, 13.4.2, 13.5, 15.2 Architect's Relationship with Subcontractors 1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.3.7 Architect's Representations 9.4.2, 9.5.1, 9.10.1 Architect's Site Visits 3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.5 Asbestos 10.3.1 Attorneys' Fees 3.18.1, 9.10.2, 10.3.3 Award of Separate Contracts 6.1.1, 6.1.2 Award of Subcontracts and Other Contracts for Portions of the Work 5.2 **Basic Definitions** 1.1 **Bidding Requirements** 1.1.1, 5.2.1, 11.4.1 **Binding Dispute Resolution** 9.7, 11.3.9, 11.3.10, 13.1, 15.2.5, 15.2.6.1, 15.3.1, 15.3.2, 15.4.1 **Boiler and Machinery Insurance** 11.3.2 Bonds, Lien 7.3.7.4, 9.10.2, 9.10.3 **Bonds, Performance, and Payment** 7.3.7.4, 9.6.7, 9.10.3, 11.3.9, 11.4 **Building Permit** 3.7.1

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Capitalization 1.3 Certificate of Substantial Completion 9.8.3, 9.8.4, 9.8.5 **Certificates for Payment** 4.2.1, 4.2.5, 4.2.9, 9.3.3, 9.4, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.3 Certificates of Inspection, Testing or Approval 13.5.4 Certificates of Insurance 9.10.2, 11.1.3 **Change Orders** 1.1.1, 2.4, 3.4.2, 3.7.4, 3.8.2.3, 3.11, 3.12.8, 4.2.8, 5.2.3, 7.1.2, 7.1.3, **7.2**, 7.3.2, 7.3.6, 7.3.9, 7.3.10, 8.3.1, 9.3.1.1, 9.10.3, 10.3.2, 11.3.1.2, 11.3.4, 11.3.9, 12.1.2, 15.1.3 Change Orders, Definition of 7.2.1 **CHANGES IN THE WORK** 2.2.1, 3.11, 4.2.8, 7, 7.2.1, 7.3.1, 7.4, 8.3.1, 9.3.1.1, 11.3.9 Claims, Definition of 15.1.1 **CLAIMS AND DISPUTES** 3.2.4, 6.1.1, 6.3, 7.3.9, 9.3.3, 9.10.4, 10.3.3, 15, 15.4 Claims and Timely Assertion of Claims 15.4.1 **Claims for Additional Cost** 3.2.4, 3.7.4, 6.1.1, 7.3.9, 10.3.2, 15.1.4 **Claims for Additional Time** 3.2.4, 3.7.4, 6.1.1, 8.3.2, 10.3.2, 15.1.5 Concealed or Unknown Conditions, Claims for 3.7.4 Claims for Damages 3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.1.1, 11.3.5, 11.3.7, 14.1.3, 14.2.4, 15.1.6 Claims Subject to Arbitration 15.3.1, 15.4.1 Cleaning Up 3.15, 6.3 Commencement of the Work, Conditions Relating to 2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3, 6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.3.1, 11.3.6, 11.4.1, 15.1.4 Commencement of the Work, Definition of 8.1.2 **Communications Facilitating Contract** Administration 3.9.1, 4.2.4 Completion, Conditions Relating to 3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1, 9.10, 12.2, 13.7, 14.1.2 **COMPLETION, PAYMENTS AND** 9 Completion, Substantial 4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2, 13.7

1

Compliance with Laws 1.6, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 9.6.4, 10.2.2, 11.1, 11.3, 13.1, 13.4, 13.5.1, 13.5.2, 13.6, 14.1.1, 14.2.1.3, 15.2.8, 15.4.2, 15.4.3 Concealed or Unknown Conditions 3.7.4, 4.2.8, 8.3.1, 10.3 Conditions of the Contract 1.1.1, 6.1.1, 6.1.4 Consent, Written 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.8.5, 9.9.1, 9.10 2, 9.10.3, 11.3.1, 13.2, 13.4.2, 15.4.4.2 **Consolidation or Joinder** 15.4.4 **CONSTRUCTION BY OWNER OR BY** SEPARATE CONTRACTORS 1.1.4, 6 Construction Change Directive, Definition of 7.3.1 **Construction Change Directives** 1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3, 7.3, 9.3.1.1 Construction Schedules, Contractor's 3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2 **Contingent Assignment of Subcontracts** 5.4, 14.2.2.2 **Continuing Contract Performance** 15.1.3 Contract, Definition of 1.1.2 **CONTRACT, TERMINATION OR SUSPENSION OF THE** 5.4.1.1, 11.3.9, 14 Contract Administration 3.1.3, 4, 9.4, 9.5 Contract Award and Execution, Conditions Relating 3.7.1, 3.10, 5.2, 6.1, 11.1.3, 11.3.6, 11.4.1 Contract Documents, Copies Furnished and Use of 1.5.2, 2.2.5, 5.3 Contract Documents, Definition of 1.1.1 **Contract Sum** 3.7.4, 3.8, 5.2.3, 7.2, 7.3, 7.4, 9.1, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.3.1, 14.2.4, 14.3.2, 15.1.4, 15.2.5 Contract Sum, Definition of 9.1 Contract Time 3.7.4, 3.7.5, 3.10.2, 5.2.3, 7.2.1.3, 7.3.1, 7.3.5, 7.4, 8.1.1, 8.2.1, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 14.3.2, 15.1.5.1, 15.2.5 Contract Time, Definition of 8.1.1 **CONTRACTOR** 3 Contractor, Definition of 3.1, 6.1.2

**Contractor's Construction Schedules 3.10**, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2 Contractor's Employees 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3, 11.1.1, 11.3.7, 14.1, 14.2.1.1 **Contractor's Liability Insurance** 11.1 Contractor's Relationship with Separate Contractors and Owner's Forces 3.12.5, 3.14.2, 4.2.4, 6, 11.3.7, 12.1.2, 12.2.4 Contractor's Relationship with Subcontractors 1.2.2, 3.3.2, 3.18.1, 3.18.2, 5, 9.6.2, 9.6.7, 9.10.2, 11.3.1.2, 11.3.7, 11.3.8 Contractor's Relationship with the Architect 1.1.2, 1.5, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.3, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3.7, 12, 13.5, 15.1.2, 15.2.1 Contractor's Representations 3.2.1, 3.2.2, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2 Contractor's Responsibility for Those Performing the Work 3.3.2, 3.18, 5.3, 6.1.3, 6.2, 9.5.1, 10.2.8 Contractor's Review of Contract Documents 3.2 Contractor's Right to Stop the Work 9.7 Contractor's Right to Terminate the Contract 14.1, 15.1.6 Contractor's Submittals 3.10, 3.11, 3.12.4, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2, 9.8.3, 9.9.1, 9.10.2, 9.10.3, 11.1.3, 11.4.2 Contractor's Superintendent 3.9, 10.2.6 Contractor's Supervision and Construction Procedures 1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.5, 7.3.7, 8.2, 10, 12, 14, 15.1.3 Contractual Liability Insurance 11.1.1.8, 11.2 Coordination and Correlation 1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1 Copies Furnished of Drawings and Specifications 1.5, 2.2.5, 3.11 Copyrights 1.5, 3.17 Correction of Work 2.3, 2.4, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, 12.2 **Correlation and Intent of the Contract Documents** 1.2 Cost, Definition of 7.3.7 Costs 2.4, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3, 7.3.3.3, 7.3.7, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.3, 12.1.2, 12.2.1, 12.2.4, 13.5, 14

**Cutting and Patching** 3.14, 6.2.5 Damage to Construction of Owner or Separate Contractors 3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 11.1.1, 11.3, 12.2.4 Damage to the Work 3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4, 11.3.1, 12.2.4 Damages, Claims for 3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.1.1, 11.3.5, 11.3.7, 14.1.3, 14.2.4, 15.1.6 Damages for Delay 6.1.1, 8.3.3, 9.5.1.6, 9.7, 10.3.2 Date of Commencement of the Work, Definition of 8.1.2 Date of Substantial Completion, Definition of 8.1.3 Day, Definition of 8.1.4 Decisions of the Architect 3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 15.2, 6.3, 7.3.7, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.5.2, 14.2.2, 14.2.4, 15.1, 15.2 **Decisions to Withhold Certification** 9.4.1, 9.5, 9.7, 14.1.1.3 Defective or Nonconforming Work, Acceptance, Rejection and Correction of 2.3, 2.4, 3.5, 4.2.6, 6.2.5, 9.5.1, 9.5.2, 9.6.6, 9.8.2, 9.9.3, 9.10.4, 12.2.1 Definitions 1.1, 2.1.1, 3.1.1, 3.5, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 15.1.1, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1 **Delays and Extensions of Time** 3.2, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, 8.3, 9.5.1, 9.7, 10.3.2, 10.4, 14.3.2, 15.1.5, 15.2.5 Disputes 6.3, 7.3.9, 15.1, 15.2 **Documents and Samples at the Site** 3.11 Drawings, Definition of 1.1.5 Drawings and Specifications, Use and Ownership of 3.11 Effective Date of Insurance 8.2.2, 11.1.2 Emergencies 10.4, 14.1.1.2, 15.1.4 Employees, Contractor's 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3.3, 11.1.1, 11.3.7, 14.1, 14.2.1.1 Equipment, Labor, Materials or 1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2 Execution and Progress of the Work 1.1.3, 1.2.1, 1.2.2, 2.2.3, 2.2.5, 3.1, 3.3.1, 3.4.1, 3.5,

Init. 1

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3.7.1, 3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.5, 8.2, 9.5.1, 9.9.1, 10.2, 10.3, 12.2, 14.2, 14.3.1, 15.1.3 Extensions of Time 3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4, 9.5.1, 9.7, 10.3.2, 10.4, 14.3, 15.1.5, 15.2.5 **Failure of Payment** 9.5.1.3, 9.7, 9.10.2, 13.6, 14.1.1.3, 14.2.1.2 Faulty Work (See Defective or Nonconforming Work) **Final Completion and Final Payment** 4.2.1, 4.2.9, 9.8.2, 9.10, 11.1.2, 11.1.3, 11.3.1, 11.3.5, 12.3, 14.2.4, 14.4.3 Financial Arrangements, Owner's 2.2.1, 13.2.2, 14.1.1.4 Fire and Extended Coverage Insurance 11.3.1.1 **GENERAL PROVISIONS Governing Law** 13.1 Guarantees (See Warranty) **Hazardous Materials** 10.2.4, 10.3 Identification of Subcontractors and Suppliers 5.2.1 Indemnification 3.17, 3.18, 9.10.2, 10.3.3, 10.3.5, 10.3.6, 11.3.1.2, 11.3.7 Information and Services Required of the Owner 2.1.2, 2.2, 3.2.2, 3.12.4, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 11.4, 13.5.1, 13.5.2, 14.1.1.4, 14.1.4, 15.1.3 **Initial Decision** 15.2 Initial Decision Maker, Definition of 1.1.8 Initial Decision Maker, Decisions 14.2.2, 14.2.4, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5 Initial Decision Maker, Extent of Authority 14.2.2, 14.2.4, 15.1.3, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5 Injury or Damage to Person or Property **10.2.8**, 10.4 Inspections 3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 12.2.1, 13.5 Instructions to Bidders 111 Instructions to the Contractor 3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.5.2 Instruments of Service, Definition of 1.1.7 Insurance 3.18.1, 6.1.1, 7.3.7, 9.3.2, 9.8.4, 9.9.1, 9.10.2, 11 **Insurance, Boiler and Machinery** 11.3.2

Insurance, Contractor's Liability 11.1 Insurance, Effective Date of 8.2.2, 11.1.2 Insurance, Loss of Use 11.3.3 **Insurance, Owner's Liability** 11.2 **Insurance**, Property 10.2.5, 11.3 Insurance, Stored Materials 9.3.2 **INSURANCE AND BONDS** 11 Insurance Companies, Consent to Partial Occupancy 9.9.1 Intent of the Contract Documents 1.2.1, 4.2.7, 4.2.12, 4.2.13, 7.4 Interest 13.6 Interpretation 1.2.3, 1.4, 4.1.1, 5.1, 6.1.2, 15.1.1 Interpretations, Written 4.2.11, 4.2.12, 15.1.4 Judgment on Final Award 15.4.2 Labor and Materials, Equipment 1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2 Labor Disputes 8.3.1 Laws and Regulations 1.5, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 9.6.4, 9.9.1, 10.2.2, 11.1.1, 11.3, 13.1, 13.4, 13.5.1, 13.5.2, 13.6, 14, 15.2.8, 15.4 Liens 2.1.2, 9.3.3, 9.10.2, 9.10.4, 15.2.8 Limitations, Statutes of 12.2.5, 13.7, 15.4.1.1 Limitations of Liability 2.3, 3.2.2, 3.5, 3.12.10, 3.17, 3.18.1, 4.2.6, 4.2.7, 4.2.12, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 10.2.5, 10.3.3, 11.1.2, 11.2, 11.3.7, 12.2.5, 13.4.2 Limitations of Time 2.1.2, 2.2, 2.4, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7, 5.2, 5.3, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 11.1.3, 11.3.1.5, 11.3.6, 11.3.10, 12.2, 13.5, 13.7, 14, 15 Loss of Use Insurance 11.3.3 Material Suppliers 1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.6, 9.10.5 Materials, Hazardous 10.2.4, 10.3

Init. 1

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Materials, Labor, Equipment and 1.1.3, 1.1.6, 1.5.1, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1.2, 10.2.4, 14.2.1.1, 14.2.1.2 Means, Methods, Techniques, Sequences and Procedures of Construction 3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2 Mechanic's Lien 2.1.2, 15.2.8 Mediation 8.3.1, 10.3.5, 10.3.6, 15.2.1, 15.2.5, 15.2.6, **15.3**, 15.4.1 **Minor Changes in the Work** 1.1.1, 3.12.8, 4.2.8, 7.1, 7.4 **MISCELLANEOUS PROVISIONS** 13 Modifications, Definition of 1.1.1 Modifications to the Contract 1.1.1, 1.1.2, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7, 10.3.2, 11.3.1 **Mutual Responsibility** 6.2 Nonconforming Work, Acceptance of 9.6.6, 9.9.3, 12.3 Nonconforming Work, Rejection and Correction of 2.3, 2.4, 3.5, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4, 12.2.1 Notice 2.2.1, 2.3, 2.4, 3.2.4, 3.3.1, 3.7.2, 3.12.9, 5.2.1, 9.7, 9.10, 10.2.2, 11.1.3, 12.2.2.1, 13.3, 13.5.1, 13.5.2, 14.1, 14.2, 15.2.8, 15.4.1 Notice, Written 2.3, 2.4, 3.3.1, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 9.7, 9.10, 10.2.2, 10.3, 11.1.3, 11.3.6, 12.2.2.1, 13.3, 14, 15.2.8, 15.4.1 **Notice of Claims** 3.7.4, 10.2.8, 15.1.2, 15.4 Notice of Testing and Inspections 13.5.1, 13.5.2 Observations, Contractor's 3.2, 3.7.4 Occupancy 2.2.2, 9.6.6, 9.8, 11.3.1.5 Orders, Written 1.1.1, 2.3, 3.9.2, 7, 8.2.2, 11.3.9, 12.1, 12.2.2.1, 13.5.2, 14.3.1 **OWNER** 2 Owner, Definition of 2.1.1 **Owner, Information and Services Required of the** 2.1.2, 2.2, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 11.3, 13.5.1, 13.5.2, 14.1.1.4, 14.1.4, 15.1.3

**Owner's** Authority 1.5, 2.1.1, 2.3, 2.4, 3.4.2, 3.8.1, 3.12.10, 3.14.2, 4.1.2, 4.1.3, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3, 7.2.1, 7.3.1, 8.2.2, 8.3.1, 9.3.1, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2, 10.3.2, 11.1.3, 11.3.3, 11.3.10, 12.2.2, 12.3, 13.2.2, 14.3, 14.4, 15.2.7 **Owner's Financial Capability** 2.2.1, 13.2.2, 14.1.1.4 **Owner's Liability Insurance** 11.2 Owner's Relationship with Subcontractors 1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2 **Owner's Right to Carry Out the Work** 2.4, 14.2.2 **Owner's Right to Clean Up** 6.3 **Owner's Right to Perform Construction and to Award Separate Contracts** 6.1 **Owner's Right to Stop the Work** 2.3 Owner's Right to Suspend the Work 14.3 Owner's Right to Terminate the Contract 14.2 **Ownership and Use of Drawings, Specifications** and Other Instruments of Service 1.1.1, 1.1.6, 1.1.7, 1.5, 2.2.5, 3.2.2, 3.11, 3.17, 4.2.12, 5.3 **Partial Occupancy or Use** 9.6.6, 9.9, 11.3.1.5 Patching, Cutting and 3.14, 6.2.5 Patents 3.17 **Payment**, Applications for 4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5, 9.6.3, 9.7, 9.8.5, 9.10.1, 14.2.3, 14.2.4, 14.4.3 **Payment, Certificates for** 4.2.5, 4.2.9, 9.3.3, 9.4, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1, 9.10.3, 13.7, 14.1.1.3, 14.2.4 **Payment**, Failure of 9.5.1.3, 9.7, 9.10.2, 13.6, 14.1.1.3, 14.2.1.2 Payment, Final 4.2.1, 4.2.9, 9.8.2, 9.10, 11.1.2, 11.1.3, 11.4.1, 12.3, 13.7, 14.2.4, 14.4.3 Payment Bond, Performance Bond and 7.3.7.4, 9.6.7, 9.10.3, 11.4 **Payments**, **Progress** 9.3, 9.6, 9.8.5, 9.10.3, 13.6, 14.2.3, 15.1.3 **PAYMENTS AND COMPLETION** 9 Payments to Subcontractors 5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 14.2.1.2 PCB 10.3.1

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**Performance Bond and Payment Bond** 7.3.7.4, 9.6.7, 9.10.3, 11.4 Permits, Fees, Notices and Compliance with Laws 2.2.2, 3.7, 3.13, 7.3.7.4, 10.2.2 PERSONS AND PROPERTY, PROTECTION OF 10 Polychlorinated Biphenyl 10.3.1 Product Data, Definition of 3.12.2 **Product Data and Samples, Shop Drawings** 3.11, 3.12, 4.2.7 **Progress and Completion** 4.2.2, 8.2, 9.8, 9.9.1, 14.1.4, 15.1.3 **Progress Payments** 9.3, 9.6, 9.8.5, 9.10.3, 13.6, 14.2.3, 15.1.3 Project, Definition of 1.1.4 **Project Representatives** 4.2.10 **Property Insurance** 10.2.5, 11.3 **PROTECTION OF PERSONS AND PROPERTY** 10 **Regulations and Laws** 1.5, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 9.6.4, 9.9.1, 10.2.2, 11.1, 11.4, 13.1, 13.4, 13.5.1, 13.5.2, 13.6, 14, 15.2.8, 15.4 Rejection of Work 3.5, 4.2.6, 12.2.1 Releases and Waivers of Liens 9.10.2 Representations 3.2.1, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.8.2, 9.10.1 Representatives 2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.1, 4.2.2, 4.2.10, 5.1.1, 5.1.2, 13.2.1Responsibility for Those Performing the Work 3.3.2, 3.18, 4.2.3, 5.3, 6.1.3, 6.2, 6.3, 9.5.1, 10 Retainage 9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3 **Review of Contract Documents and Field Conditions by Contractor** 3.2, 3.12.7, 6.1.3 Review of Contractor's Submittals by Owner and Architect 3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2 Review of Shop Drawings, Product Data and Samples by Contractor 3.12 **Rights and Remedies** 1.1.2, 2.3, 2.4, 3.5, 3.7.4, 3.15.2, 4.2.6, 5.3, 5.4, 6.1, 6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.2, 12.2.4, 13.4. 14. 15.4 **Royalties, Patents and Copyrights** 

Rules and Notices for Arbitration 15.4.1 Safety of Persons and Property 10.2, 10.4 **Safety Precautions and Programs** 3.3.1, 4.2.2, 4.2.7, 5.3, 10.1, 10.2, 10.4 Samples, Definition of 3.12.3 Samples, Shop Drawings, Product Data and 3.11, 3.12, 4.2.7 Samples at the Site, Documents and 3.11 **Schedule of Values** 9.2, 9.3.1 Schedules, Construction 3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2 Separate Contracts and Contractors 1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 12.1.2 Shop Drawings, Definition of 3.12.1 Shop Drawings, Product Data and Samples 3.11, 3.12, 4.2.7 Site, Use of 3.13, 6.1.1, 6.2.1 Site Inspections 3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.4.2, 9.10.1, 13.5 Site Visits, Architect's 3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.5 Special Inspections and Testing 4.2.6, 12.2.1, 13.5 Specifications, Definition of 1.1.6 **Specifications** 1.1.1, 1.1.6, 1.2.2, 1.5, 3.11, 3.12.10, 3.17, 4.2.14 Statute of Limitations 13.7, 15.4.1.1 Stopping the Work 2.3, 9.7, 10.3, 14.1 Stored Materials 6.2.1, 9.3.2, 10.2.1.2, 10.2.4 Subcontractor, Definition of 5.1.1 **SUBCONTRACTORS** 5 Subcontractors, Work by 1.2.2, 3.3.2, 3.12.1, 4.2.3, 5.2.3, 5.3, 5.4, 9.3.1.2, 9.6.7 Subcontractual Relations 5.3, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 14.1, 14.2.1 Submittals 3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.7, 9.2, 9.3, 9.8, 9.9.1, 9.10.2, 9.10.3, 11.1.3 Submittal Schedule 3.10.2, 3.12.5, 4.2.7 Subrogation, Waivers of 6.1.1, 11.3.7

3.17

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**Substantial Completion** 4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2, 13.7 Substantial Completion, Definition of 9.8.1 Substitution of Subcontractors 5.2.3, 5.2.4 Substitution of Architect 4.1.3 Substitutions of Materials 3.4.2, 3.5, 7.3.8 Sub-subcontractor, Definition of 5.1.2 Subsurface Conditions 3.7.4 Successors and Assigns 13.2 **Superintendent** 3.9, 10.2.6 **Supervision and Construction Procedures** 1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.7, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.3 Surety 5.4.1.2, 9.8.5, 9.10.2, 9.10.3, 14.2.2, 15.2.7 Surety, Consent of 9.10.2, 9.10.3 Surveys 2.2.3 Suspension by the Owner for Convenience 14.3 Suspension of the Work 5.4.2, 14.3 Suspension or Termination of the Contract 5.4.1.1, 14 Taxes 3.6, 3.8.2.1, 7.3.7.4 **Termination by the Contractor** 14.1, 15.1.6 Termination by the Owner for Cause 5.4.1.1, 14.2, 15.1.6 Termination by the Owner for Convenience 14.4 Termination of the Architect 4.1.3 Termination of the Contractor 1422 **TERMINATION OR SUSPENSION OF THE** CONTRACT 14 **Tests and Inspections** 3.1.3, 3.3.3, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 10.3.2, 11.4.1, 12.2.1, 13.5 TIME 8 Time, Delays and Extensions of 3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, 8.3, 9.5.1, 9.7, 10.3.2, 10.4, 14.3.2, 15.1.5, 15.2.5

1

**Time Limits** 2.1.2, 2.2, 2.4, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2, 5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 11.1.3, 12.2, 13.5, 13.7, 14, 15.1.2, 15.4 **Time Limits on Claims** 3.7.4, 10.2.8, 13.7, 15.1.2 Title to Work 9.3.2, 9.3.3 Transmission of Data in Digital Form 1.6 **UNCOVERING AND CORRECTION OF WORK** 12 **Uncovering of Work** 12.1 Unforeseen Conditions, Concealed or Unknown 3.7.4, 8.3.1, 10.3 **Unit Prices** 7.3.3.2, 7.3.4 Use of Documents 1.1.1, 1.5, 2.2.5, 3.12.6, 5.3 Use of Site 3.13, 6.1.1, 6.2.1 Values, Schedule of 9.2, 9.3.1 Waiver of Claims by the Architect 13.4.2 Waiver of Claims by the Contractor 9.10.5, 13.4.2, 15.1.6 Waiver of Claims by the Owner 9.9.3, 9.10.3, 9.10.4, 12.2.2.1, 13.4.2, 14.2.4, 15.1.6 Waiver of Consequential Damages 14.2.4, 15.1.6 Waiver of Liens 9.10.2, 9.10.4 Waivers of Subrogation 6.1.1, 11.3.7 Warranty 3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.4, 12.2.2, 13.7 Weather Delays 15.1.5.2 Work, Definition of 1.1.3 Written Consent 1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 11.4.1, 13.2, 13.4.2, 15.4.4.2 Written Interpretations 4.2.11, 4.2.12 Written Notice 2.3, 2.4, 3.3.1, 3.9, 3.12.9, 3.12.10, 5.2.1, 8.2.2, 9.7, 9.10, 10.2.2, 10.3, 11.1.3, 12.2.2, 12.2.4, 13.3, 14, 15.4.1 Written Orders 1.1.1, 2.3, 3.9, 7, 8.2.2, 12.1, 12.2, 13.5.2, 14.3.1, 15.1.2

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#### ARTICLE 1 GENERAL PROVISIONS § 1.1 BASIC DEFINITIONS

#### § 1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding requirements.

#### § 1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

#### § 1.1.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

#### § 1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by separate contractors.

#### § 1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

#### § 1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials. equipment, systems, standards and workmanship for the Work, and performance of related services.

#### § 1.1.7 INSTRUMENTS OF SERVICE

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

#### § 1.1.8 INITIAL DECISION MAKER

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

#### § 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

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§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

#### § 1.3 CAPITALIZATION

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles or (3) the titles of other documents published by the American Institute of Architects.

#### § 1.4 INTERPRETATION

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

#### § 1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

#### § 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

#### ARTICLE 2 OWNER

#### § 2.1 GENERAL

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

#### § 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the

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portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.2 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.2.3 The Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.2.4 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.2.5 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

#### § 2.3 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

#### § 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

#### **ARTICLE 3 CONTRACTOR**

#### § 3.1 GENERAL

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

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#### § 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

#### § 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

#### § 3.4 LABOR AND MATERIALS

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

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§ 3.4.2 Except in the case of minor changes in the Work authorized by the Architect in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

#### § 3.5 WARRANTY

The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects, except for those inherent in the quality of the Work the Contract Documents require or permit. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

#### § 3.6 TAXES

The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

#### § 3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall

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continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

#### § 3.8 ALLOWANCES

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and .2 other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3 Whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

#### § 3.9 SUPERINTENDENT

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

#### § 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

#### § 3.11 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required

Init. 1

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submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

#### § 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop

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Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

#### § 3.13 USE OF SITE

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

#### § 3.14 CUTTING AND PATCHING

§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

#### § 3.15 CLEANING UP

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from the Contractor.

#### § 3.16 ACCESS TO WORK

The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

#### § 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

#### § 3.18 INDEMNIFICATION

§ 3.18.1 To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a

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party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

#### ARTICLE 4 ARCHITECT

#### § 4.1 GENERAL

§ 4.1.1 The Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner, Contractor and Architect. Consent shall not be unreasonably withheld.

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall employ a successor architect as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.

#### § 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

#### § 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed.

Init. 1

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However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

#### **ARTICLE 5 SUBCONTRACTORS**

#### § 5.1 DEFINITIONS

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

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§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

#### § 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitution.

#### § 5.3 SUBCONTRACTUAL RELATIONS

By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

#### § 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- assignment is effective only after termination of the Contract by the Owner for cause pursuant to .1 Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

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§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation shall be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

#### ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS § 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

#### § 6.2 MUTUAL RESPONSIBILITY

§ 6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a separate contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a separate contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

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#### § 6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

#### ARTICLE 7 CHANGES IN THE WORK

#### § 7.1 GENERAL

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

#### § 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

#### § 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

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§ 7.3.6 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum. the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

- Costs of labor, including social security, old age and unemployment insurance, fringe benefits required .1 by agreement or custom, and workers' compensation insurance;
- .2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed:
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others:
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
- .5 Additional costs of supervision and field office personnel directly attributable to the change.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

#### § 7.4 MINOR CHANGES IN THE WORK

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

#### **ARTICLE 8 TIME**

#### § 8.1 DEFINITIONS

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

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## § 8.2 PROGRESS AND COMPLETION

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

## § 8.3 DELAYS AND EXTENSIONS OF TIME

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

# ARTICLE 9 PAYMENTS AND COMPLETION

## § 9.1 CONTRACT SUM

The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

## § 9.2 SCHEDULE OF VALUES

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

## § 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon

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compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

## § 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

### § 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- third party claims filed or reasonable evidence indicating probable filing of such claims unless security .2 acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- damage to the Owner or a separate contractor; .5
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.3 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers to whom the

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Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Architect will reflect such payment on the next Certificate for Payment.

### § 9.6 PROGRESS PAYMENTS

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor no later than seven days after receipt of payment from the Owner the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

## § 9.7 FAILURE OF PAYMENT

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

#### § 9.8 SUBSTANTIAL COMPLETION

§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

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§ 9.8.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

### § 9.9 PARTIAL OCCUPANCY OR USE

§ 9.9.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.9.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.9.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

#### § 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract

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Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- .1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents; or
- .3 terms of special warranties required by the Contract Documents.

§ 9.10.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

## ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

### § 10.1 SAFETY PRECAUTIONS AND PROGRAMS

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

## § 10.2 SAFETY OF PERSONS AND PROPERTY

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

§ 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in

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whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

### § 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

### § 10.3 HAZARDOUS MATERIALS

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

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§ 10.3.5 The Contractor shall indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

§ 10.3.6 If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall indemnify the Contractor for all cost and expense thereby incurred.

## § 10.4 EMERGENCIES

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

## ARTICLE 11 INSURANCE AND BONDS

## § 11.1 CONTRACTOR'S LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- .1 Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;
- Claims for damages because of bodily injury, occupational sickness or disease, or death of the .2 Contractor's employees;
- .3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- .4 Claims for damages insured by usual personal injury liability coverage;
- .5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- .6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
- .7 Claims for bodily injury or property damage arising out of completed operations; and
- .8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional

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insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

## § 11.2 OWNER'S LIABILITY INSURANCE

The Owner shall be responsible for purchasing and maintaining the Owner's usual liability insurance.

## § 11.3 PROPERTY INSURANCE

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

## § 11.3.2 BOILER AND MACHINERY INSURANCE

The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

## § 11.3.3 LOSS OF USE INSURANCE

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

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§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

## § 11.3.7 WAIVERS OF SUBROGATION

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

## § 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

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§ 11.4.2 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

## ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

## § 12.1 UNCOVERING OF WORK

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

## § 12.2 CORRECTION OF WORK

### § 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

### § 12.2.2 AFTER SUBSTANTIAL COMPLETION

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.3. The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be

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sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

## § 12.3 ACCEPTANCE OF NONCONFORMING WORK

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

# **ARTICLE 13 MISCELLANEOUS PROVISIONS**

## § 13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

## § 13.2 SUCCESSORS AND ASSIGNS

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

## § 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

## § 13.4 RIGHTS AND REMEDIES

§ 13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach there under, except as may be specifically agreed in writing.

## § 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

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§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

### § 13.6 INTEREST

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

### § 13.7 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

# ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

## § 14.1 TERMINATION BY THE CONTRACTOR

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped:
- .2 An act of government, such as a declaration of national emergency that requires all Work to be stopped;
- Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the .3 reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

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## § 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- otherwise is guilty of substantial breach of a provision of the Contract Documents. .4

§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

## § 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- that performance is, was or would have been so suspended, delayed or interrupted by another cause for .1 which the Contractor is responsible; or
- .2 that an equitable adjustment is made or denied under another provision of the Contract.

## § 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

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#### ARTICLE 15 CLAIMS AND DISPUTES § 15.1 CLAIMS § 15.1.1 DEFINITION

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

### § 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

### § 15.1.3 CONTINUING CONTRACT PERFORMANCE

Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

#### § 15.1.4 CLAIMS FOR ADDITIONAL COST

If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

### § 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

## § 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, .1 business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

## § 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

1

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§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

§ 15.2.6 Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.

§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

## § 15.3 MEDIATION

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 shall be subject to mediation as a condition precedent to binding dispute resolution.

§ 15.3.2 The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.

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§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

### § 15.4 ARBITRATION

§ 15.4.1 If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.

§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement shall be specifically enforceable under applicable law in any court having jurisdiction thereof.

### § 15.4.4 CONSOLIDATION OR JOINDER

§ 15.4.4.1 Either party, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

§ 15.4.4.2 Either party, at its sole discretion, may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as the Owner and Contractor under this Agreement.

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## SECTION SGC- SUPPLEMENTARY GENERAL CONDITIONS

## **GENERAL CONDITIONS**

The "General Conditions of the Contract for Construction," AlA Document A201-2007, published by the American Institute of Architects, Articles 1 through 15 inclusive, is a part of this Contract.

## SUPPLEMENTARY CONDITIONS

The following addendum supplements, modifies, deletes and/or adds to the General Conditions. Where any Article, Paragraph or subparagraph in the General Conditions is supplemented by one of the following paragraphs, the provisions of such Article, Paragraph, or Subparagraph shall remain in effect and the supplemental provisions shall be considered as added thereto. Where any Article, Paragraph, or subparagraph in the General Conditions is amended, voided or superseded by any of the following paragraphs, the provisions of such Article, Paragraph or subparagraph not so amended, voided, or superseded shall remain in effect.

# MODIFICATIONS TO VARIOUS ARTICLES OF THE AIA CONDITIONS

## ARTICLE 1 - GENERAL PROVISIONS

1.1.1 In the first sentence, delete "are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and" after "The Contract Documents".

Insert "between the Owner and Contractor (hereinafter the Agreement)" after "consist of the Agreement".

In the last sentence:

Delete "Unless specifically enumerated in the Agreement".

Delete "not" after "Contract Documents do".

Delete "other" after "sample forms,".

Delete "or" after "or proposal," and insert "and".

Delete "bidding requirements" after "relating to" and insert "those documents."

1.1.8 Delete "Claims" and insert "claims".

Delete "and certify termination of the Agreement under Section 14.2.2.".

1.2.1 Add to the end of the sub-section:

All Work mentioned or indicated in the Contract Documents shall be performed by the Contractor as part of this Contract unless it is specifically indicated in the Contract Documents that such Work is to be done by others. Should the Drawings or the Specifications disagree in themselves or with each other, the Contractor shall provide the better quality or greater quantity of Work unless otherwise directed by written addendum to the Contract.

## 1.2.2 Add to the end of the sentence:

, except that the performance of filed sub-trade work shall comply with the provisions of chapter 149 of the General Laws of the Commonwealth of Massachusetts. The Contractor and all Subcontractors shall refer to all of the Drawings, including those showing primarily the Work of the mechanical, electrical and other specialized trades, and to all of the Sections of the Specifications, and shall perform all Work reasonably inferable therefrom as being necessary to produce the indicated results.

1.2.4 Add the following new sub-sections 1.2.4 to 1.2.11 as follows:

-1.2.11

§ 1.2.4 All indications or notations which apply to one of a number of similar situations, materials or processes shall be deemed to apply to all such situations, materials or processes wherever they appear in the Work, except where a contrary result is clearly indicated by the Contract Documents.

§ 1.2.5 Where codes, standards, requirements and publications of public and private bodies are referred to in the Specifications, references shall be understood to be to the latest revision prior to the date of receiving bids, except where otherwise indicated.

§ 1.2.6 Where no explicit quality or standards for materials or workmanship are established for Work, such Work is to be of good quality for the intended use and consistent with the quality of the surrounding Work and of the construction of the Project generally.

§ 1.2.7 All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the manufacturer's written or printed directions and instructions unless otherwise indicated in the Contract Documents.

§ 1.2.8 The Mechanical, Electrical and Fire Protection Drawings are diagrammatic only, and are not intended to show the alignment, physical locations or configurations of such Work. Such Work shall be installed without additional cost to the Owner to clear all obstructions, permit proper clearances for the Work of other trades, and present an orderly appearance where exposed. Prior to beginning such Work, the Contractor shall prepare coordination drawings showing the exact alignment, physical location and configuration of the Mechanical, Electrical and Fire Protection installations and demonstrating to the Contractor's satisfaction that the installations will comply with the preceding sentence. A copy of the drawings shall be submitted to the Architect, and the Contractor shall revise and resubmit the drawings if so directed by the Architect.

§ 1.2.9 Exact locations of fixtures and outlets shall be obtained from the Architect as provided in subparagraph 3.2.5 before the Work is roughed in; Work installed without such information from the Architect shall be relocated at the Contractor's expense.

§ 1.2.10 Test boring or soil test information included with the Contract Documents or otherwise made available to the Contractor was obtained by the Owner for use by the Architects in the design of the Project or Work. The Owner does not hold out such information to the Contractor as a completely accurate indication of subsurface conditions, and no claim for extra cost or extension of time resulting from a reliance by the Contractor on such information shall be allowed except as provided in subparagraph 3.7.4.

§ 1.2.11 Where the Work is to fit with existing conditions or work to be performed by others, the Contractor shall fully and completely join the Work with such conditions or work, unless otherwise specified. Owner provided drawings showing existing conditions or construction are based on available documents and are not guaranteed to show actual existing conditions.

1.5.1 Delete 1.5.1 and replace as follows:

§ 1.5.1 All Drawings, Specifications and copies thereof furnished by the Owner are and shall remain the Owner's property. They are to be used only with respect to this Project and are not to be used on any other project without the prior written consent of the Owner. With the exception of one contract set for each party to the Contract, such documents are to be returned or suitably accounted for to the Owner at the completion of the Work. Submission or distribution to meet official regulatory requirements or for other purposes in connection with the Project is not to be construed as publication in derogation of any reserved rights.

## ARTICLE 2 - OWNER

- 2.1.2 Delete sub-section 2.1.2.
- 2.2.1 Delete the last three sentences.
- 2.2.3 In the first sentence insert "available" after "shall furnish".

Delete the last sentence and replace as follows:

The Owner makes no warranty as to the accuracy or completeness of such information, and the Contractor shall exercise proper precautions relating to the safe performance of the Work.

- 2.2.4 Delete the last sentence.
- 2.2.5 Add to the end of the sub-section as follows:

All additional copies will be furnished upon request at the cost of reproduction.

2.3 Delete from the last sentence ", except to the extent required by Section 6.1.3" and add as follows:

The Contractor shall resume the Work after such stoppage promptly upon written notice to do so from the Owner. The Contractor shall remain responsible for maintaining the progress of the Work and shall not be entitled to any increase in the Contract Sum or Contract Time. The Contractor shall be responsible for all costs incurred by the Owner attributable to such an order to stop the Work.

## 2.4 In the second sentence:

Delete "Change Order" and replace with "Construction Change Directive".

Insert "and Owner's Project Manager's" after "for the Architect's".

Delete the third sentence.

Add to the end of the section as follows:

The rights of the Owner hereunder are in addition to any other rights set forth in the Contract Documents or available at law or in equity.

## **ARTICLE 3 - CONTRACTOR**

3.2.1 Delete "generally" after "the site, become".

Add to the end of the sub-section as follows:

The Contractor shall not be entitled to any change in the Contract Time or Contract Sum on account of its failure, or that of any Subcontractor, to comply with the foregoing requirements.

3.2.2 Delete the beginning of the second sentence as follows:

These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however,

Delete the last sentence and replace as follows:

If the Contractor performs any construction activity that it knows or should know involves a recognized error, inconsistency or omission in the Contract Documents without such notice to the Architect, the Contractor shall assume appropriate responsibility for such performance and shall bear responsibility for the costs of any required correction.

3.2.3 Delete "not" after "Contractor is".

Delete ", but" after "public authorities" and create new sentence beginning with "The Contractor shall promptly".

3.2.4 Delete "claims" after "the Contractor shall make" and insert "a claim".

Delete the last sentence.

3.2.5 Add new sub-section 3.2.5 as follows:

§ 3.2.5 Any claim by the Contractor or Subcontractors that, in submitting their respective bids, they did not include all items as shown in the Contract Documents will be given no consideration for an adjustment of any kind. If any item is specified in a Section which would not normally furnish this item it shall be the responsibility of the Contractor to coordinate the situation with the Subcontractor, and if the item under consideration is not to be provided by the Subcontractor it shall be the responsibility of the Contractor to provide the work in question, without any additional cost to the Owner.

3.3.1 Add to the end of the first sentence as follows:

which shall not be less than such state of skill and attention generally rendered by the contracting profession for projects similar to the Project in scope, difficulty and location. The Contractor shall adequately staff the Project to properly and thoroughly manage, schedule and supervise all construction activities.

Delete the last sentence.

3.3.2 Add the last sentence as follows:

This obligation shall also extend to the presence on the Site of suppliers of materials or equipment, their employees, contractors, and agents engaged in the Work.

3.4.3 Add to the end of the second sentence as follows:

, and the Contractor shall ensure that all workers to be employed on the Project have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration (OSHA) of

## SUPPLEMENTARY GENERAL CONDITIONS

at least 10 hours. The Contractor shall be responsible for maintaining all safety precautions at and around the Project site. On the Owner's request, the Contractor shall permanently remove from the Project site any employee of the Contractor or any Subcontractor who fails to comply with the requirements of the Contract Documents or whose presence or behavior is deemed by the Owner to be adverse to the success of the Project or the Owner's interests.

3.5 Add to the end of the first sentence as follows:

and, promptly after written notification of non-conformance, shall be repaired or replaced by the Contractor with Work conforming to such requirements.

Delete the second to last sentence.

3.5.2 Add new sub-sections 3.5.2 to 3.5.8 as follows:

## -3.5.8

§ 3.5.2 The Contractor shall be responsible for determining that all materials furnished for the Work meet all requirements of the Contract Documents. The Architect may require the Contractor to produce reasonable evidence that a material meets such requirements, such as certified reports of past tests by qualified testing laboratories, reports of studies by qualified experts, or other evidence which, in the opinion of the Architect, would lead to a reasonable certainty that any material used, or proposed to be used, in the Work meets the requirements of the Contract Documents. All such data shall be furnished at the Contractor's expense. This provision shall not require the Contractor to pay for periodic testing of different batches of the same material, unless such testing is specifically required by the Contract Documents to be performed at the Contractor's expense.

§ 3.5.3 If the Contractor proposes to use a material which, while suitable for the intended use, deviates in any way from the detailed requirements of the Contract Documents, the Contractor shall inform the Architect in writing of the nature of such deviations at the time the material is submitted for approval and request approval of the deviation.

The Architect shall judge the design and appearance of proposed substitutes, an may refuse to approve any substitute which, in the Architect's opinion, would be out of character or otherwise inconsistent with the character or quality of design of the Project.

§ 3.5.4 In informing the Architect of deviations or substitutions, the Contractor shall provide, upon request, evidence leading to a reasonable certainty that the proposed substitution or deviation will provide a quality of result at least equal to that otherwise attainable in accordance with the Contract Documents. If, in the opinion of the Architect, the evidence presented by the Contractor does not provide a sufficient basis for such reasonable certainty, the Architect may reject such substitution or deviation without further investigation.

§ 3.5.5 Any additional cost, or any loss or damage arising from the substitution of any material or any method for those originally specified shall be borne by the Contractor, notwithstanding approval or acceptance of such substitution by the Owner or the Architect, unless such substitution was made at the written request or direction of the Owner or the Architect.

§ 3.5.6 The warranty provided in this paragraph 3.5 shall be in addition to and not in limitation of any other warranty required by the Contract Documents or otherwise prescribed by law.

§ 3.5.7 The Contractor shall procure and deliver to the Architect, no later than the date claimed by the Contractor as the date of Substantial Completion, all special warranties required by the Contract Documents. Delivery by the Contractor shall constitute the Contractor's guarantee to the Owner that the warranty will be performed in accordance with its terms and conditions.

\$3.5.8 The Contractor shall guarantee all Work for a period of one year after Date of Substantial Completion, or by the terms of any special guarantee required by the Contract Documents. The Contractor shall, upon written notice from the Owner, promptly correct defective Work or Work not in accordance with the Contract Documents.

3.6.1 Add new sub-section 3.6.1 as follows:

§ 3.6.1 The project is exempt from the Massachusetts Sales Tax to the extent permitted by G.L. c.64H, §6(f). The exemption number will be provided by the Awarding Authority to the Contractor.

3.7.2 Add to the end of the sub-section as follows:

If any of the Work is required to be inspected or approved by any public authority, the Contractor shall cause such inspection or approval to be performed and shall comply with any instructions or corrections ordered by the public authority.

- 3.7.3 Delete "knowing it" after "performs Work" and replace with "it knows or should know".
- 3.7.4 Delete sub-section 3.7.4 and replace as follows:

§ 3.7.4 Concealed or Unknown Conditions. Claims for concealed or unknown conditions shall be governed by Chapter 30, Section 39N of the General Laws of the Commonwealth of Massachusetts, as amended.

- 3.7.5 Delete second and last sentences.
- 3.8 Delete section 3.8 in its entirety.

## 3.9.1 In the first sentence:

Insert ", in accordance with the Contract Documents," after "shall employ".

Insert "at all times" after "the Project site".

3.9.4 Add new sub-sections 3.9.4 and 3.9.5 as follows:

-3.9.5

§ 3.9.4 The Contractor shall coordinate and supervise the Work performed by Subcontractors to the end that the Work is carried out without conflict between trades and so that no trade, at any time, causes delay to the general progress of the Work. The Contractor and all Subcontractors shall at all times afford each trade, any separate contractor, or the Owner, every reasonable opportunity for the installation of Work and the storage of materials.

§ 3.9.5 The Contractor shall arrange for and attend job meetings with the Architect and such other persons as the Architect may from time to time wish to have present. The Contractor shall be represented by a principal, project manager, general superintendent or other authorized main office representative, as well as by the Contractor's own superintendent. An authorized representative of any Subcontractor or Sub-subcontractor shall attend such meetings if the representative's presence is requested by the Architect. Such representatives shall be empowered to make binding commitments on all matters to be discussed at such meetings, including costs, payments, change orders, time schedules and manpower. Any notices required under the Contract may be served on such representatives.

3.10.1 In the first sentence delete "promptly" after "The Contractor" and replace with "within twenty (20) days".

In the second sentence, insert "or as requested by the Architect" after "conditions of the Work and Project".

Add to the end of the sub-section as follows:

The construction schedule shall be in such form and contain such information as the Architect and Owner require. The construction schedule shall be resource loaded for the Contractor and all subcontractors, with each resource identified by name, description, unit of measure, and calendar assignment. For each class of work included in the Contractor's schedule of values, the construction schedule shall show the percentage of completion to be obtained and the total dollar value of the work to be completed as of the first of each month until Substantial Completion. All calculations shall be on the basis of work in place, but not including the value of materials delivered but not in place.

3.10.3 Add to the end of the sub-section as follows:

The Contractor's compliance with the construction schedule is a material obligation of the Contract.

3.10.4 Add new sub-sections 3.10.4, 3.10.5, and 3.10.6 as follows: -3.10.6

§ 3.10.4 The Contractor shall monitor the progress of the Work for conformance with the requirements of the construction schedule and shall promptly advise the Owner of any delays or potential delays. The construction schedule shall be updated every month (or more frequently if requested by the Owner) to reflect actual conditions (such updates are sometimes referred to in these General Conditions as "progress reports"). In the event any progress report indicates delays in achievement of any milestone date set forth in such schedule, the Contractor shall propose in written form an affirmative plan (the "Recovery Schedule") to correct the delay, including overtime and/or additional labor, if necessary, which Recovery Schedule shall indicate the date by which the progress of the Work will comply with the construction schedule, and shall be subject to the approval of the Owner and the Architect. In no event shall any progress report or Recovery Schedule constitute an adjustment in the construction schedule, Contract Time or any milestone date unless any such adjustment is agreed to by the Owner and authorized pursuant to a Change Order.

§ 3.10.5 In the event (i) that the performance of the Work, as of a milestone date, has not progressed or reached the level of completion required by the construction schedule, and (ii) the progress of the Work is not brought back into compliance with the construction schedule on the date proposed by the Recovery Schedule, or the Contractor otherwise fails to comply with the Recovery Schedule, the Owner shall have the right to order the Contractor to take corrective measures to expedite the progress of the Work, including, without limitation, (1) supplying additional manpower, equipment, and facilities, (2) working additional shifts or overtime, (3) working additional days, and (4) other similar measures (hereinafter referred to collectively as "Corrective Measures"). Such Corrective Measures shall continue until the progress of the Work complies with the stage of completion required by the Contract Documents.

§ 3.10.6 The Contractor shall not be entitled to an adjustment in the Contract Sum in connection with Corrective Measures required by the Owner under or pursuant to Section 3.10.5. The Owner may exercise the rights furnished the Owner under or pursuant to Section 3.10.5 as frequently as reasonably necessary to ensure that the Contractor's performance of the Work complies with the milestone dates set forth in the construction schedule.

3.12.6 Add to the end of the sub-section as follows:

By approving and submitting Shop Drawings, Product Data, Samples, and similar submittals the Contractor thereby represents that the Contractor has determined and verified all dimensions, quantities, field dimensions, relations to existing work, coordination with work to be installed later, coordination with information

on previously accepted Shop Drawings, Product Data, Samples, or similar submittals and verification of compliance with all the requirements of the Contract Documents. The accuracy of all such information is the responsibility of the Contractor. In reviewing Shop Drawings, Product Data, Samples, and similar submittals the Architect shall be entitled to rely upon the Contractor's representation that such information is correct and accurate.

- 3.12.10 Add to the end of the last sentence as follows:
  - , except as provided in Section 3.2.
- 3.12.11 Add new subsection 3.12.11 as follows:

§ 3.12.11 When professional certification of materials, systems or equipment is required by the Contract Documents, the Owner shall be entitled to rely upon such certifications, and neither the Owner nor the Architect shall be expected to make an independent examination with respect to the performance of such materials, systems or equipment.

3.13 Add to the end of the section as follows:

The right of possession of the premises and the improvements made thereon by the Contractor shall remain at all times with the Owner. The Contractor's right to entry and use thereof arises solely from the permission granted by the Owner under the Contract Documents. The Owner shall not be liable to the Contractor, the Subcontractors, their employees, or anyone else with respect to the conditions of the premises, except only for a condition caused directly and solely by the negligence of the Owner.

- 3.15.1 Add "site" to the end of the second sentence.
- 3.15.2 Add to the end of the sentence as follows:

, and may deduct all costs thereof from any payment due the Contractor.

- 3.16 Insert ", Owner's representatives" after "provide the Owner".
- 3.18.1 Delete the first sentence and replace as follows:

To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, including claims, damage, loss or expense attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, including the Work, caused in whole or in part by the negligent or wrongful acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations, including those of indemnity, which would otherwise exist as to a party or person described in this section.

## ARTICLE 4 - ARCHITECT

4.1.2 In the first sentence delete ", Contractor" after "consent of the Owner".

In the second sentence insert "of the Owner" after "Consent".

- 4.1.3 Delete sub-section 4.1.3.
- 4.2.3 In the first sentence delete "reasonably" after "will keep the Owner".
- 4.2.10 Delete sub-section 4.2.10.
- 4.2.11 Add to the end of the sub-section as follows:

The parties agree that the Architect's duties under this subparagraph shall be governed by Chapter 30, Section 39P of the General Laws of the Commonwealth of Massachusetts, as amended.

4.2.12 Delete the second sentence.

## ARTICLE 5 - SUBCONTRACTORS

- 5.2.1 Delete the last sentence.
- 5.2.2 In the second sentence insert "and legally permissible" after "has made reasonable".
- 5.2.3 Delete the last two sentences and replace as follows:

No increase in the Contract Sum or Contract Time shall be allowed for such change.

5.2.4 Add to the end of the sub-section as follows:

The applicable provisions of Chapter 149, Section 44F of the General Laws of the Commonwealth of Massachusetts shall apply to filed sub-bid subcontractors.

5.4.1 In sub-heading .1 delete "Section 14.2" and replace with "Article 14".

Add new sub-heading .3 as follows:

.3 The Owner may further assign the subcontract to a successor contractor or other entity.

Delete last sentence of sub-section.

5.4.2 Delete sub-sections 5.4.2 and 5.4.3.

# ARTICLE 6 - CONSTRUCTION BY OWNER OR SEPARATE CONTRACTORS

6.1.1 At the end of the first sentence delete "including those portions related to insurance and waiver of subrogation".

In the second sentence delete "Claim" after "shall make such" and replace with "claim".

6.1.4 Delete sub-section 6.1.4 and replace as follows:

§ 6.1.4 The Owner reserves the right to enter any part of the Project site at any time to inspect the Work or to perform other work with its own forces or separate contractors, or to address any emergency situation. Such access is not to be construed to mean partial occupancy by the Owner and no claim for increase in the Contract Time or Sum will be considered unless such Owner's contractors have delayed or damaged the Contractor's Work. The Contractor shall permit the Owner to place and install as much furniture, equipment and other material during the progress of the Work as is possible before completion of the various parts of the Work and agrees that such placing and installation of equipment shall not in any way evidence the completion or acceptance of the Work or any portion of it.

- 6.2.3 Delete the last sentence.
- 6.2.5 Delete sub-section 6.2.5.

## ARTICLE 7 - CHANGES IN THE WORK

7.2.3 Add new sub-section 7.2.3 as follows:

§ 7.2.3 Upon request of the Owner or the Architect, the Contractor shall without cost to the Owner submit to the Architect, in such form as the Architect may require, an accurate written estimate of the cost of any proposed extra Work or change. The estimate shall indicate the quantity and unit cost of each item of material, and the number of hours of work and hourly rate for each class of labor, as well as a description and the amounts of all other costs chargeable under the terms of this Article. Unit labor costs for the installation of each item of material shall be shown if required by the Architect. The Contractor shall promptly revise and resubmit each estimate if the Architect determines that it is not in compliance with the requirements of this Article, or that it contains errors of fact or mathematical errors. If required by the Architect, in order to establish the exact cost of new Work added or of previously required Work omitted, the Contractor shall obtain and furnish to the Architect bona fide proposals from recognized

<sup>-5.4.3</sup> 

suppliers for furnishing any material included in such Work. Such estimates shall be furnished promptly so as to occasion no delay in the Work, and shall be furnished at the Contractor's expense. The Contractor shall state in the estimate any extension of time required for the completion of the Work if the change or extra work is ordered.

7.3.3 Delete the first sentence of the sub-section and replace as follows:

If the Construction Change Directive provides for an adjustment to the Contract Sum, and if the Contract Documents include a unit price for the work that is the subject of such directive, such unit price shall be the basis of the adjustment to the Contract Sum, unless the Owner, in its sole discretion, chooses another method. If, however, the Contract Documents do not include a unit price for such work, the adjustment shall be based on one of the following methods, as selected by the Owner:

In sub-heading .2 delete "stated in the Contract Documents or" after "Unit prices".

7.3.4 Delete sub-section 7.3.4 and replace as follows:

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that, in the opinion of the Architect, application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner, the applicable unit prices shall be equitably adjusted.

7.3.5 In the first sentence add after "the Work involved and" as follows:

, within five (5) calendar days from receipt of the Construction Change Directive,"

Insert "by written notice" after "advise the Architect".

Add to the end of the sub-section as follows:

Failure to so advise the Architect within such 5-day period (1) shall be interpreted as Contractor's agreement with the proposed method of adjustment; (2) shall constitute an irrevocable waiver of any right of the Contractor to submit a claim on account of the method of adjustment; and (3) shall cause the Construction Change Directive to be deemed and constitute a Change Order.

- 7.3.6 In the second sentence delete "recorded as" after "immediately shall be" and replace with "deemed and shall constitute".
- 7.3.7 Delete first sentence and replace as follows:

If the proposed method of adjustment in the Contract Sum is based on unit prices that are stated in the Contract Documents, such unit prices shall be the basis of any adjustment to the Contract Sum, unless the Owner has chosen another method pursuant to subparagraph 7.3.3. If the proposed method of adjustment is not based on such unit prices and the Contractor objects to the proposed method of adjustment, the Contractor must notify the Architect of such objection in writing within five (5) calendar days from Contractor's receipt of the Construction Change Directive. Failure to so object will irrevocably waive any such objections and claims on account of such method of adjustment, and the Construction Change Directive shall be deemed and shall constitute a Change Order. If the Contractor does so object, the adjustment to the Contract Sum shall be determined by the Architect on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, a reasonable allowance for overhead and profit.

In sub-heading .4 insert "and" after "and insurance," and delete ", and sales, use or similar taxes related to the Work" after "permit fees".

Delete sub-heading .5 and replaces as follows:

- .5 A reasonable allowance for overhead and profit.
- 7.3.9 Delete the end of the first sentence starting after "Directive to the Owner," and replace as follows:

amounts for such changes in the Work shall not be included in Applications for Payment. Such amounts shall only be included in an Application for Payment after the adjustment for the Construction Change Directive has been included in a Change Order signed by the Owner and the Contractor.

# ARTICLE 8 - TIME

- 8.2.2 In the first sentence delete ", except by agreement or instruction of the Owner in writing, prematurely".
- 8.2.4 Add new sub-sections 8.2.4 and 8.2.5 as follows:
- -8.2.5

§ 8.2.4 Unless specifically required by law, no payment under this Contract shall be due until the construction schedule, required by Section 3.10, and conforming to the requirements of the General Requirements has been accepted by the Architect.

§ 8.2.5 If the Architect in reviewing any Application for Payment determines that the amount of completed Work in place as certified by the Architect is less than 90% of the Work in place required by the Contractor's construction schedule or schedule of values provided for in Section 9.2, or that there have been delays to critical paths and the Contract completion date will not be met, or that, in the Owner's sole discretion, there is reasonable concern that the Work will not be Substantially Complete by the date required in the Contract Documents, the Contractor shall be required to submit a recovery schedule with a written description of the steps the Contractor intends to take to put the Project back on schedule. At the Owner's option, the Contractor shall take some or all of the following actions at no additional cost to the Owner:

- .1 Increase the number of workers on the site, in such quantities and trades as will substantially eliminate the backlog of work;
- .2 Increase the number of working hours per shift, shifts per day, working days per week, amount of construction equipment, or any combination of the foregoing, sufficiently to substantially eliminate backlog of work; or
- .3 Reschedule activities so that the completion dates initially scheduled will be met.
- 8.3.1 Insert "(except weather)" after "casualties or other causes".

Delete "pending mediation and arbitration" after "delay authorized by Owner".

Add to the end of the sub-section as follows:

, and this shall be the Contractor's sole remedy for such delay. Under no circumstances will the Contractor be entitled to an increase in the Contract Sum, or to any other damages, on account of or in connection with any delay, regardless of the cause of such delay, and Contractor agrees not to make any claim for such damages, including, but not limited, claims for damages on account of having to perform out-of-sequence work, claims for damages on account of loss of production, and claims for damages on account of hindrances or interference with the work.

- 8.3.3 Delete sub-section 8.3.3.
- 8.3.4 Add new sections 8.3.4 and 8.3.5 as follows:
- -8.3.5

§ 8.3.4 No extension of time shall be granted because of seasonal or abnormal variations in temperature, humidity or precipitation, which conditions shall be wholly at the risk of the Contractor, whether occurring within the time originally scheduled for completion or within the period of any extension granted. There shall be no increase in the Contract Sum on account of any additional costs of operations or conditions resulting therefrom.

§ 8.3.5 The Contractor hereby agrees that the Contractor shall have no claim for damages of any kind against the Owner or the Architect on account of any delay in the commencement of the Work and/or any hindrance, delay or suspension of any portion of the Work, whether such delay is caused by the Owner, the Architect, or otherwise, except as and to the extent expressly provided in G.L. c. 30, §39N. The Contractor acknowledges that the Contractor's sole remedy for any such delay and/or suspension will be an extension of time as provided in this Article.

## 8.4 Add new section 8.4 as follows:

## § 8.4 LIQUIDATED DAMAGES

§ 8.4.1 It is expressly understood and agreed, by and between the Contractor and Owner, that the time for the completion of the Work described herein is a reasonable time for the completion of same, taking into consideration the average climatic range and usual industrial and/or residential conditions prevailing in this locality. If the said Contractor shall neglect, fail or refuse to complete the Work within the times herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration for the awarding of this Contract, to pay to the Owner \$1,000.00, not as a penalty but as liquidated damages for such breach of contract, for each and every calendar day that the Contractor shall be in default after the time stipulated for completing the Work. The said amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain, and said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be deducted by the Owner from periodic payments.

## ARTICLE 9 - SCHEDULE OF VALUES

9.2 Add to the end of the section as follows:

, and shall be revised if later found by the Architect to be inaccurate. In addition, the Contractor shall submit to the Architect, at least 14 days before the first Application for Payment, a Cash Flow Schedule that shows the percentage completion to be obtained and the total dollar value of Work to be completed as of the first of each month until Substantial Completion. All calculations in the Cash Flow Schedule shall be on the basis of Work in place and shall exclude the value of materials delivered but not in place.

9.2.1 Add new sub-section 9.2.1 as follows:

§ 9.2.1 The Cash Flow Schedule shall be based on an orderly progression of the Work allowing adequate time for each operation (including adequate time for submission and review of submittals) and leading to a reasonable certainty of Substantial Completion by the date established in the Agreement. The Cash Flow Schedule will be reviewed by the Architect for compliance with the requirements of the Contract Documents. Unless specifically required by law, no payment under this Contract shall be due until the Cash Flow Schedule has been reviewed and approved by the Architect. The Architect's review of the Cash Flow Schedule shall not impose any duty on the Architect or the Owner with respect to the timing, planning, scheduling or execution of the Work. In particular if the Contractor proposes a Cash Flow Schedule indicating a date of Substantial Completion which is earlier than the Contract Time the Contractor shall not be

entitled to additional payment or compensation of any kind if for any reason the full Contract Time is required to achieve Substantial Completion of the Work.

- 9.3.1.1 Delete sub-section 9.3.1.1.
- 9.3.2 Add to the end of the sub-section as follows:

The Owner may deduct the amount of such costs from payments due the Contractor.

9.4.1 Insert at the beginning of the first sentence as follows:

Subject to the Contractor's compliance with Section 9.3 and the provisions of Section 9.6,

9.5.1 Add new sub-headings .8, .9, .10, .11, and .12 as follows:

.8 failure of the Contractor or mechanical or electrical trade subcontractors to comply with requirements of the General Requirements for maintaining record drawings. The Contractor shall check record drawings each month. Written confirmation that the record drawings are current will be required by the Architect before approval of the Contractor's monthly payment requisition;

.9 failure of the Contractor to provide required warranties under Section 9.3, claims for direct payment, or reasonable evidence indicating probable filing of such claims;

.10 costs incurred by the Owner under Section 10.2.5;

.11 failure of the Contractor to submit prerequisite documentation required by the General Requirements; or

- .12 liquidated damages due the Owner pursuant to Section 8.4.
- 9.5.3 Delete sub-section 9.5.3.
- 9.6.4 Delete "If the Contractor fails to furnish such evidence within seven days," from the beginning of the second sentence.
- 9.6.5 Delete sub-section 9.6.5.
- 9.6.7 Delete sub-section 9.6.7.
- 9.6.8 Add new sub-section 9.6.8 as follows:

§ 9.6.8 Notwithstanding the provisions of Section 9.6 all progress payments shall be made in accordance with Chapter 30, Sections 39F, 39G and 39K (as appropriate) of the General Laws of the Commonwealth of Massachusetts, as amended.

9.7 Delete section 9.7.

9.8.1 Add to the end of the sub-section as follows:

In addition, Substantial Completion for the entire Project shall be achieved only when: (1) the Owner has beneficial occupancy and use of the entire Project for all its intended uses; (2) all Project systems included in the Work are operational and acceptable to the Owner; (3) all governmental inspections for the Project have been successfully completed, all governmental approvals and related paperwork have been delivered to the Owner, and final and unconditional certificates of occupancy for the entire Project have been delivered to the Owner, (4) the only remaining Work to be performed is minor in nature and the remaining Work may reasonably be performed without having a material adverse effect on or materially interfering with the Owner's occupancy and use of the Project and (5) all prerequisites to Substantial Completion defined in the Contract Documents have been completed.

9.8.2 Add to the end of the first sentence as follows:

together with the estimated value of completing or correcting such items (the "Punchlist") and (2) the permits and certificates referenced in Section 13.5. The Architect shall have the right to modify and supplement the Punchlist, including the estimated value of completion or correction.

9.8.5 Delete sub-section 9.8.5 and replace as follows:

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor by the Architect. The certificate shall state the date of substantial completion, shall state any consequent responsibilities of the Contractor and the Owner in accordance with the Contract Documents. The Contractor shall complete and correct any incomplete and defective work within forty-five (45) calendar days from the date of Substantial Completion

9.8.6 Add new sub-section 9.8.6 as follows:

§ 9.8.6 Services provided by the Architect to conduct more than three (3) inspections of completed Work and any inspections beyond sixty (60) days after the date of substantial completion of any portion of the Work as stated in the Agreement shall be paid by the Contractor to the Owner. The Owner may deduct the cost of such services and inspections from payments due the Contractor.

9.9.1 Delete the end of the first sentence starting after "Work at any stage".

Delete the second sentence and replace as follows:

Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner has accepted in writing the

responsibilities assigned to it and the Contractor for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance.

Delete the second to last sentence.

9.10.1 Add to the end of the sub-section as follows:

By Final Completion, the Contractor shall have completed its performance of all Punchlist items, completed all balancing of mechanical and other applicable systems and all seasonal system adjustments that are reasonably necessary to proper functioning of the completed Project, delivered to the Owner all operations and maintenance manuals and completed related training for such manuals, and delivered to the Owner all required warranties and guarantees.

9.10.3 Delete sub-sections 9.10.3 and 9.10.4. -9.10.4

- 9.10.5 Insert "for payment for Work performed and of all other claims of which the payee knew or should have known at the time of final payment," after "claims that payee"
- 9.10.6 Add new sub-section 9.10.6 as follows:

§ 9.10.6 Notwithstanding anything in the Contract Documents to the contrary, final payment shall be made in accordance with the requirements of G.L.c.30,
§39K (building projects) or §39G (public works projects), as amended.

## ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

10.2.1 Add new sub-heading .4 as follows:

.4 work or property of the Owner, its tenants, or other parties at or near the Project site with the Owner's permission.

10.2.5 At the beginning and end of the first sentence:

Delete "and" after "10.2.1.2".

Insert "and 10.2.1.4" after "10.2.1.3".

Delete the remainder of the first sentence as follows:

, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor.

Add to the end of the sub-section as follows:

Where the damage or loss presents an immediate danger to the public, the Owner, in its sole discretion and at the Contractor's expense, may promptly remedy such damage or loss without prior notice to the Contractor.

10.2.9 Add new sub-sections 10.2.9, 10.2.10, 10.2.11, 10.2.12, and 10.2.13 as follows: -10.2.13

§ 10.2.9 The Contractor shall provide and maintain in good operating condition suitable and adequate fire protection equipment and services, and shall comply with all reasonable recommendations regarding fire protection made by the representatives of the fire insurance company carrying insurance on the Work or by the local fire chief or fire marshal. The area within the site limits shall be kept orderly and clean, and all combustible rubbish shall be promptly removed from the site.

§ 10.2.10 The Contractor shall at all times protect excavations, trenches, buildings and materials from rain water, groundwater, backup or leakage of sewers, drains and other piping, and from water of any other origin and shall remove promptly any accumulation of water. The Contractor shall provide and operate all pumps, piping and other equipment necessary to this end.

§ 10.2.11 The Contractor shall remove snow and ice which might result in damage or delay.

§ 10.2.12 During the progress of the Work and at all times prior to the date of Substantial Completion or occupancy of the Work by the Owner, whichever is earlier, the Contractor shall provide temporary heat, ventilation, and enclosure, adequate to permit the Work to proceed in a timely fashion, and to prevent damage to completed Work or Work in progress, or to materials stored on the premises. The use of the permanent heating and/or ventilation systems for temporary heat and/or ventilation shall be subject to the prior written approval of the Owner and Architect.

§ 10.2.13 [G.L. c.149, §44F(1)] The Contractor shall install weather protection and furnish adequate heat in the protected area from November 1 to March 31.

## 10.3.1 Delete the second sentence and replace as follows:

The Contractor shall not cause or permit any introduction onto, under, or near the Owner's property of any hazardous materials or substances as defined by any applicable law, and shall not cause of permit any release, discharge, transportation, storage, or disposal of such materials or substances onto, under, or near the Owner's property or areas near the Owner's property. If the Contractor encounters or recognizes on the site any material known or reasonably believed to be hazardous, including but not limited to asbestos or polychlorinated biphenyl (PCB), the Contractor shall immediately stop Work in the area affected and report the condition to the Owner and Architect in writing. The Contractor and the
Owner shall cooperate in implementing measures to remove or contain said material and the Contractor shall comply with all directions of the Architect in the implementation of such removal or containment.

- 10.3.2 Delete sub-sections 10.3.2, 10.3.3, and 10.3.4.
- 10.3.5 Delete the remainder of the sentence starting after "obligations under" and replace as follows:

Article 10 or for any violation of applicable law related to the Contractor's noncompliance with the provisions of this Article 10.

- 10.3.6 Delete sub-section 10.3.6.
- 10.3.7 Add new sub-section 10.3.7 as follows:

§ 10.3.7 The parties anticipate that certain hazardous substances and/or materials may be discovered at the site. When such conditions are set forth in the Contract Documents, the Contractor acknowledges that such conditions have been considered in establishing the Contract Time and Contract Sum. No extension of the Contract Time or increase in the Contract Sum shall be claimed or allowed with respect to any hazardous substances or materials located at the site which were disclosed in the Contract Documents. The Contractor shall strictly comply with all laws, regulations, rules, orders, ordinances and the like related to the excavation, storage, removal and disposal of any such hazardous substances or materials.

## ARTICLE 11 - INSURANCE AND BONDS

11.1.2 Delete sub-section 11.1.2 and replace as follows:

§ 11.1.2 The insurance required by Section 11.1.1 shall include all major divisions of coverage, and shall be on a comprehensive general basis including Premises and Operations (including X-C-U), Owner's and Contractor's Protective, Products and Completed Operations, and Owned, Non-owned, and Hired Motor Vehicles. Such insurance shall be written for not less than any limits of liability required by law or those set forth in the Contract Documents, whichever is greater.

All insurance shall be written on an occurrence basis, unless the Owner approves in writing coverage on a claims-made basis. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from date of commencement of the Work until date of final payment and any further period during which coverage is required to be maintained after final payment by the Contract Documents. The Owner shall be named an Additional Insured on all policies. Coverage for such liability insurance shall be provided by a company or companies reasonably acceptable to the Owner and authorized to do business in Massachusetts. Contractor shall furnish to Owner written confirmation as to the insurance carrier's most current financial ratings prior to commencing work.

11.1.3 Add to the end of the sub-section as follows:

These certificates shall set forth evidence of all coverage required by Sections 11.1.1 and 11.1.2. The Contractor shall furnish to the Owner copies of any endorsements that are subsequently issued amending limits of coverage.

11.1.3.1 Add new sub-sections 11.1.3.1 and 11.1.3.2 as follows: -11.1.3.2

> 11.1.3.1 The Contractor shall be responsible for having acceptable insurance coverage provided by or on behalf of all Subcontractors, with such insurance to be similar to that required of the Contractor under the Agreement and these General Conditions. The Contractor shall not allow any Subcontractor to commence Work on the Project prior to the Contractor's receipt of certificates of insurance that are acceptable in form and limits to the Owner; the Owner shall have no obligation to pay the Contractor for any Work performed by a Subcontractor who has not supplied acceptable insurance certificates prior to starting its Work. The Owner shall be named an additional insured on all such certificates.

> 11.1.3.2 All insurance policies shall contain provisions or endorsements necessary to assure coverage of claims by one insured against another. All required insurance policies are to be endorsed to state that the Contractor's policies shall be primary to all other insurance available to the Owner and other specified additional insureds for liability arising out of or resulting from the Contractor's operations under the Contract, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them or by anyone for whose acts any of them may be liable.

- 11.1.4 Insert "the Owner's Project Manager," after "(1) the Owner,".
- 11.1.5 Add new sub-section 11.1.5 as follows:
  - § 11.1.5 In no case shall the limits of liability be less than the following:
  - 1. Contractor's Liability Insurance
  - Workers Compensation: a.
    - State: Statutory. 1.
    - 2. **Employer Liability:** 
      - \$1.000,000.00 Bodily Injury by Accident \$1,000,000.00 Bodily Injury by Disease - policy limit
      - \$1,000,000.00 Bodily Injury by Disease each
    - 3. \$4,000,000.00 Umbrella Liability - all limits

- b. Comprehensive General Liability (including Premises-Operations; Independent Contractor's Protective; Products and Completed Operations; Broad Form Property Damage):
  - Bodily Injury: \$1,000,000.00 Each Occurrence. \$2,000,000.00 Aggregate, Products and Completed \$2,000,000.00 Operations.
  - Property Damage Liability (including coverage for XCU hazards).
     \$1,000,000.00 Each Occurrence.
     \$2,000,000.00 Aggregate.
  - 3. Products and Completed Operations insurance shall be maintained for a minimum period of 2 years after final payment and Contractor shall continue to provide evidence of such coverage to Owner on an annual basis during the aforementioned.
  - 4. Contractual Liability (Hold Harmless Coverage):
    \$1,000,000.00 Bodily Injury Each Occurrence.
    \$1,000,000.00 Property Damage Each Occurrence.
    \$2,000,000.00 Property Damage Aggregate
  - 5. Personal Injury, with Employment Exclusion deleted: \$2,000,000.00 All Limits.
- c. Comprehensive Automobile Liability (owned, non-owned, hired):
  - Bodily Injury: \$1,000,000.00 Each Person. \$1,000,000.00 Each Accident.
  - 2. Property Damage \$1,000,000.00 Each Accident.
  - 3. Umbrella Liability Coverage: \$4,000,000.00 All Limits.

The commercial general liability policy shall be endorsed to provide that the general aggregate shall apply to this Project only.

- 11.2 Delete section 11.2 and replace as follows:
  - § 11.2 OWNER'S LIABILITY INSURANCE

The **<u>OWNER</u>** shall procure and pay for an Owner's policy of Owner's protective liability insurance insuring the Owner and its officers, employees and agents against claims which may arise from operations under the Contract or relating thereto.

11.3.1 Delete sub-section 11.3.1 and replace as follows:

The **<u>OWNER</u>** shall purchase and maintain builders' risk property insurance in accordance with all requirements specified in this Paragraph 11.3.

11.3.1.1 Delete sub-sections 11.3.1.1, 11.3.1.2, 11.3.1.3, 11.3.1.4, and 11.3.1.5. -11.3.1.5

11.3.2 Delete sub-sections 11.3.2, 11.3.3, 11.3.4, 11.3.5, 11.3.6, and 11.3.7. -11.3.7

11.3.8 Delete the first sentence.

11.3.9 Delete sub-sections 11.3.9 and 11.3.10. -11.3.10

11.3.11 Add new sub-section 11.3.11 as follows:

§ 11.3.11 The Owner shall have the power to adjust and settle with its insurers any loss for which it has obtained insurance.

Upon the occurrence of an insured loss, the Owner and the Contractor shall cooperate with each other and with each other's insurer in the submission of claims and related information and the distribution of any insurance proceeds. If after such a loss no other special agreement is made, replacement of damaged work shall be covered by an appropriate change order.

11.4.1 Delete "Owner shall have the right to require the".

Delete "to" after "Contractor" and replace with "shall".

Delete the end of the sentence starting after "obligations arising thereunder" and replace as follows:

, each in the amount of 100% of the Contract Price, and each by a surety company qualified to do business under the laws of the Commonwealth of Massachusetts and acceptable to the Owner. The attorney-in-fact who signs the bonds on behalf of the surety, must affix to each bond a certified and current copy of the power of attorney. The Performance and Payment Bonds shall be written in a form satisfactory to the Owner.

## ARTICLE 12 - UNCOVERING AND CORRECTION OF WORK

12.2.1 Add to the end of the sub-section as follows:

The Contractor shall bear the cost of any loss or damages to the Owner resulting from such failure or defect.

12.2.2.1 Delete the third sentence.

Add to the end of the sub-section as follows:

If the correction or repair of any of the Work is required to avoid impacts to the maintenance, operation or safety of any portion of the Project site or the Owner's property, the Owner reserves the right to undertake the repairs prior to notifying the Contractor or without waiting for the Contractor to respond, without waiving the Owner's rights under the warranties and the Owner's right to correct work under Section 2.4.

## ARTICLE 13 - MISCELLANEOUS PROVISIONS

- 13.1 Delete the end of the sentence following the words "by the law of the", and insert the words "Commonwealth of Massachusetts" at the end of the sentence as revised.
- 13.2.1 In the second sentence delete "Except as provided in Section 13.2.2".
- 13.2.2 Delete sub-section 13.2.2.
- 13.5.4 Delete sub-section 13.5.4 and replace as follows:

§ 13.5.4 The Contractor shall obtain and deliver promptly to the Architect any occupancy permit and any certificates of final inspection of any part of the Contractor's work and operating permits for any mechanical apparatus, such as elevators, escalators, boilers, air compressors, etc., which may be required by law to permit full use and occupancy of the premises by the Owner. Receipt of such permits or certificates by the Architect shall be a condition precedent to Substantial Completion of the Work.

- 13.7 Delete section 13.7.
- 13.7.1 Add new sub-section 13.7.1 as follows:

§ 13.7.1 It is expressly agreed that the obligations of the Contractor hereunder arise out of contractual duties, and that the failure of the Contractor to comply with the requirements of the Contract Documents shall constitute a breach of contract, not a tort, for the purpose of applicable statutes of limitation and repose. Any cause of action which the Owner may have on account of such failure shall be deemed to accrue only when the Owner has obtained actual knowledge of such failure, not before.

13.8 Add new section 13.8 as follows:

## § 13.8 LIMITATION OF LIABILITY

§ 13.8.1 The Owner shall be liable, if ever, only to the extent of its interest in the Project; and no officer, director, partner, agent or employee of the Owner shall

ever be personally or individually liable with respect to this Contract or the Work. Each Subcontract shall include the foregoing limitation, which shall be effective if the Owner ever succeeds to the Contractor's rights and obligations under a Subcontract.

13.9 Add new section 13.9 as follows:

§ 13.9 DEFENSE OF SUITS

§ 13.9.1 The Contractor shall be responsible for, shall defend and pay all costs, attorneys' fees and liabilities both direct and indirect as a result of suits arising out of this Contract.

§ 13.9.2 Neither final acceptance nor occupation of the premises by the Owner shall relieve the Contractor of responsibility for all claims for labor, materials, and equipment arising out of this Contract.

§ 13.9.3 The Contractor shall indemnify and hold harmless the Owner and the Architect and their agents and employees from and against all claims, damages, losses, and expenses including attorneys' fees arising out of or resulting from the performance of the work.

## ACTICLE 14 - TERMINATION OR SUSPENSION OF THE CONTRACT

14.1.1 Insert in the beginning of the first sentence as follows:

Provided that the Contractor is not in breach of any of its obligations under the Contract,

Delete sub-headings .1, .2, and .4.

- 14.1.2 Delete sub-section 14.1.2.
- 14.1.3 Delete sub-section 14.1.3 and replace as follows:

§ 14.1.3 If one of the above reasons exists, the Contractor may, upon seven days written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work properly executed and for all materials or equipment not incorporated in the Work, but delivered and suitably stored at the site. The payment for materials or equipment stored at the site shall be conditioned upon submission by the Contractor of bills of sale or such other evidence as is satisfactory to the Owner to establish the Owner's title to such material or equipment or otherwise protect the Owner's interest.

14.1.4 Delete sub-section 14.1.4.

14.2.1 Delete "repeatedly" from the beginning of sub-headings .1 and .3.

Insert new sub-headings .4 and .5 after sub-heading .3 as follows:

.4 becomes the subject of a voluntary petition in bankruptcy or any voluntary proceeding related to insolvency, receivership, liquidation or comparable proceeding or any assignment for the benefit of creditors or becomes the subject of an involuntary petition in bankruptcy or any involuntary proceeding related to insolvency, receivership, liquidation or comparable proceeding or any assignment for the benefit of creditors.

.5 submits three successive Applications for Payment, each of which indicate that the actual Work completed is less than 90 percent of the values estimated in the construction schedule (submitted by the Contractor pursuant to Section 3.10.1) to be completed by the respective dates.

14.2.2 In the first sentence delete ",upon certification by the Initial Decision Maker that sufficient cause exists to justify such action,".

Delete the second sentence of sub-heading .3.

14.2.4 In the first sentence:

Insert "all costs and losses incurred by the Owner on account of the Contractor's failure to comply with the Contract Documents and" after "the Work, including".

Insert "and Owner's Project Manager's" after "for the Architect's".

Delete the last sentence of the sub-section and replace as follows:

The Owner shall be entitled to hold all amounts due the Contractor at the date of termination until all of the Owner's damages have been established, and to apply such amounts to such damages.

14.3.2 Insert ", subject to compliance with the conditions of Section 8.3." at the end of the first sentence.

Delete the second sentence.

- 14.4.2 In sub-heading .3 delete "and" after "all existing contracts" and replace with "except for subcontracts, if any, that Owner elects to assume, terminate all"
- 14.4.3 Delete sub-section 14.4.3 and replace as follows:

§ 14.4.3 In the event that the Contract is terminated for the Owner's convenience, the Contractor shall be reimbursed in accordance with the Contract Documents for all Work properly performed up to the termination date, and for all materials or equipment not incorporated in the Work, but delivered and suitably stored at the site. Payment for materials or equipment stored at the site shall be conditioned upon submission by the Contractor of bills of sale or such other evidence as is satisfactory to the Owner to establish the Owner's title to such material or equipment or otherwise protect the Owner's interest. The Contractor shall not be entitled to payment for overhead and profit on the Work not executed.

## ARTICLE 15 - CLAIMS AND DISPUTES

15.1.1 Delete sub-section 15.1.1 and replace as follows:

## § 15.1.1 DEFINITION

The word "Claim" shall mean a written demand by the Contractor for an increase in the Contract Time or the Contract Sum. The Contractor is responsible for substantiating its Claims. The word "Claim" shall not include claims by the Owner. The Owner may withhold from the Contractor the value of any claims against the Contractor in accordance with Massachusetts General Laws, including, but not limited to, Sections 39G and 39K of Chapter 30.

15.1.2 Delete sub-section 15.1.2 and replace as follows:

## § 15.1.2 NOTICE OF CLAIMS

Contractor must initiate Claims within fourteen (14) calendar days after occurrence of the event giving rise to such Claim by written notice to the Architect and the Owner. Such written notice must (1) be signed by the Contractor; (2) conspicuously identify on its face that the notice serves as a notice of claim; (3) explain in sufficient detail the basis of the Claim; (4) identify the date of the event giving rise to such Claim; and (5) state the exact dollar amount of the increase in the Contract Sum being requested, if any, and the number of days extension to the Contract Time sought, if any.

15.1.3 Delete "Section 9.7 and" after "as provided in".

Delete the final sentence.

- 15.1.5.1 In the second sentence delete "of cost and" after "include an estimate".
- 15.1.5.2 Delete sub-section 15.1.5.2.
- 15.1.6 Delete sub-section 15.1.6.
- 15.2.1 In the third sentence:

Delete "mediation" after "condition precedent to" and replace with "litigation".

Delete the end of the sentence beginning after "payment is due".

15.2.2 Delete sub-section 15.2.2 and replace as follows:

§ 15.2.2 The Initial Decision Maker will review Claims and within 30 days of the receipt of the Claim take one or more of the following actions: (1) request additional supporting data from the Contractor; (2) notify the Contractor that the Initial Decision Maker requires additional time to resolve the Claim; and/or (3) reject the Claim in whole or in part.

- 15.2.3 Delete the last sentence.
- 15.2.4 Delete sub-section 15.2.4 and replace as follows:

§ 15.2.4 If the Architect requests the Contractor to furnish additional supporting data in connection with a Claim, the Contractor shall provide such data within ten (10) calendar days of such request. If the Contractor is of the opinion that it is impossible to provide such data within such time, the Contractor shall notify the Architect of such opinion in writing within such ten-day period. If the Architect determines that it is impossible for such data to be provided within such ten-day period through no fault of the Contractor, the Contractor shall provide such data within 30 calendar days of the Architect's request, unless the Architect fixes another date, in which case the data must be submitted by the date so fixed. Failure of the Contractor to provide such data within the time prescribed herein shall result in the irrevocable waiver of the Claim.

15.2.5 Delete the last sentence and replace as follows:

The rejection of a claim by the Architect and any decisions of the Owner with respect to the same, and the interpretations by the Architect of the plans, drawings and specifications, shall be final and binding on the Contractor in accordance with Section 39J of Chapter 30 of the Massachusetts General Laws.

15.2.6 Delete sub-section 15.2.6 in is entirety.

15.2.7 Delete the capitalized word, "Claim," and replace with lower-case word, "claim," in the first and second sentences.

15.2.8 Delete sub-section 15.2.8.

15.3 Delete sections 15.3 and 15.4 in their entirety. -15.4

## END OF SUPPLEMENTARY GENERAL CONDITIONS

## **PERFORMANCE BOND**

### KNOW ALL MEN BY THESE PRESENTS: That we \_\_\_\_\_

(Name of Contractor)

a \_\_\_\_\_\_ hereinafter called "Principal" and (Corporation, Partnership, Joint Venture or Individual)

\_\_\_\_\_\_\_of \_\_\_\_\_\_, State of \_\_\_\_\_\_ (Surety) (City)

\_\_\_\_\_\_hereinafter called the "Surety" and licensed by the State Division of Insurance to do business under the laws of the Commonwealth of Massachusetts, are held and firmly bound to the Town of Carver, Massachusetts, hereinafter called "Owner", in the penal sum of \_\_\_\_\_\_ Dollars (\$\_\_\_\_\_) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION is such that whereas the Principal has entered into a certain contract with the Owner (the "Construction Contract"), dated the \_\_\_\_\_\_ day of \_\_\_\_\_\_, 2019, for the construction described as follows:

NOW, THEREFORE, if the Principal shall well, truly and faithfully perform its duties, all the undertakings, covenants, terms, conditions, and agreements of the Construction Contract during the original term thereof, and any extensions thereof which may be granted by the Owner, with or without notice to the Surety, and if he shall satisfy all claims and demands incurred under the Construction Contract, and shall fully indemnify and save harmless the Owner from all costs and damages which it may suffer by reason of failure to do so, and shall reimburse and repay the Owner all outlay and expense which the Owner may incur in making good any default, then this obligation shall be void; otherwise, this obligation shall remain in full force and effect.

PROVIDED, FURTHER, that the Surety's obligation under this Bond shall arise after (1) the Owner has declared the Principal in default of the Construction Contract or (2) has declared that the Principal has failed, or is otherwise unable or unwilling, to execute the work consistent with, and in conformance to, the Construction Contract (collectively referred to as a "Contractor Default"). The determination of a Contractor Default shall be made solely by the Owner.

When the Surety's obligation under this Bond arises, the Surety, at its sole expense and at the consent and election of the Owner, shall immediately take one of following steps: (1) arrange for the Principal to perform and complete the work of the Construction Contract; (2) arrange for a contractor other than the Principal to perform and complete the work of the Construction Contract; (3) reimburse the Owner, in a manner and at such time as the Owner shall decide, for all costs and expenses incurred by the Owner in performing and completing the work of the Construction Contract.

If the Surety does not proceed as provided in this Bond with due diligence and all deliberate speed, the Surety shall be deemed to be in default of this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner.

After the Surety's obligation under this Bond arises, the Surety is obligated, to the limit of the amounts of this Bond, for (1) the correction of defective work and completion of the Construction Contract; (2) additional design, professional services, and legal costs, including attorney's fees, resulting from the Contractor Default or from the default of the Surety under this Bond; (3) any additional work beyond the Construction Contract made necessary by the Contractor Default or default of the Surety under this Bond; and (4) liquidated damages as provided in the Construction Contract, or if none are so specified, actual and foreseeable consequential damages resulting from the Contractor Default or default of the Surety under this Bond.

Any proceeding, legal or equitable, under this Bond shall be instituted in any court of competent jurisdiction in the Commonwealth of Massachusetts.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Construction Contract or to the work to be performed thereunder or the specifications accompanying the same shall in any way affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Construction Contract or to the work or to the specifications.

IN WITNESS WHEREOF, this instrument is executed in \_\_\_\_\_() counterparts, each one of which shall be deemed an original, this the \_\_\_\_\_ day of \_\_\_\_\_, 2019.

By

\_\_\_\_\_ (SEAL)

ATTEST:

Principal

(Principal Secretary)

(Address-Zip Code)

Witness as to Principal

(Address-Zip Code)

-	Surety
_ By _	
	(Attorney-in-Fact)
-	
-	(Address Zin Code)
(SEAL)	(Address-Zip Code)
_	
_	
	- By _ - - - (SEAL)

NOTE: Date of Bond must not be prior to date of Contract. If Contractor is a Partnership, all partners should execute Bond.

180484

# FORM OF PAYMENT BOND

## KNOW ALL MEN BY THESE PRESENTS:

That we,	,	as
Principal and		as Surety, are held and firmly bound unto the
		as Obligee, in the sum
of	dollars (\$	_) to be paid to the Obligee, for which payments,
well and truly to be	e made, we bind ourselve	s, our respective heirs, executors, administrators,
successors and assi	igns, jointly and severally	y, firmly by these presents.
WHEREAS, the sa	id Principal has made a c	contract with the Obligee, bearing the date of
	, 2019, for the cons	struction of New Facility for the Carver Police
Department, Carve	<u>er, MA</u> .	
extensions of time, the surety of such the hereby waived the to, provisions of M Section 29, as ame become null and vol IN WITNESS WH	changes, or additions to nodifications, alterations foregoing to include any lassachusetts General Law nded and Federal Regula oid: otherwise it shall ren EREOF, the Principal an	<ul> <li>said contract that may hereafter be made, notice to , extensions of time, changes, or additions being other purposes or items set out in, and to be subject ws, Chapter 30, Section 39A, and Chapter 149, tion 24 CFR 85.36(h), then this obligation shall hain in full force and virtue.</li> <li>d Surety have hereunto set their hands and seals this</li> </ul>
day	/ of	, 2019.
PRINCIPAL		SURETY
	(Title)	(Attorney-in-fact)
Seal:		Seal:
Attest:		Attest:



CHARLES D. BAKER Governor

KARYN E. POLITO Lt. Governor

## THE COMMONWEALTH OF MASSACHUSETTS EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT DEPARTMENT OF LABOR STANDARDS

## **Prevailing Wage Rates**

As determined by the Director under the provisions of the Massachusetts General Laws, Chapter 149, Sections 26 to 27H ROSALIN ACOSTA Secretary WILLIAM D MCKINNEY Director

Awarding Authority:	Town of Carver
<b>Contract Number:</b>	City/Town: CARVER
Description of Work:	New Police Facility Work consists of site development, site improvements, and the construction of a new, one-story, slab-on-grade, police facility, separate Storage Outbuilding & related improvements.
Job Location:	3 Center Street

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

• This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the "Wage Request Number" on all pages of this schedule.

• An Awarding Authority must request an updated wage schedule from the Department of Labor Standards ("DLS") if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.

• The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.

• All apprentices working on the project are required to be registered with the Massachusetts Department of Labor Standards, Division of Apprentice Standards (DLS/DAS). Apprentice must keep his/her apprentice identification card on his/her person during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. Any apprentice not registered with DLS/DAS regardless of whether or not they are registered with any other federal, state, local, or private agency must be paid the journeyworker's rate for the trade.

• The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule. Awarding authorities are required to request these updates no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. Contractors are required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The annual update requirement is not applicable to 27F "rental of equipment" contracts.

• Every contractor or subcontractor which performs construction work on the project is required to submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee's name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. A sample of a payroll reporting form may be obtained at http://www.mass.gov/dols/pw.

• Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.

• Employees not receiving the prevailing wage rate set forth on the wage schedule may report the violation to the Fair Labor Division of the office of the Attorney General at (617) 727-3465.

• Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemplovment	Total Rate
Construction						
(2 AXLE) DRIVER - EQUIPMENT	08/01/2019	\$34.25	\$12.41	\$12.70	\$0.00	\$59.36
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/01/2019	\$34.25	\$12.41	\$13.72	\$0.00	\$60.38
	06/01/2020	\$35.15	\$12.41	\$13.72	\$0.00	\$61.28
	08/01/2020	\$35.15	\$12.91	\$13.72	\$0.00	\$61.78
	12/01/2020	\$35.15	\$12.91	\$14.82	\$0.00	\$62.88
	06/01/2021	\$35.95	\$12.91	\$14.82	\$0.00	\$63.68
	08/01/2021	\$35.95	\$13.41	\$14.82	\$0.00	\$64.18
	12/01/2021	\$35.95	\$13.41	\$16.01	\$0.00	\$65.37
(3 AXLE) DRIVER - EQUIPMENT	08/01/2019	\$34.32	\$12.41	\$12.70	\$0.00	\$59.43
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/01/2019	\$34.32	\$12.41	\$13.72	\$0.00	\$60.45
	06/01/2020	\$35.22	\$12.41	\$13.72	\$0.00	\$61.35
	08/01/2020	\$35.22	\$12.91	\$13.72	\$0.00	\$61.85
	12/01/2020	\$35.22	\$12.91	\$14.82	\$0.00	\$62.95
	06/01/2021	\$36.02	\$12.91	\$14.82	\$0.00	\$63.75
	08/01/2021	\$36.02	\$13.41	\$14.82	\$0.00	\$64.25
	12/01/2021	\$36.02	\$13.41	\$16.01	\$0.00	\$65.44
(4 & 5 AXLE) DRIVER - EQUIPMENT	08/01/2019	\$34.44	\$12.41	\$12.70	\$0.00	\$59.55
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/01/2019	\$34.44	\$12.41	\$13.72	\$0.00	\$60.57
	06/01/2020	\$35.34	\$12.41	\$13.72	\$0.00	\$61.47
	08/01/2020	\$35.34	\$12.91	\$13.72	\$0.00	\$61.97
	12/01/2020	\$35.34	\$12.91	\$14.82	\$0.00	\$63.07
	06/01/2021	\$36.14	\$12.91	\$14.82	\$0.00	\$63.87
	08/01/2021	\$36.14	\$13.41	\$14.82	\$0.00	\$64.37
	12/01/2021	\$36.14	\$13.41	\$16.01	\$0.00	\$65.56
ADS/SUBMERSIBLE PILOT	08/01/2019	\$102.78	\$9.90	\$21.15	\$0.00	\$133.83
PILE DRIVER LOCAL 56 (ZONE 1)						
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR LABORERS - ZONE 2	06/01/2019	\$34.70	\$7.85	\$14.88	\$0.00	\$57.43
	12/01/2019	\$35.56	\$7.85	\$14.88	\$0.00	\$58.29
	06/01/2020	\$36.45	\$7.85	\$14.88	\$0.00	\$59.18
	12/01/2020	\$37.34	\$7.85	\$14.88	\$0.00	\$60.07
	06/01/2021	\$38.26	\$7.85	\$14.88	\$0.00	\$60.99
For approximation rates and "Approximation I ADODED"	12/01/2021	\$39.17	\$7.85	\$14.88	\$0.00	\$61.90
ASRESTOS REMOVER - DIDE / MECH FOLIIDT	0.6.101.1001.0	<b>#2</b> < 00	¢10.50	<b> </b>	¢0.00	
HEAT & FROST INSULATORS LOCAL 6 (BOSTON)	06/01/2019	\$36.00	\$12.50	\$8.85 ¢0.05	\$0.00	\$57.35
	12/01/2019	\$37.00	\$12.50	\$8.85 ¢0.05	\$0.00	\$58.35
	06/01/2020	\$38.00	\$12.50	\$8.85	\$0.00	\$59.35
	12/01/2020	\$39.00	\$12.50	\$8.85	\$0.00	\$60.35
ASPHALI KAKEK LABORERS - ZONE 2	06/01/2019	\$34.20	\$7.85	\$14.88	\$0.00	\$56.93
	12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
	06/01/2020	\$35.95	\$7.85	\$14.88	\$0.00	\$58.68
	12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.57
	06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
	12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE	06/01/2019	\$48.18	\$12.00	\$15.60	\$0.00	\$75.78
OPERATING ENGINEERS LOCAL 4	12/01/2019	\$49.33	\$12.00	\$15.60	\$0.00	\$76.93
	06/01/2020	\$50.43	\$12.00	\$15.60	\$0.00	\$78.03
	12/01/2020	\$51.58	\$12.00	\$15.60	\$0.00	\$79.18
	06/01/2021	\$52.68	\$12.00	\$15.60	\$0.00	\$80.28
	12/01/2021	\$53.83	\$12.00	\$15.60	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BACKHOE/FRONT-END LOADER	06/01/2019	\$48.18	\$12.00	\$15.60	\$0.00	\$75.78
OF EKATING ENGINEEKS LOCAL 4	12/01/2019	\$49.33	\$12.00	\$15.60	\$0.00	\$76.93
	06/01/2020	\$50.43	\$12.00	\$15.60	\$0.00	\$78.03
	12/01/2020	\$51.58	\$12.00	\$15.60	\$0.00	\$79.18
	06/01/2021	\$52.68	\$12.00	\$15.60	\$0.00	\$80.28
	12/01/2021	\$53.83	\$12.00	\$15.60	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER	06/01/2019	\$34.20	\$7.85	\$14.88	\$0.00	\$56.93
LABORERS - ZONE 2	12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
	06/01/2020	\$35.95	\$7.85	\$14.88	\$0.00	\$58.68
	12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.57
	06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
	12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER	06/01/2019	\$34.70	\$7.85	\$14.88	\$0.00	\$57.43
	12/01/2019	\$35.56	\$7.85	\$14.88	\$0.00	\$58.29
	06/01/2020	\$36.45	\$7.85	\$14.88	\$0.00	\$59.18
	12/01/2020	\$37.34	\$7.85	\$14.88	\$0.00	\$60.07
	06/01/2021	\$38.26	\$7.85	\$14.88	\$0.00	\$60.99
	12/01/2021	\$39.17	\$7.85	\$14.88	\$0.00	\$61.90
For apprentice rates see "Apprentice- LABORER"						
BOILER MAKER ROLERMAKERS LOCAL 29	01/01/2019	\$44.71	\$7.07	\$17.72	\$0.00	\$69.50
DOILDANIMERO LOCAL 27	01/01/2020	\$46.10	\$7.07	\$17.98	\$0.00	\$71.15

Effecti	<b>ve Date -</b> 01/01/2019				Supplemental		
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	65	\$29.06	\$7.07	\$11.52	\$0.00	\$47.65	
2	65	\$29.06	\$7.07	\$11.52	\$0.00	\$47.65	
3	70	\$31.30	\$7.07	\$12.40	\$0.00	\$50.77	
4	75	\$33.53	\$7.07	\$13.30	\$0.00	\$53.90	
5	80	\$35.77	\$7.07	\$14.18	\$0.00	\$57.02	
6	85	\$38.00	\$7.07	\$15.07	\$0.00	\$60.14	
7	90	\$40.24	\$7.07	\$15.95	\$0.00	\$63.26	
8	95	\$42.47	\$7.07	\$16.84	\$0.00	\$66.38	

## Apprentice - BOILERMAKER - Local 29

### **Effective Date -** 01/01/2020

Effect	ive Date - 01/01/2020				Supplemental		
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Tot	tal Rate
1	65	\$29.97	\$7.07	\$11.69	\$0.00		\$48.73
2	65	\$29.97	\$7.07	\$11.69	\$0.00		\$48.73
3	70	\$32.27	\$7.07	\$12.59	\$0.00		\$51.93
4	75	\$34.58	\$7.07	\$13.49	\$0.00		\$55.14
5	80	\$36.88	\$7.07	\$14.38	\$0.00		\$58.33
6	85	\$39.19	\$7.07	\$15.29	\$0.00		\$61.55
7	90	\$41.49	\$7.07	\$16.18	\$0.00		\$64.74
8	95	\$43.80	\$7.07	\$17.09	\$0.00		\$67.96
Notes	·	·					
 Appre	entice to Journeyworker Ratio:1:4						
BRICK/STONE/ARTII	FICIAL MASONRY (INCL. MASO	NRY 08/01/2019	\$54.40	\$10.75	\$21.30	\$0.00	\$86.45
WATERPROOFING)	UINCY)	02/01/2020	\$55.04	\$10.75	\$21.30	\$0.00	\$87.09
	/	08/01/2020	\$56.39	\$10.75	\$21.45	\$0.00	\$88.59
		02/01/2021	\$57.03	\$10.75	\$21.45	\$0.00	\$89.23
		08/01/2021	\$58.43	\$10.75	\$21.61	\$0.00	\$90.79

02/01/2022

\$59.02

\$10.75

\$21.61

\$0.00

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\$91.38

	Effecti	ve Date -	08/01/2019				Supplemental		
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	50		\$27.20	\$10.75	\$21.30	\$0.00	\$59.25	
	2	60		\$32.64	\$10.75	\$21.30	\$0.00	\$64.69	
	3	70		\$38.08	\$10.75	\$21.30	\$0.00	\$70.13	
	4	80		\$43.52	\$10.75	\$21.30	\$0.00	\$75.57	
	5	90		\$48.96	\$10.75	\$21.30	\$0.00	\$81.01	
	Effecti	ve Date -	02/01/2020				Supplemental		
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	50		\$27.52	\$10.75	\$21.30	\$0.00	\$59.57	
	2	60		\$33.02	\$10.75	\$21.30	\$0.00	\$65.07	
	3	70		\$38.53	\$10.75	\$21.30	\$0.00	\$70.58	
	4	80		\$44.03	\$10.75	\$21.30	\$0.00	\$76.08	
	5	90		\$49.54	\$10.75	\$21.30	\$0.00	\$81.59	
	Notes:								
	Appre	ntice to Jou	urneyworker Ratio:1:5						
BULLDOZER/GRADER/SCRAPER		06/01/2019	9 \$47.	69 \$12.00	\$15.60	\$0.00	\$75.29		
OPERATING ENGL	VEERS LO	JCAL 4		12/01/2019	<b>\$</b> 48.	83 \$12.00	\$15.60	\$0.00	\$76.43
				06/01/2020	\$49.	91 \$12.00	\$15.60	\$0.00	\$77.51
				12/01/2020	\$51.	05 \$12.00	\$15.60	\$0.00	\$78.65
				06/01/202	\$52.	14 \$12.00	\$15.60	\$0.00	\$79.74
				12/01/202	\$53.	28 \$12.00	\$15.60	\$0.00	\$80.88
For apprentice	rates see "	Apprentice- C	OPERATING ENGINEERS"						
LABORERS - FOUN	NDERP IDATION	INNING B AND MARINI	E E E E E E E E E E E E E E E E E E E	06/01/2019	9 \$40.	25 \$7.85	\$16.05	\$0.00	\$64.15
				12/01/2019	9 \$41.	25 \$7.85	\$16.05	\$0.00	\$65.15
				06/01/2020	) \$42.5	24 \$7.85	\$16.05	\$0.00	\$66.14
				12/01/2020	) \$43.	22 \$7.85	\$16.05	\$0.00	\$67.12
				06/01/2021	\$44.	24 \$7.85	\$16.05	\$0.00	\$68.14
For apprentice	rates see "	Apprentice- L	ABORER"	12/01/2021	\$45.	25 \$7.85	\$16.05	\$0.00	\$69.15
CAISSON & UN	NDERP	INNING L	ABORER	06/01/2019	\$39.	10 \$7.85	\$16.05	\$0.00	\$63.00
LABOKEKS - FOUN	DATION	AND MAKINI	2	12/01/2019	<b>9</b> \$40.	10 \$7.85	\$16.05	\$0.00	\$64.00
				06/01/2020	\$41.	09 \$7.85	\$16.05	\$0.00	\$64.99
				12/01/2020	\$42.	07 \$7.85	\$16.05	\$0.00	\$65.97
				06/01/202	\$43.	09 \$7.85	\$16.05	\$0.00	\$66.99
				12/01/202	\$44.	10 \$7.85	\$16.05	\$0.00	\$68.00
For apprentice	rates see "	Apprentice- L	ABORER"						

#### Apprentice - BRICK/PLASTER/CEMENT MASON - Local 3 Quincy Effective Date - 08/01/2019

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CAISSON & UNDERPINNING TOP MAN	06/01/2019	\$39.10	\$7.85	\$16.05	\$0.00	\$63.00
LABORERS - FOUNDATION AND MARINE	12/01/2019	\$40.10	\$7.85	\$16.05	\$0.00	\$64.00
	06/01/2020	\$41.09	\$7.85	\$16.05	\$0.00	\$64.99
	12/01/2020	\$42.07	\$7.85	\$16.05	\$0.00	\$65.97
	06/01/2021	\$43.09	\$7.85	\$16.05	\$0.00	\$66.99
	12/01/2021	\$44.10	\$7.85	\$16.05	\$0.00	\$68.00
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR	06/01/2019	\$34.20	\$7.85	\$14.88	\$0.00	\$56.93
LABORERS - ZONE 2	12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
	06/01/2020	\$35.95	\$7.85	\$14.88	\$0.00	\$58.68
	12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.57
	06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
	12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER"						
CARPENTER	09/01/2019	\$41.90	\$9.40	\$18.95	\$0.00	\$70.25
CARPENTERS -ZONE 2 (Eastern Massachusetts)	03/01/2020	\$42.50	\$9.40	\$18.95	\$0.00	\$70.85
	09/01/2020	\$43.15	\$9.40	\$18.95	\$0.00	\$71.50
	03/01/2021	\$43.75	\$9.40	\$18.95	\$0.00	\$72.10
	09/01/2021	\$44.40	\$9.40	\$18.95	\$0.00	\$72.75
	03/01/2022	\$45.00	\$9.40	\$18.95	\$0.00	\$73.35
	09/01/2022	\$45.65	\$9.40	\$18.95	\$0.00	\$74.00
	03/01/2023	\$46.25	\$9.40	\$18.95	\$0.00	\$74.60

Effectiv	ve Date - 0	09/01/2019				Supplemental	
Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	50		\$20.95	\$9.40	\$1.73	\$0.00	\$32.08
2	60		\$25.14	\$9.40	\$1.73	\$0.00	\$36.27
3	70		\$29.33	\$9.40	\$13.76	\$0.00	\$52.49
4	75		\$31.43	\$9.40	\$13.76	\$0.00	\$54.59
5	80		\$33.52	\$9.40	\$15.49	\$0.00	\$58.41
6	80		\$33.52	\$9.40	\$15.49	\$0.00	\$58.41
7	90		\$37.71	\$9.40	\$17.22	\$0.00	\$64.33
8	90		\$37.71	\$9.40	\$17.22	\$0.00	\$64.33

## Apprentice - CARPENTER - Zone 2 Eastern MA

### **Effective Date -** 03/01/2020

	Effect	ive Date - 03/01/2020	)			Supplemental			
	Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Tota	al Rate	
	1	50	\$21.25	\$9.40	\$1.73	\$0.00		\$32.38	
	2	60	\$25.50	\$9.40	\$1.73	\$0.00	:	\$36.63	
	3	70	\$29.75	\$9.40	\$13.76	\$0.00	;	\$52.91	
	4	75	\$31.88	\$9.40	\$13.76	\$0.00		\$55.04	
	5	80	\$34.00	\$9.40	\$15.49	\$0.00	;	\$58.89	
	6	80	\$34.00	\$9.40	\$15.49	\$0.00	;	\$58.89	
	7	90	\$38.25	\$9.40	\$17.22	\$0.00	;	\$64.87	
	8	90	\$38.25	\$9.40	\$17.22	\$0.00		\$64.87	
	Notes								
		% Indentured After 10 Step 1&2 \$29 99/ 3&4	)/1/17; 45/45/55/55/70/70/80/80 4 \$35 85/ 5&6 \$54 22/ 7&8 \$60 14						
	Appre	entice to Journeyworke	r Ratio:1:5						
CARPENTER	WOOD	FRAME	04/01/2019	\$27.52	\$7.07	\$7.86	\$0.00	\$42.45	
CARPENTERS -ZO	ONE 2 (Wo	od Frame)	10/01/2019	\$27.95	\$7.07	\$7.86	\$0.00	\$42.88	

All Aspects of New Wood Frame Work

Effecti	ve Date - 04/01/2019				Supplemental		
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	60	\$16.51	\$7.07	\$0.00	\$0.00	\$23.58	
2	60	\$16.51	\$7.07	\$0.00	\$0.00	\$23.58	
3	65	\$17.89	\$7.07	\$7.86	\$0.00	\$32.82	
4	70	\$19.26	\$7.07	\$7.86	\$0.00	\$34.19	
5	75	\$20.64	\$7.07	\$7.86	\$0.00	\$35.57	
6	80	\$22.02	\$7.07	\$7.86	\$0.00	\$36.95	
7	85	\$23.39	\$7.07	\$7.86	\$0.00	\$38.32	
8	90	\$24.77	\$7.07	\$7.86	\$0.00	\$39.70	

## Apprentice - CARPENTER (Wood Frame) - Zone 2

#### 10/01/2019 Effective Date -

	Effecti	ive Date - 10/01/2019	)			Supplemental		
	Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Tot	al Rate
	1	60	\$16.77	\$7.07	\$0.00	\$0.00		\$23.84
	2	60	\$16.77	\$7.07	\$0.00	\$0.00		\$23.84
	3	65	\$18.17	\$7.07	\$7.86	\$0.00		\$33.10
	4	70	\$19.57	\$7.07	\$7.86	\$0.00		\$34.50
	5	75	\$20.96	\$7.07	\$7.86	\$0.00		\$35.89
	6	80	\$22.36	\$7.07	\$7.86	\$0.00		\$37.29
	7	85	\$23.76	\$7.07	\$7.86	\$0.00		\$38.69
	8	90	\$25.16	\$7.07	\$7.86	\$0.00		\$40.09
	Notes:							
	1	% Indentured After 10	/1/17; 45/45/55/55/70/70/80/80					
		Step 1&2 \$19.45/ 3&4	\$26.96/ 5&6 \$34.19/ 7&8 \$36.95					
	Appre	entice to Journeyworke	r Ratio:1:5					
CEMENT MAS	SONRY	PLASTERING	07/01/2019	\$47.67	\$12.75	\$22.41	\$0.62	\$83.45
BRICKLAYERS LO	CAL 3 (QU	UINCY)	01/01/2020	\$49.07	\$12.75	\$22.41	\$0.62	\$84.85

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Page 9 of 42

Sten	ve Date -	07/01/2019	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
up	50		\$23.84	\$12.75	\$15.41	\$0.00	\$52.00
	50 60		\$23.64	\$12.75 \$12.75	\$13.41 \$17.41	\$0.60	\$52.00
	65		\$28.00	\$12.75 \$12.75	\$17.41 \$19.41	\$0.62	\$39.50 \$60.75
1	70		\$30.99	\$12.75 \$12.75	\$10.41	\$0.02	\$02.77 ¢(( 14
5	70		\$33.37	\$12.75	\$19.41	\$0.62	\$00.13
, <	/5		\$35.75	\$12.75	\$20.41	\$0.62	\$69.53
э -	80		\$38.14	\$12.75	\$21.41	\$0.62	\$72.92
/	90		\$42.90	\$12.75	\$22.41	\$0.62	\$78.68
ffecti	ve Date -	01/01/2020				Supplemental	
<b>ffecti</b> tep	ve Date - percent	01/01/2020	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ffecti tep	ve Date - percent 50	01/01/2020	Apprentice Base Wage \$24.54	Health \$12.75	Pension \$15.41	Supplemental Unemployment \$0.00	Total Rate \$52.70
ffecti tep	ve Date - percent 50 60	01/01/2020	Apprentice Base Wage \$24.54 \$29.44	Health \$12.75 \$12.75	Pension \$15.41 \$17.41	Supplemental Unemployment \$0.00 \$0.62	Total Rate \$52.70 \$60.22
ffecti tep	ve Date - percent 50 60 65	01/01/2020	Apprentice Base Wage \$24.54 \$29.44 \$31.90	Health \$12.75 \$12.75 \$12.75	Pension \$15.41 \$17.41 \$18.41	Supplemental Unemployment \$0.00 \$0.62 \$0.62	Total Rate \$52.7( \$60.22 \$63.68
ffecti tep	ve Date - percent 50 60 65 70	01/01/2020	Apprentice Base Wage \$24.54 \$29.44 \$31.90 \$34.35	Health \$12.75 \$12.75 \$12.75 \$12.75	Pension \$15.41 \$17.41 \$18.41 \$19.41	Supplemental Unemployment \$0.00 \$0.62 \$0.62 \$0.62	Total Rate \$52.70 \$60.22 \$63.68 \$67.12
Effecti tep	<b>ve Date -</b> percent 50 60 65 70 75	01/01/2020	Apprentice Base Wage \$24.54 \$29.44 \$31.90 \$34.35 \$36.80	Health \$12.75 \$12.75 \$12.75 \$12.75 \$12.75 \$12.75	Pension \$15.41 \$17.41 \$18.41 \$19.41 \$20.41	Supplemental Unemployment \$0.00 \$0.62 \$0.62 \$0.62 \$0.62	Total Rate \$52.70 \$60.22 \$63.68 \$67.13 \$70.58
2 <b>ffecti</b> 8tep 1 2 3 4 5 5	<b>ve Date -</b> percent 50 60 65 70 75 80	01/01/2020	Apprentice Base Wage \$24.54 \$29.44 \$31.90 \$34.35 \$36.80 \$39.26	Health \$12.75 \$12.75 \$12.75 \$12.75 \$12.75 \$12.75 \$12.75	Pension \$15.41 \$17.41 \$18.41 \$19.41 \$20.41 \$21.41	Supplemental Unemployment \$0.00 \$0.62 \$0.62 \$0.62 \$0.62 \$0.62 \$0.62	Total Rat \$52.70 \$60.22 \$63.60 \$67.12 \$70.53 \$74.04

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Apprentice -	CE	MENT	MAS	SONRY	Y/PLA	STER	ING ·	- Easte	ern i	Mass	(Qui	ncy)
Effective Date		07/01	/2010	)								

Apprentice to Journeyworker Ratio:1:3

**Issue Date:** 09/23/2019

CHAIN SAW OPERATOR	06/01/2019	\$34.20	\$7.85	\$14.88	\$0.00	\$56.93
LABORERS - ZONE 2	12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
	06/01/2020	\$35.95	\$7.85	\$14.88	\$0.00	\$58.68
	12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.57
	06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
	12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER"						
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES	06/01/2019	\$49.18	\$12.00	\$15.60	\$0.00	\$76.78
OPERATING ENGINEERS LOCAL 4	12/01/2019	\$50.33	\$12.00	\$15.60	\$0.00	\$77.93
	06/01/2020	\$51.43	\$12.00	\$15.60	\$0.00	\$79.03
	12/01/2020	\$52.58	\$12.00	\$15.60	\$0.00	\$80.18
	06/01/2021	\$53.68	\$12.00	\$15.60	\$0.00	\$81.28
	12/01/2021	\$54.83	\$12.00	\$15.60	\$0.00	\$82.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
COMPRESSOR OPERATOR	06/01/2019	\$32.28	\$12.00	\$15.60	\$0.00	\$59.88
OPERATING ENGINEERS LOCAL 4	12/01/2019	\$33.07	\$12.00	\$15.60	\$0.00	\$60.67
	06/01/2020	\$33.82	\$12.00	\$15.60	\$0.00	\$61.42
	12/01/2020	\$34.60	\$12.00	\$15.60	\$0.00	\$62.20
	06/01/2021	\$35.35	\$12.00	\$15.60	\$0.00	\$62.95
	12/01/2021	\$36.14	\$12.00	\$15.60	\$0.00	\$63.74

20190922-003

Wage Request Number:

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DELEADER (BRIDGE)	07/01/2019	\$50.66	\$8.20	\$21.45	\$0.00	\$80.31
PAINTERS LOCAL 55 - ZONE 2	01/01/2020	\$50.96	\$8.20	\$22.10	\$0.00	\$81.26
	07/01/2020	\$52.06	\$8.20	\$22.10	\$0.00	\$82.36
	01/01/2021	\$53.16	\$8.20	\$22.10	\$0.00	\$83.46

## Apprentice - PAINTER Local 35 - BRIDGES/TANKS

Effecti	ve Date - 07/01/2019				Supplemental	
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	50	\$25.33	\$8.20	\$0.00	\$0.00	\$33.53
2	55	\$27.86	\$8.20	\$5.78	\$0.00	\$41.84
3	60	\$30.40	\$8.20	\$6.30	\$0.00	\$44.90
4	65	\$32.93	\$8.20	\$6.83	\$0.00	\$47.96
5	70	\$35.46	\$8.20	\$18.30	\$0.00	\$61.96
6	75	\$38.00	\$8.20	\$18.83	\$0.00	\$65.03
7	80	\$40.53	\$8.20	\$19.35	\$0.00	\$68.08
8	90	\$45.59	\$8.20	\$20.40	\$0.00	\$74.19

	Effect	ive Date - 01/01/2020				Supplemental		
	Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rat	te
	1	50	\$25.48	\$8.20	\$0.00	\$0.00	\$33.6	8
	2	55	\$28.03	\$8.20	\$5.94	\$0.00	\$42.1	7
	3	60	\$30.58	\$8.20	\$6.48	\$0.00	\$45.2	.6
	4	65	\$33.12	\$8.20	\$7.02	\$0.00	\$48.3	4
	5	70	\$35.67	\$8.20	\$18.51	\$0.00	\$62.3	8
	6	75	\$38.22	\$8.20	\$19.05	\$0.00	\$65.4	7
	7	80	\$40.77	\$8.20	\$19.59	\$0.00	\$68.5	6
	8	90	\$45.86	\$8.20	\$20.67	\$0.00	\$74.7	3
	Notes							ı 
		Steps are 750 hrs.						
	Appre	entice to Journeyworker Ratio:1:1						
DEMO: ADZEN	MAN		06/01/2019	\$39.30	\$7.85	\$15.85	\$0.00	\$63.00
LABORERS - ZONE	2 rates see	"Apprentice- LABORER"	12/01/2019	\$40.30	\$7.85	\$15.85	\$0.00	\$64.00
DEMO: BACK	HOE/L	OADER/HAMMER OPERATOR	06/01/2019	\$40.30	\$7.85	\$15.85	\$0.00	\$64.00
EABORERS - ZONE	2 rates see	"Apprentice- LABORER"	12/01/2019	\$41.30	\$7.85	\$15.85	\$0.00	\$65.00
DEMO: BURN	ERS		06/01/2010	\$40.05	\$7.85	\$15.85	\$0.00	\$63.75
LABORERS - ZONE	2		12/01/2019	\$41.05	\$7.85	\$15.85	\$0.00	\$64.75
For apprentice	rates see	"Apprentice- LABORER"	12/01/2019	9 \$41.03	\$7.03	φ15.05	φ0.00	φ04./J
DEMO: CONCI	RETE C	CUTTER/SAWYER	06/01/2019	\$40.30	\$7.85	\$15.85	\$0.00	\$64.00
LABORERS - ZONE	2		12/01/2019	\$41.30	\$7.85	\$15.85	\$0.00	\$65.00

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For apprentice rates see "Apprentice- LABORER"

**Issue Date:** 09/23/2019

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: JACKHAMMER OPERATOR	06/01/2019	\$40.05	\$7.85	\$15.85	\$0.00	\$63.75
LABORERS - ZONE 2	12/01/2019	\$41.05	\$7.85	\$15.85	\$0.00	\$64.75
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER	06/01/2019	\$39.30	\$7.85	\$15.85	\$0.00	\$63.00
LABORERS - ZONE 2	12/01/2019	\$40.30	\$7.85	\$15.85	\$0.00	\$64.00
For apprentice rates see "Apprentice- LABORER"						
DIRECTIONAL DRILL MACHINE OPERATOR	06/01/2019	\$47.69	\$12.00	\$15.60	\$0.00	\$75.29
OPERATING ENGINEERS LOCAL 4	12/01/2019	\$48.83	\$12.00	\$15.60	\$0.00	\$76.43
	06/01/2020	\$49.91	\$12.00	\$15.60	\$0.00	\$77.51
	12/01/2020	\$51.05	\$12.00	\$15.60	\$0.00	\$78.65
	06/01/2021	\$52.14	\$12.00	\$15.60	\$0.00	\$79.74
	12/01/2021	\$53.28	\$12.00	\$15.60	\$0.00	\$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER	08/01/2019	\$68.52	\$9.90	\$21.15	\$0.00	\$99.57
PILE DRIVER LOCAL 56 (ZONE 1)						
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER	08/01/2019	\$48.94	\$9.90	\$21.15	\$0.00	\$79.99
PILE DRIVER LOCAL 56 (ZONE 1)						
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT)	08/01/2019	\$73.41	\$9.90	\$21.15	\$0.00	\$104.46
PILE DRIVER LOCAL 56 (ZONE 1)						
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT)	08/01/2019	\$102.78	\$9.90	\$21.15	\$0.00	\$133.83
FILE DRIVER LOCAL 30 (ZONE 1)						
For apprentice rates see "Apprentice- PILE DRIVER"						
ELECTRICIAN	09/01/2019	\$42.26	\$10.15	\$13.54	\$0.00	\$65.95
ELECTRICIAINS LOCAL 223	03/01/2020	\$42.87	\$10.40	\$13.94	\$0.00	\$67.21

\$20.21

\$16.03

\$0.00

Effect	tive Date - 09/01/2019		Supplemental			
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	40	\$16.90	\$10.15	\$0.51	\$0.00	\$27.56
2	42	\$17.75	\$10.15	\$0.53	\$0.00	\$28.43
3	45	\$19.02	\$10.15	\$0.57	\$0.00	\$29.74
4	48	\$20.28	\$10.15	\$4.93	\$0.00	\$35.36
5	50	\$21.13	\$10.15	\$4.97	\$0.00	\$36.25
6	55	\$23.24	\$10.15	\$5.33	\$0.00	\$38.72
7	60	\$25.36	\$10.15	\$5.64	\$0.00	\$41.15
8	65	\$27.47	\$10.15	\$5.94	\$0.00	\$43.56
9	70	\$29.58	\$10.15	\$6.25	\$0.00	\$45.98
10	75	\$31.70	\$10.15	\$6.50	\$0.00	\$48.35

# Apprentice - ELECTRICIAN - Local 223

10	75	\$31.70	\$10.15	\$6.50	\$0.00	\$48.35	5
<b>Effe</b> Step	ctive Date - 03/01/2020 percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate	9
1	40	\$17.15	\$10.40	\$0.51	\$0.00	\$28.06	6
2	42	\$18.01	\$10.40	\$0.54	\$0.00	\$28.95	5
3	45	\$19.29	\$10.40	\$0.58	\$0.00	\$30.27	7
4	48	\$20.58	\$10.40	\$5.22	\$0.00	\$36.20	)
5	50	\$21.44	\$10.40	\$5.26	\$0.00	\$37.10	)
6	55	\$23.58	\$10.40	\$5.63	\$0.00	\$39.61	1
7	60	\$25.72	\$10.40	\$5.93	\$0.00	\$42.05	5
8	65	\$27.87	\$10.40	\$6.25	\$0.00	\$44.52	2
9	70	\$30.01	\$10.40	\$6.54	\$0.00	\$46.95	5
10	75	\$32.15	\$10.40	\$6.79	\$0.00	\$49.34	1
Note	s: Steps are 750 hours					   	
Арр	rentice to Journeyworker Ratio	:2:3***					
ELEVATOR CONST	RUCTOR	01/01/2019	\$59.47	\$15.58	\$17.51	\$0.00	\$92.56
ELEVATOR CONSTRUCT	ORS LOCAL 4	01/01/2020	\$61.42	\$15.73	\$18.41	\$0.00	\$95.56
		01/01/2021	\$63.47	\$15.88	\$19.31	\$0.00	\$98.66

01/01/2022

\$65.62

\$101.86

	Effecti	ve Date -	01/01/2019				Supplemental		
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	50		\$29.74	\$15.58	\$0.00	\$0.00	\$45.32	
	2	55		\$32.71	\$15.58	\$17.51	\$0.00	\$65.80	
	3	65		\$38.66	\$15.58	\$17.51	\$0.00	\$71.75	
	4	70		\$41.63	\$15.58	\$17.51	\$0.00	\$74.72	
	5	80		\$47.58	\$15.58	\$17.51	\$0.00	\$80.67	
	Effecti	ve Date -	01/01/2020				Supplemental		
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	50		\$30.71	\$15.73	\$0.00	\$0.00	\$46.44	
	2	55		\$33.78	\$15.73	\$18.41	\$0.00	\$67.92	
	3	65		\$39.92	\$15.73	\$18.41	\$0.00	\$74.06	
	4	70		\$42.99	\$15.73	\$18.41	\$0.00	\$77.13	
	5	80		\$49.14	\$15.73	\$18.41	\$0.00	\$83.28	
	Notes:								
		Steps 1-2	are 6 mos.; Steps 3-5 are 1	year					
	Appre	ntice to Jo	urneyworker Ratio:1:1						
ELEVATOR CONST	ONSTR	UCTOR H	ELPER	01/01/2019	9 \$41.63	\$15.58	\$17.51	\$0.00	\$74.72
ELEVATOR CONST	KUCTOK	S LOCAL 4		01/01/2020	0 \$42.99	\$15.73	\$18.41	\$0.00	\$77.13
				01/01/202	1 \$44.43	\$15.88	\$19.31	\$0.00	\$79.62
				01/01/2022	2 \$45.93	\$16.03	\$20.21	\$0.00	\$82.17
For apprentice	rates see "	Apprentice - I	OP						
LABORERS - ZONE	KD KA	IL EKEU I	UK	06/01/2019	9 \$34.20	\$7.85	\$14.88	\$0.00	\$56.93
				12/01/2019	9 \$35.06	\$7.85	\$14.88	\$0.00	\$57.79
				06/01/2020	0 \$35.95	\$7.85	\$14.88	\$0.00	\$58.68
				12/01/2020	9 \$36.84	\$7.85	\$14.88	\$0.00	\$59.57
				06/01/202	1 \$37.76	\$7.85	\$14.88	\$0.00	\$60.49
For apprentice	rates see "	'Apprentice- L	ABORER"	12/01/202	1 \$38.67	\$7.85	\$14.88	\$0.00	\$61.40
FIELD ENG.IN	ST.PER	SON-BLD	G,SITE,HVY/HWY	05/01/2019	9 \$43.68	\$11.50	\$15.60	\$0.00	\$70.78
OPERATING ENGL	NEERS LO	OCAL 4		11/01/2019	9 \$44.68	\$11.50	\$15.60	\$0.00	\$71.78
				05/01/201	) \$45.83	\$11.50	\$15.60	\$0.00	\$72.93
				11/01/2020	) \$46.83	\$11.50	\$15.60	\$0.00	\$73.93
				05/01/202	1 \$47.98	\$11.50	\$15.60	\$0.00	\$75.08
				11/01/202	1 \$48.98	\$11.50	\$15.60	\$0.00	\$76.08
				05/01/202	2 \$50.13	\$11.50	\$15.60	\$0.00	\$77.23

#### Apprentice - ELEVATOR CONSTRUCTOR - Local 4 01/01/2010

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	<b>Total Rate</b>
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY	05/01/2019	\$45.17	\$11.50	\$15.60	\$0.00	\$72.27
OPERATING ENGINEERS LOCAL 4	11/01/2019	\$46.18	\$11.50	\$15.60	\$0.00	\$73.28
	05/01/2020	\$47.33	\$11.50	\$15.60	\$0.00	\$74.43
	11/01/2020	\$48.34	\$11.50	\$15.60	\$0.00	\$75.44
	05/01/2021	\$49.50	\$11.50	\$15.60	\$0.00	\$76.60
	11/01/2021	\$50.51	\$11.50	\$15.60	\$0.00	\$77.61
	05/01/2022	\$51.67	\$11.50	\$15.60	\$0.00	\$78.77
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY	05/01/2019	\$22.48	\$11.50	\$15.60	\$0.00	\$49.58
or Ekimino Enometerio Eocht 4	11/01/2019	\$23.07	\$11.50	\$15.60	\$0.00	\$50.17
	05/01/2020	\$23.74	\$11.50	\$15.60	\$0.00	\$50.84
	11/01/2020	\$24.33	\$11.50	\$15.60	\$0.00	\$51.43
	05/01/2021	\$25.01	\$11.50	\$15.60	\$0.00	\$52.11
	11/01/2021	\$25.61	\$11.50	\$15.60	\$0.00	\$52.71
	05/01/2022	\$26.28	\$11.50	\$15.60	\$0.00	\$53.38
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER ELECTRICIANS LOCAL 223	09/01/2019	\$42.26	\$10.15	\$13.54	\$0.00	\$65.95
	03/01/2020	\$42.87	\$10.40	\$13.94	\$0.00	\$67.21
FOR ADDRESS SEE AD		**		<b>01145</b>	<u> </u>	* **
/ COMMISSIONING <i>electricians</i>	09/01/2019	\$35.78	\$10.15	\$11.45	\$0.00	\$57.38
LOCAL 223	03/01/2020	\$36.27	\$10.40	\$11.78	\$0.00	\$58.45
For apprentice rates see "Apprentice- IELECOMMUNICATIONS IECHNICIAN"				<b>**</b>	<u> </u>	•
OPERATING ENGINEERS LOCAL 4	06/01/2019	\$39.54	\$12.00	\$15.60	\$0.00	\$67.14
	12/01/2019	\$40.49	\$12.00	\$15.60	\$0.00	\$68.09
	06/01/2020	\$41.40	\$12.00	\$15.60	\$0.00	\$69.00
	12/01/2020	\$42.35	\$12.00	\$15.60	\$0.00	\$69.95
	06/01/2021	\$43.26	\$12.00	\$15.60	\$0.00	\$70.86
For apprentice rates see "Apprentice_OPERATING ENGINEERS"	12/01/2021	\$44.21	\$12.00	\$15.60	\$0.00	\$71.81
FLAGGER & SIGNALER	0(/01/2010	¢22.50	<b>\$7.05</b>	¢1100	00.03	¢ 45.00
LABORERS - ZONE 2	06/01/2019	\$22.50	\$7.85	\$14.88	\$0.00	\$45.23
	12/01/2019	\$23.50	\$7.85	\$14.00	\$0.00	\$46.23
	06/01/2020	\$23.50	\$7.85	\$14.88	\$0.00	\$46.23
	12/01/2020	\$24.50	\$7.85	\$14.88	\$0.00	\$47.23
	06/01/2021	\$24.50	\$7.85	\$14.88	\$0.00	\$47.23
For apprentice rates see "Apprentice- LABORER"	12/01/2021	\$24.50	\$7.85	\$14.88	\$0.00	\$47.23
FLOORCOVERER	09/01/2019	\$46.25	\$9.40	\$19.25	\$0.00	\$74.90
FLOORCOVERERS LOCAL 2168 ZONE I	03/01/2019	\$47.05	\$9.40	\$19.25	\$0.00	\$75.70
	09/01/2020	\$17.05	\$9.40	\$19.25	\$0.00	\$76.50
	02/01/2020	\$10 65	\$0.40	\$10.25	\$0.00	\$77.20
	00/01/2021	\$40.45	\$9.40 \$0.40	\$10.25	\$0.00	\$72.10
	02/01/2021	947.4J	\$7.40	\$10.25	\$0.00	\$70.1U
	03/01/2022	\$30.25	\$9.40	\$19.23	\$0.00	\$78.90

Effecti	ve Date - 09/01/2019				Supplemental	
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	50	\$23.13	\$9.40	\$1.79	\$0.00	\$34.32
2	55	\$25.44	\$9.40	\$1.79	\$0.00	\$36.63
3	60	\$27.75	\$9.40	\$13.88	\$0.00	\$51.03
4	65	\$30.06	\$9.40	\$13.88	\$0.00	\$53.34
5	70	\$32.38	\$9.40	\$15.67	\$0.00	\$57.45
6	75	\$34.69	\$9.40	\$15.67	\$0.00	\$59.76
7	80	\$37.00	\$9.40	\$17.46	\$0.00	\$63.86
8	85	\$39.31	\$9.40	\$17.46	\$0.00	\$66.17

## Apprentice - FLOORCOVERER - Local 2168 Zone I

### **Effective Date -** 03/01/2020

Effec	ctive Date - 03/01/2020				Supplemental		
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total R	Rate
1	50	\$23.53	\$9.40	\$1.79	\$0.00	\$34	.72
2	55	\$25.88	\$9.40	\$1.79	\$0.00	\$37	2.07
3	60	\$28.23	\$9.40	\$13.88	\$0.00	\$51	.51
4	65	\$30.58	\$9.40	\$13.88	\$0.00	\$53	.86
5	70	\$32.94	\$9.40	\$15.67	\$0.00	\$58	3.01
6	75	\$35.29	\$9.40	\$15.67	\$0.00	\$60	0.36
7	80	\$37.64	\$9.40	\$17.46	\$0.00	\$64	.50
8	85	\$39.99	\$9.40	\$17.46	\$0.00	\$66	6.85
	s: Steps are 750 hrs. % After 09/1/17; 45/45 Step 1&2 \$32.00/ 3&4	5/55/55/70/70/80/80 (1500hr Steps) \$38.36/ 5&6 \$57.45/ 7&8 \$63.86					
	N DIGWED	Kau0:1:1					
FORK LIF I/CHERR	Y PICKER LOCAL 4	06/01/2019	9 \$48.18	\$12.00	\$15.60	\$0.00	\$75.78
		12/01/2019	9 \$49.33	\$12.00	\$15.60	\$0.00	\$76.93
		06/01/2020	0 \$50.43	\$12.00	\$15.60	\$0.00	\$78.03
		12/01/2020	0 \$51.58	\$12.00	\$15.60	\$0.00	\$79.18
		06/01/202	1 \$52.68	\$12.00	\$15.60	\$0.00	\$80.28
For apprentice rates se	Step       percent         1       50         2       55         3       60         4       65         5       70         6       75         7       80         8       85         Notes: Steps are 750 hrs.         % After 09/1/17; 45/45/55/55/7         Step 1&2 \$32.00/ 3&4 \$38.36/         Apprentice to Journeyworker Ratio:1         X LIFT/CHERRY PICKER         47ING ENGINEERS LOCAL 4         or apprentice rates see "Apprentice- OPERATING ENGINEERS         ERATOR/LIGHTING PLANT/HEATERS         47ING ENGINEERS LOCAL 4	12/01/202 IGINEERS"	1 \$53.83	\$12.00	\$15.60	\$0.00	\$81.43
GENERATOR/LIGH	TING PLANT/HEATERS	06/01/2019	9 \$32.28	\$12.00	\$15.60	\$0.00	\$59.88
OPERATING ENGINEERS	LOCAL 4	12/01/2019	9 \$33.07	\$12.00	\$15.60	\$0.00	\$60.67
		06/01/2020	0 \$33.82	\$12.00	\$15.60	\$0.00	\$61.42
		12/01/2020	0 \$34.60	\$12.00	\$15.60	\$0.00	\$62.20
		06/01/202	1 \$35.35	\$12.00	\$15.60	\$0.00	\$62.95
For apprentice rates se	e "Apprentice- OPERATING EN	12/01/202	1 \$36.14	\$12.00	\$15.60	\$0.00	\$63.74
GLAZIER (GLASS P	LANK/AIR BARRIER/IN	NTERIOR 04/01/2014	0 \$2010	\$10.60	\$9.90	\$0.00	\$50 60
SYSTEMS) GLAZIERS LOCAL 1333	· · · · · · · · · · · · · · · · · · ·	06/01/2020	0 \$39.18	\$10.80	\$10.45	\$0.00	\$60.43

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Effecti	ve Date -	06/01/2019				Supplemental		
Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	50		\$19.09	\$10.60	\$1.80	\$0.00	\$31.49	
2	56		\$21.48	\$10.60	\$1.80	\$0.00	\$33.88	
3	63		\$23.86	\$10.60	\$2.40	\$0.00	\$36.86	
4	69		\$26.25	\$10.60	\$2.40	\$0.00	\$39.25	
5	75		\$28.64	\$10.60	\$2.90	\$0.00	\$42.14	
6	81		\$31.02	\$10.60	\$2.90	\$0.00	\$44.52	
7	88		\$33.41	\$10.60	\$9.90	\$0.00	\$53.91	
8	94		\$35.79	\$10.60	\$9.90	\$0.00	\$56.29	

Apprentice -	GLAZIER - Local 1333
Effortivo Doto	06/01/2019

I	Effectiv	ve Date -	06/01/2020				Supplemental			
S	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Тс	otal Rate	
_	1	50		\$19.59	\$10.80	\$1.80	\$0.00		\$32.19	
:	2	56		\$22.04	\$10.80	\$1.80	\$0.00		\$34.64	
:	3	63		\$24.49	\$10.80	\$2.45	\$0.00		\$37.74	
	4	69		\$26.94	\$10.80	\$2.45	\$0.00		\$40.19	
:	5	75		\$29.39	\$10.80	\$3.15	\$0.00		\$43.34	
	6	81		\$31.83	\$10.80	\$3.15	\$0.00		\$45.78	
	7	88		\$34.28	\$10.80	\$10.45	\$0.00		\$55.53	
:	8	94		\$36.73	\$10.80	\$10.45	\$0.00		\$57.98	
1	Notes:									
Ē	Apprei	ntice to Jou	ırneyworker Ratio:1:3							
HOISTING ENG	INEER	CRANES	/GRADALLS	06/01/2019	9 \$48.18	\$12.00	\$15.60	\$0.00	\$75.78	;
OPERATING ENGINE	EERS LC	OCAL 4		12/01/2019	\$49.33	\$12.00	\$15.60	\$0.00	\$76.93	i
				06/01/2020	\$50.43	\$12.00	\$15.60	\$0.00	\$78.03	i
				12/01/2020	\$51.58	\$12.00	\$15.60	\$0.00	\$79.18	;
				06/01/202	\$52.68	\$12.00	\$15.60	\$0.00	\$80.28	;
				12/01/202	\$53.83	\$12.00	\$15.60	\$0.00	\$81.43	;

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Effecti	ve Date -	06/01/2019				Supplemental		
Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	55		\$26.50	\$12.00	\$0.00	\$0.00	\$38.50	
2	60		\$28.91	\$12.00	\$15.60	\$0.00	\$56.51	
3	65		\$31.32	\$12.00	\$15.60	\$0.00	\$58.92	
4	70		\$33.73	\$12.00	\$15.60	\$0.00	\$61.33	
5	75		\$36.14	\$12.00	\$15.60	\$0.00	\$63.74	
6	80		\$38.54	\$12.00	\$15.60	\$0.00	\$66.14	
7	85		\$40.95	\$12.00	\$15.60	\$0.00	\$68.55	
8	90		\$43.36	\$12.00	\$15.60	\$0.00	\$70.96	

## Apprentice - OPERATING ENGINEERS - Local 4

#### 12/01/2019 Effective Date -

Effecti	ve Date -	12/01/2019				Supplemental		
Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	55		\$27.13	\$12.00	\$0.00	\$0.00	\$39.13	
2	60		\$29.60	\$12.00	\$15.60	\$0.00	\$57.20	
3	65		\$32.06	\$12.00	\$15.60	\$0.00	\$59.66	
4	70		\$34.53	\$12.00	\$15.60	\$0.00	\$62.13	
5	75		\$37.00	\$12.00	\$15.60	\$0.00	\$64.60	
6	80		\$39.46	\$12.00	\$15.60	\$0.00	\$67.06	
7	85		\$41.93	\$12.00	\$15.60	\$0.00	\$69.53	
8	90		\$44.40	\$12.00	\$15.60	\$0.00	\$72.00	

#### Notes:

Apprentic	e to Journeyw	orker Ratio:	1:6	 	 

HVAC (DUCTWORK)	08/01/2019	\$48.10	\$13.20	\$24.12	\$2.56	\$87.98
SHEEIMEIAL WORKERS LOCAL 1/ - A	02/01/2020	\$49.75	\$13.20	\$24.12	\$2.61	\$89.68
	08/01/2020	\$51.35	\$13.20	\$24.12	\$2.66	\$91.33
	02/01/2021	\$53.00	\$13.20	\$24.12	\$2.71	\$93.03
	08/01/2021	\$54.75	\$13.20	\$24.12	\$2.76	\$94.83
	02/01/2022	\$56.50	\$13.20	\$24.12	\$2.81	\$96.63
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS)	09/01/2019	\$42.26	\$10.15	\$13.54	\$0.00	\$65.95
ELECTRICIANS LOCAL 223	03/01/2020	\$42.87	\$10.40	\$13.94	\$0.00	\$67.21
For apprentice rates see "Apprentice- ELECTRICIAN"						
HVAC (TESTING AND BALANCING - AIR)	08/01/2019	\$48.10	\$13.20	\$24.12	\$2.56	\$87.98
SHEEIMEIAL WORKERS LOCAL I / - A	02/01/2020	\$49.75	\$13.20	\$24.12	\$2.61	\$89.68
	08/01/2020	\$51.35	\$13.20	\$24.12	\$2.66	\$91.33
	02/01/2021	\$53.00	\$13.20	\$24.12	\$2.71	\$93.03
	08/01/2021	\$54.75	\$13.20	\$24.12	\$2.76	\$94.83
	02/01/2022	\$56.50	\$13.20	\$24.12	\$2.81	\$96.63

For apprentice rates see "Apprentice- SHEET METAL WORKER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (TESTING AND BALANCING -WATER) PLUMBERS & PIPEFITTERS LOCAL 51	09/01/2018	\$42.04	\$10.00	\$18.20	\$0.00	\$70.24
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HVAC MECHANIC PLUMBERS & PIPEFITTERS LOCAL 51	09/01/2018	\$42.04	\$10.00	\$18.20	\$0.00	\$70.24
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						
HYDRAULIC DRILLS	06/01/2019	\$34.70	\$7.85	\$14.88	\$0.00	\$57.43
LABORERS - ZONE 2	12/01/2019	\$35.56	\$7.85	\$14.88	\$0.00	\$58.29
	06/01/2020	\$36.45	\$7.85	\$14.88	\$0.00	\$59.18
	12/01/2020	\$37.34	\$7.85	\$14.88	\$0.00	\$60.07
	06/01/2021	\$38.26	\$7.85	\$14.88	\$0.00	\$60.99
	12/01/2021	\$39.17	\$7.85	\$14.88	\$0.00	\$61.90
For apprentice rates see "Apprentice- LABORER"						
INSULATOR (PIPES & TANKS) HEAT & FROST INSULATORS LOCAL 6 (BOSTON)	09/01/2019	\$48.44	\$12.80	\$16.40	\$0.00	\$77.64

## Apprentice - ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston

Effecti	ve Date - 09/01/2019				Supplemental		
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rat	te
1	50	\$24.22	\$12.80	\$11.90	\$0.00	\$48.9	2
2	60	\$29.06	\$12.80	\$12.80	\$0.00	\$54.6	6
3	70	\$33.91	\$12.80	\$13.70	\$0.00	\$60.4	1
4	80	\$38.75	\$12.80	\$14.60	\$0.00	\$66.1	5
Notes:	Steps are 1 year						
Appre	ntice to Journeyworker Ratio:1	.4					
IRONWORKER/WELI	DER	09/16/2019	\$39.71	\$7.70	\$17.10	\$0.00	\$64.51
IRONWORKERS LOCAL 37		03/16/2020	\$40.61	\$7.70	\$17.10	\$0.00	\$65.41
		09/16/2020	\$41.51	\$7.70	\$17.10	\$0.00	\$66.31
		03/16/2021	\$42.46	\$7.70	\$17.10	\$0.00	\$67.26

	Effecti	ive Date -	09/16/2019				S1		
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	70		\$27.80	\$7.70	\$17.10	\$0.00	\$52.60	
	2	75		\$29.78	\$7.70	\$17.10	\$0.00	\$54.58	
	3	80		\$31.77	\$7.70	\$17.10	\$0.00	\$56.57	
	4	85		\$33.75	\$7.70	\$17.10	\$0.00	\$58.55	
	5	90		\$35.74	\$7.70	\$17.10	\$0.00	\$60.54	
	6	95		\$37.72	\$7.70	\$17.10	\$0.00	\$62.52	
	Effecti	ive Date -	03/16/2020				Supplemental		
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	70		\$28.43	\$7.70	\$17.10	\$0.00	\$53.23	
	2	75		\$30.46	\$7.70	\$17.10	\$0.00	\$55.26	
	3	80		\$32.49	\$7.70	\$17.10	\$0.00	\$57.29	
	4	85		\$34.52	\$7.70	\$17.10	\$0.00	\$59.32	
	5	90		\$36.55	\$7.70	\$17.10	\$0.00	\$61.35	
	6	95		\$38.58	\$7.70	\$17.10	\$0.00	\$63.38	
	Notes:								
	Appre	ntice to Jo	urneyworker Ratio:1:4						
ACKHAMM	IER & PA	VING BRI	EAKER OPERATOR	06/01/2019	9 \$34.20	\$7.85	\$14.88	\$0.00	\$56.93
ABORERS - ZO	NE 2			12/01/2019	9 \$35.06	\$7.85	\$14.88	\$0.00	\$57.79
				06/01/2020	0 \$35.95	\$7.85	\$14.88	\$0.00	\$58.68
				12/01/2020	9 \$36.84	\$7.85	\$14.88	\$0.00	\$59.57
				06/01/202	1 \$37.76	\$7.85	\$14.88	\$0.00	\$60.49
				12/01/202	1 \$38.67	\$7.85	\$14.88	\$0.00	\$61.40
For apprenti	ice rates see '	"Apprentice- I	LABORER"						
ABORERS - ZO	NE 2			06/01/2019	9 \$33.95	\$7.85	\$14.88	\$0.00	\$56.68
				12/01/2019	9 \$34.81	\$7.85	\$14.88	\$0.00	\$57.54
				06/01/2020	0 \$35.70	\$7.85	\$14.88	\$0.00	\$58.43
				12/01/2020	0 \$36.59	\$7.85	\$14.88	\$0.00	\$59.32
				06/01/202	1 \$37.51	\$7.85	\$14.88	\$0.00	\$60.24
				12/01/202	1 \$38.42	\$7.85	\$14.88	\$0.00	\$61.15

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	Appre	ntice - LA	ABORER - Zone 2						
	Effect	ive Date -	06/01/2019				Supplemental		
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	60		\$20.37	\$7.85	\$14.88	\$0.00	\$43.10	
	2	70		\$23.77	\$7.85	\$14.88	\$0.00	\$46.50	
	3	80		\$27.16	\$7.85	\$14.88	\$0.00	\$49.89	
	4	90		\$30.56	\$7.85	\$14.88	\$0.00	\$53.29	
	Effect	ive Date -	12/01/2019				Supplemental		
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	60		\$20.89	\$7.85	\$14.88	\$0.00	\$43.62	
	2	70		\$24.37	\$7.85	\$14.88	\$0.00	\$47.10	
	3	80		\$27.85	\$7.85	\$14.88	\$0.00	\$50.58	
	4	90		\$31.33	\$7.85	\$14.88	\$0.00	\$54.06	
	Notes:								
	Appre	entice to Jo	urneyworker Ratio:1:5						
LABORER: CARPENTER TENDER			06/01/2019	\$33.9	5 \$7.85	\$14.88	\$0.00	\$56.68	
LABORERS - ZONE	2			12/01/2019	\$34.8	1 \$7.85	\$14.88	\$0.00	\$57.54
				06/01/2020	\$35.70	0 \$7.85	\$14.88	\$0.00	\$58.43
				12/01/2020	\$36.5	9 \$7.85	\$14.88	\$0.00	\$59.32
				06/01/2021	\$37.5	1 \$7.85	\$14.88	\$0.00	\$60.24
				12/01/2021	\$38.42	2 \$7.85	\$14.88	\$0.00	\$61.15
For apprentice	rates see	"Apprentice- I	LABORER"						
LABORER: CE	MENT	FINISHER	R TENDER	06/01/2019	\$33.9	5 \$7.85	\$14.88	\$0.00	\$56.68
EADORERS - ZONE	. 2			12/01/2019	\$34.8	1 \$7.85	\$14.88	\$0.00	\$57.54
				06/01/2020	\$35.70	0 \$7.85	\$14.88	\$0.00	\$58.43
				12/01/2020	\$36.5	9 \$7.85	\$14.88	\$0.00	\$59.32
				06/01/2021	\$37.5	1 \$7.85	\$14.88	\$0.00	\$60.24
				12/01/2021	\$38.42	2 \$7.85	\$14.88	\$0.00	\$61.15
For apprentice	rates see	"Apprentice- I	LABORER"						
LABORER: HA	ZARD	OUS WAS	TE/ASBESTOS REMOVER	06/01/2019	\$34.1	5 \$7.85	\$14.83	\$0.00	\$56.83
For apprentice	rates see	"Apprentice- I	LABORER"	12/01/2019	\$35.0	1 \$7.85	\$14.83	\$0.00	\$57.69
LABORER: MASON TENDER			06/01/2019	\$34.20	0 \$7.85	\$14.88	\$0.00	\$56.93	
LABORERS - ZONE	2			12/01/2019	\$35.00	6 \$7.85	\$14.88	\$0.00	\$57.79
				06/01/2020	\$35.9	5 \$7.85	\$14.88	\$0.00	\$58.68
				12/01/2020	\$36.84	4 \$7.85	\$14.88	\$0.00	\$59.57
				06/01/2021	\$37.70	6 \$7.85	\$14.88	\$0.00	\$60.49
				12/01/2021	\$38.6	7 \$7.85	\$14.88	\$0.00	\$61.40

For apprentice rates see "Apprentice- LABORER"

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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	<b>Total Rate</b>
LABORER: MULTI-TRADE TENDER	06/01/2019	\$33.95	\$7.85	\$14.88	\$0.00	\$56.68
LABORERS - ZONE 2	12/01/2019	\$34.81	\$7.85	\$14.88	\$0.00	\$57.54
	06/01/2020	\$35.70	\$7.85	\$14.88	\$0.00	\$58.43
	12/01/2020	\$36.59	\$7.85	\$14.88	\$0.00	\$59.32
	06/01/2021	\$37.51	\$7.85	\$14.88	\$0.00	\$60.24
For expression rates are "Apprentice. LADORED"	12/01/2021	\$38.42	\$7.85	\$14.88	\$0.00	\$61.15
LABORERS - ZONE 2	06/01/2019	\$33.95	\$7.85	\$14.88	\$0.00	\$56.68
	12/01/2019	\$34.81	\$7.85	\$14.88	\$0.00	\$57.54
	06/01/2020	\$35.70	\$7.85	\$14.88	\$0.00	\$58.43
	12/01/2020	\$36.59	\$7.85	\$14.88	\$0.00	\$59.32
	06/01/2021	\$37.51	\$7.85	\$14.88	\$0.00	\$60.24
	12/01/2021	\$38.42	\$7.85	\$14.88	\$0.00	\$61.15
This classification applies to all tree work associated with the removal of a utility company for the purpose of operation, maintenance or repair of u	standing trees, and trimming and ren tility company equipment. For appre	noval of branches entice rates see "A	s and limbs wl Apprentice- LA	en the work is	s not done for	
LASER BEAM OPERATOR	06/01/2019	\$34.20	\$7.85	\$14.88	\$0.00	\$56.93
LABORERS - ZONE 2	12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
	06/01/2020	\$35.95	\$7.85	\$14.88	\$0.00	\$58.68
	12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.57
	06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
	12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER"						
MARBLE & TILE FINISHERS	08/01/2019	\$41.49	\$10.75	\$19.61	\$0.00	\$71.85
BRICKLAYERS LOCAL 3 - MARBLE & TILE	02/01/2020	\$42.00	\$10.75	\$19.61	\$0.00	\$72.36
	08/01/2020	\$43.08	\$10.75	\$19.76	\$0.00	\$73.59
	02/01/2021	\$43.59	\$10.75	\$19.76	\$0.00	\$74.10
	08/01/2021	\$44.71	\$10.75	\$19.92	\$0.00	\$75.38
	02/01/2022	\$45.18	\$10.75	\$19.92	\$0.00	\$75.85

\$21.61

\$10.75

\$0.00

\$91.37

	Effecti	ive Date -	08/01/2019				Supplemental		
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	50		\$20.75	\$10.75	\$19.61	\$0.00	\$51.11	
	2	60		\$24.89	\$10.75	\$19.61	\$0.00	\$55.25	
	3	70		\$29.04	\$10.75	\$19.61	\$0.00	\$59.40	
	4	80		\$33.19	\$10.75	\$19.61	\$0.00	\$63.55	
	5	90		\$37.34	\$10.75	\$19.61	\$0.00	\$67.70	
	Effecti	ive Date -	02/01/2020				Supplemental		
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	50		\$21.00	\$10.75	\$19.61	\$0.00	\$51.36	
	2	60		\$25.20	\$10.75	\$19.61	\$0.00	\$55.56	
	3	70		\$29.40	\$10.75	\$19.61	\$0.00	\$59.76	
	4	80		\$33.60	\$10.75	\$19.61	\$0.00	\$63.96	
	5	90		\$37.80	\$10.75	\$19.61	\$0.00	\$68.16	
	Notes:							   	
	Appre	ntice to Jo	urneyworker Ratio:1:3						
MARBLE MASONS, TILELAYERS & TERRAZZO MECH BRICKLAYERS LOCAL 3 - MARBLE & TILE		08/01/2019	9 \$54.	42 \$10.75	\$21.30	\$0.00	\$86.47		
		02/01/2020	\$55.	05 \$10.75	\$21.30	\$0.00	\$87.10		
			08/01/2020	) \$56. <del>.</del>	40 \$10.75	\$21.45	\$0.00	\$88.60	
				02/01/202	\$57.	04 \$10.75	\$21.45	\$0.00	\$89.24
				08/01/2021	\$58.4	44 \$10.75	\$21.61	\$0.00	\$90.80

02/01/2022

\$59.01

### **Apprentice** - *MARBLE* & *TILE FINISHER* - *Local 3 Marble* & *Tile* **Effective Date** - 08/01/2019

Effect	ive Date -	08/01/2019				Supplemental		
Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	50		\$27.21	\$10.75	\$21.30	\$0.00	\$59.26	
2	60		\$32.65	\$10.75	\$21.30	\$0.00	\$64.70	
3	70		\$38.09	\$10.75	\$21.30	\$0.00	\$70.14	
4	80		\$43.54	\$10.75	\$21.30	\$0.00	\$75.59	
5	90		\$48.98	\$10.75	\$21.30	\$0.00	\$81.03	
Effect	ive Date -	02/01/2020				Supplemental		
Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	50		\$27.53	\$10.75	\$21.30	\$0.00	\$59.58	
2	60		\$33.03	\$10.75	\$21.30	\$0.00	\$65.08	
3	70		\$38.54	\$10.75	\$21.30	\$0.00	\$70.59	
4	80		\$44.04	\$10.75	\$21.30	\$0.00	\$76.09	
5	90		\$49.55	\$10.75	\$21.30	\$0.00	\$81.60	
Notes:								
i								
Appre	ntice to Jou	urneyworker Ratio:1:5						
MECH. SWEEPER OP	ERATOR (	ON CONST. SITES)	06/01/2019	9 \$4	7.69 \$12.00	\$15.60	\$0.00	\$75.29
OPERATING ENGINEERS L	OCAL 4		12/01/2019	9 \$4	8.83 \$12.00	\$15.60	\$0.00	\$76.43
			06/01/2020	) \$4	9.91 \$12.00	\$15.60	\$0.00	\$77.51
			12/01/2020	) \$5	1.05 \$12.00	\$15.60	\$0.00	\$78.65
			06/01/202	1 \$52	2.14 \$12.00	\$15.60	\$0.00	\$79.74
For apprentice rates see	"Apprentice O	DEPATING ENGINEEDS"	12/01/202	1 \$53	3.28 \$12.00	\$15.60	\$0.00	\$80.88
MECHANICS MAINT	FNANCE	I ERATING ENGINEERS	0.6/01/2014		7 (0 \$12.00	¢15.00		<b>\$75.20</b>
OPERATING ENGINEERS LOCAL 4			06/01/2019	9 <b>\$</b> 4	/.69 \$12.00	\$15.00	\$0.00	\$75.29
			12/01/2019	9 \$43 0 0 44	8.83 \$12.00	\$15.00 \$15.00	\$0.00	\$/6.43
			06/01/2020	) \$4	9.91 \$12.00	\$15.00	\$0.00	\$//.51
			12/01/2020	J \$5	1.05 \$12.00	\$15.60 \$15.60	\$0.00 \$0.00	\$78.65
			06/01/2021	1 \$52 1 0~~	2.14 \$12.00	\$15.00	\$0.00 \$0.00	\$/9.74
For apprentice rates see	"Apprentice- O	PERATING ENGINEERS"	12/01/202	1 \$5.	3.28 \$12.00	\$15.60	20.00	\$80.88
MILLWRIGHT (Zone 2) MILLWRIGHTS LOCAL 1121 - Zone 2			04/01/2019	9 \$3	8.87 \$9.90	\$18.50	\$0.00	\$67.27

Apprentice -	MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile								
Effective Date	- 08/01/2019								
Step    percent    Apprentice Base Wage    Health    Pension    Unemployment    Total Rate      1    55    \$21.38    \$9.90    \$5.31    \$0.00    \$36.59      2    65    \$25.27    \$9.90    \$15.13    \$0.00    \$50.30      3    75    \$29.15    \$9.90    \$16.10    \$0.00    \$55.15      4    85    \$33.04    \$9.90    \$17.06    \$0.00    \$60.00      Notes:      Steps are 2,000 hours      Apprentice to Journeyworker Ratio:1:5		Effective Date - 04/01/2019					Sumplemental		
---	-----------------	-----------------------------	-----------------------------------	----------------------	--------------------	---------	--------------	-----------------	--------------------
1  55  \$21.38  \$9.90  \$5.31  \$0.00  \$36.59    2  65  \$25.27  \$9.90  \$15.13  \$0.00  \$50.30    3  75  \$29.15  \$9.90  \$16.10  \$0.00  \$55.15    4  85  \$33.04  \$9.90  \$17.06  \$0.00  \$60.00    Notes:		Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total R	late
2  65  \$25.27  \$9.90  \$15.13  \$0.00  \$50.30    3  75  \$29.15  \$9.90  \$16.10  \$0.00  \$55.15    4  85  \$33.04  \$9.90  \$17.06  \$0.00  \$60.00    Notes:		1	55	\$21.38	\$9.90	\$5.31	\$0.00	\$36	.59
3  75  \$29.15  \$9.90  \$16.10  \$0.00  \$55.15    4  85  \$33.04  \$9.90  \$17.06  \$0.00  \$60.00    Notes:		2	65	\$25.27	\$9.90	\$15.13	\$0.00	\$50	.30
4  85  \$33.04  \$9.90  \$17.06  \$0.00  \$60.00    Notes:		3	75	\$29.15	\$9.90	\$16.10	\$0.00	\$55	.15
Notes:		4	85	\$33.04	\$9.90	\$17.06	\$0.00	\$60	0.00
Steps are 2,000 hours		Notes:	·						
Apprentice to Journeyworker Ratio:1:5      MORTAR MIXER    06/01/2019    \$34.20    \$7.85    \$14.88    \$0.00    \$56.97			Steps are 2,000 hours						
MORTAR MIXER 06/01/2019 \$34.20 \$7.85 \$14.88 \$0.00 \$56.92		Appre	ntice to Journeyworker Ratio:1:5						
	MORTAR MIX	XER		06/01/2019	\$34.20	\$7.85	\$14 88	\$0.00	\$56.93
LABORERS - ZONE 2 12/01/2019 \$35.06 \$7.85 \$14.88 \$0.00 \$57.70	LABORERS - ZONH	E 2		12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
				06/01/2020	\$35.00	\$7.85	\$14.88	\$0.00	\$58.68
12/01/2020 \$36.84 \$7.85 \$14.88 \$0.00 \$59.50 12/01/2020 \$36.84 \$7.85 \$14.88 \$0.00 \$59.50				12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.50 \$59.57
06/01/2021 \$37.76 \$7.85 \$14.88 \$0.00 \$60.44				06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
12/01/2021 \$38.67 \$7.85 \$14.88 \$0.00 \$61.40				12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER"	For apprentice	e rates see "	Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES, GRADALLS)    06/01/2019    \$23.11    \$12.00    \$15.60    \$0.00    \$50.7	OILER (OTHE	R THAN	TRUCK CRANES, GRADALLS)	06/01/2019	\$23.11	\$12.00	\$15.60	\$0.00	\$50.71
12/01/2019 \$23.68 \$12.00 \$15.60 \$0.00 \$51.28	OI ERAIINO ENOI	INEERS EC	ICAL 4	12/01/2019	\$23.68	\$12.00	\$15.60	\$0.00	\$51.28
06/01/2020 \$24.23 \$12.00 \$15.60 \$0.00 \$51.83				06/01/2020	\$24.23	\$12.00	\$15.60	\$0.00	\$51.83
12/01/2020 \$24.80 \$12.00 \$15.60 \$0.00 \$52.40				12/01/2020	\$24.80	\$12.00	\$15.60	\$0.00	\$52.40
06/01/2021 \$25.35 \$12.00 \$15.60 \$0.00 \$52.9				06/01/2021	\$25.35	\$12.00	\$15.60	\$0.00	\$52.95
12/01/2021 \$25.93 \$12.00 \$15.60 \$0.00 \$53.52	<b>.</b>			12/01/2021	\$25.93	\$12.00	\$15.60	\$0.00	\$53.53
For apprentice rates see "Apprentice- OPERATING ENGINEERS"	For apprentice	e rates see "	Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS)    06/01/2019    \$27.57    \$12.00    \$15.60    \$0.00    \$55.17      OPERATING ENGINEERS LOCAL 4    06/01/2019    \$27.57    \$12.00    \$15.60    \$0.00    \$55.17	OILER (IRUC	INEERS LO	NES, GRADALLS) DCAL 4	06/01/2019	\$27.57	\$12.00	\$15.60	\$0.00	\$55.17
12/01/2019 \$28.24 \$12.00 \$15.60 \$0.00 \$55.84				12/01/2019	\$28.24	\$12.00	\$15.60	\$0.00	\$55.84
06/01/2020 \$28.89 \$12.00 \$15.60 \$0.00 \$56.49				06/01/2020	\$28.89	\$12.00	\$15.60	\$0.00	\$56.49
12/01/2020 \$29.57 \$12.00 \$15.60 \$0.00 \$57.1				12/01/2020	\$29.57	\$12.00	\$15.60	\$0.00	\$57.17
06/01/2021 \$30.21 \$12.00 \$15.60 \$0.00 \$57.8				06/01/2021	\$30.21	\$12.00	\$15.60	\$0.00	\$57.81
12/01/2021    \$30.89    \$12.00    \$15.60    \$0.00    \$58.49	For oppropriate	a rotas sas "	Appropriate ODED ATING ENGINEEDS"	12/01/2021	\$30.89	\$12.00	\$15.60	\$0.00	\$58.49
OTHER POWER DRIVEN FOLIPMENT - CLASS II 000000000000000000000000000000000	OTHER POWE	FR DRIV	TEN FOLUPMENT - CLASS U	0.(101/2010		¢12.00	¢15.00	¢0.00	<b>\$75.20</b>
OPERATING ENGINEERS LOCAL 4    10/01/2019    \$4/.69    \$12.00    \$15.60    \$0.00    \$/5.25	OPERATING ENG	INEERS LO	DCAL 4	06/01/2019	\$47.69	\$12.00	\$15.00	\$0.00 ¢0.00	\$75.29
12/01/2019 \$48.83 \$12.00 \$15.60 \$0.00 \$76.4				12/01/2019	\$48.83	\$12.00	\$15.00	\$0.00 ¢0.00	\$/6.43
06/01/2020 \$49.91 \$12.00 \$15.60 \$0.00 \$77.5				06/01/2020	\$49.91	\$12.00	\$15.60	\$0.00	\$77.51
				12/01/2020	\$51.05	\$12.00	\$15.00	\$0.00	\$/8.65
06/01/2021 \$52.14 \$12.00 \$15.60 \$0.00 \$/9.74				06/01/2021	\$52.14	\$12.00	\$15.60	\$0.00	\$79.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"    12/01/2021    \$53.28    \$12.00    \$15.60    \$0.00    \$80.88	For apprentice	e rates see "	Apprentice- OPERATING ENGINEERS"	12/01/2021	\$53.28	\$12.00	\$15.00	20.00	\$80.88
PAINTER (BRIDGES/TANKS) 07/01/2019 \$50.66 \$8.20 \$21.45 \$0.00 \$80.3	PAINTER (BR	IDGES/	TANKS)	07/01/2010	\$50.66	\$8.20	\$21.45	\$0.00	\$80.31
PAINTERS LOCAL 35 - ZONE 2 01/01/2017 \$50,00 \$62,20 \$22,10 \$0,00 \$81,20	PAINTERS LOCAL	L 35 - ZONI	22	01/01/2010	\$50.00 \$50.96	\$8.20	\$22.10	\$0.00	\$81.26
07/01/2020 \$50,00 \$0.20 \$22.10 \$0.00 \$01.20 07/01/2020 \$52.06 \$8.20 \$22.10 \$0.00 \$82.20				07/01/2020	) \$52.06	\$8.20	\$22.10	\$0.00	\$82.36
01/01/2021 \$53.16 \$8.20 \$22.10 \$0.00 \$83.4				01/01/2020	\$53.16	\$8.20	\$22.10	\$0.00	\$83.46

Apprentice -	MILLWRIGHT - Local 1121 Zone 2
	04/01/2010

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Effectiv	e Date -	07/01/2019				Supplemental	
Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	50		\$25.33	\$8.20	\$0.00	\$0.00	\$33.53
2	55		\$27.86	\$8.20	\$5.78	\$0.00	\$41.84
3	60		\$30.40	\$8.20	\$6.30	\$0.00	\$44.90
4	65		\$32.93	\$8.20	\$6.83	\$0.00	\$47.96
5	70		\$35.46	\$8.20	\$18.30	\$0.00	\$61.96
6	75		\$38.00	\$8.20	\$18.83	\$0.00	\$65.03
7	80		\$40.53	\$8.20	\$19.35	\$0.00	\$68.08
8	90		\$45.59	\$8.20	\$20.40	\$0.00	\$74.19

# Apprentice - PAINTER Local 35 - BRIDGES/TANKS

Effective Date -	01/01/2020

Effec	tive Date - 01/01/2020				Supplemental		
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	50	\$25.48	\$8.20	\$0.00	\$0.00	\$33.68	
2	55	\$28.03	\$8.20	\$5.94	\$0.00	\$42.17	
3	60	\$30.58	\$8.20	\$6.48	\$0.00	\$45.26	
4	65	\$33.12	\$8.20	\$7.02	\$0.00	\$48.34	
5	70	\$35.67	\$8.20	\$18.51	\$0.00	\$62.38	
6	75	\$38.22	\$8.20	\$19.05	\$0.00	\$65.47	
7	80	\$40.77	\$8.20	\$19.59	\$0.00	\$68.56	
8	90	\$45.86	\$8.20	\$20.67	\$0.00	\$74.73	
Notes	Steps are 750 hrs.						
Appr	entice to Journeyworker Ratio:1:1						
PAINTER (SIGN, PIC PAINTERS LOCAL 35 - ZOI	TORIAL & DISPLAY) NE 2	06/01/2013	\$\$25.81	\$7.07	\$7.05	\$0.00 \$3	9.93

Eff	ective Date -	06/01/2013				Supplemental			
Ste	p percent	А	pprentice Base Wage	Health	Pension	Unemployment	Tot	al Rate	
1	50		\$12.91	\$7.07	\$0.00	\$0.00		\$19.98	
2	55		\$14.20	\$7.07	\$2.45	\$0.00		\$23.72	
3	60		\$15.49	\$7.07	\$2.45	\$0.00		\$25.01	
4	65		\$16.78	\$7.07	\$2.45	\$0.00		\$26.30	
5	70		\$18.07	\$7.07	\$7.05	\$0.00		\$32.19	
6	75		\$19.36	\$7.07	\$7.05	\$0.00		\$33.48	
7	80		\$20.65	\$7.07	\$7.05	\$0.00		\$34.77	
8	85		\$21.94	\$7.07	\$7.05	\$0.00		\$36.06	
9	90		\$23.23	\$7.07	\$7.05	\$0.00		\$37.35	
Not	tes:								
	Steps are	4 mos.							
Ap	prentice to Jo	urneyworker Ratio:1:1							
PAINTER (SPRAY	OR SANDBL	AST, NEW) *	07/01/2019	\$41.5	6 \$8.20	\$21.45	\$0.00	\$71.21	
* If 30% or more of surfaces to be painted are new construction,		01/01/2020	\$41.8	6 \$8.20	\$22.10	\$0.00	\$72.16		
THE W Parit Tate Shar	i de useu. <i>PAINI</i>	ERS LOCAL 55 - ZONE 2	07/01/2020	\$42.9	6 \$8.20	\$22.10	\$0.00	\$73.26	
			01/01/2021	\$44.0	6 \$8.20	\$22.10	\$0.00	\$74.36	

#### Apprentice - PAINTER SIGN - Local 35 Zone 2 Effective Data 06/01/2013

Effecti	ive Date - 07/01/2019				Supplemental		
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	50	\$20.78	\$8.20	\$0.00	\$0.00	\$28.98	
2	55	\$22.86	\$8.20	\$5.78	\$0.00	\$36.84	
3	60	\$24.94	\$8.20	\$6.30	\$0.00	\$39.44	
4	65	\$27.01	\$8.20	\$6.83	\$0.00	\$42.04	
5	70	\$29.09	\$8.20	\$18.30	\$0.00	\$55.59	
6	75	\$31.17	\$8.20	\$18.83	\$0.00	\$58.20	
7	80	\$33.25	\$8.20	\$19.35	\$0.00	\$60.80	
8	90	\$37.40	\$8.20	\$20.40	\$0.00	\$66.00	

Apprentice -	PAINTER Local 35 Zone 2 - Spray/Sandblast - New
	07/01/0010

#### **Effective Date -** 01/01/2020

Effecti	ive Date - 01/01/2020			Supplemental			
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	2
1	50	\$20.93	\$8.20	\$0.00	\$0.00	\$29.13	
2	55	\$23.02	\$8.20	\$5.94	\$0.00	\$37.16	, )
3	60	\$25.12	\$8.20	\$6.48	\$0.00	\$39.80	)
4	65	\$27.21	\$8.20	\$7.02	\$0.00	\$42.43	;
5	70	\$29.30	\$8.20	\$18.51	\$0.00	\$56.01	
6	75	\$31.40	\$8.20	\$19.05	\$0.00	\$58.65	j
7	80	\$33.49	\$8.20	\$19.59	\$0.00	\$61.28	3
8	90	\$37.67	\$8.20	\$20.67	\$0.00	\$66.54	Ļ
Notes:		·					
	Steps are 750 hrs.						
Appre	entice to Journeyworker Ratio:1:1						
PAINTER (SPRAY OR	R SANDBLAST, REPAINT)	07/01/2019	\$39.62	\$8.20	\$21.45	\$0.00	\$69.27
PAINIERS LOCAL 35 - ZON	E 2	01/01/2020	\$39.92	\$8.20	\$22.10	\$0.00	\$70.22
		07/01/2020	\$41.02	\$8.20	\$22.10	\$0.00	\$71.32

01/01/2021

\$42.12

\$8.20

\$22.10

\$0.00

\$72.42

Effecti	ive Date - 0	07/01/2019				Supplemental	
Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	50		\$19.81	\$8.20	\$0.00	\$0.00	\$28.01
2	55		\$21.79	\$8.20	\$5.78	\$0.00	\$35.77
3	60		\$23.77	\$8.20	\$6.30	\$0.00	\$38.27
4	65		\$25.75	\$8.20	\$6.83	\$0.00	\$40.78
5	70		\$27.73	\$8.20	\$18.30	\$0.00	\$54.23
6	75		\$29.72	\$8.20	\$18.83	\$0.00	\$56.75
7	80		\$31.70	\$8.20	\$19.35	\$0.00	\$59.25
8	90		\$35.66	\$8.20	\$20.40	\$0.00	\$64.26

Apprentice -	PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint
Effoative Date	07/01/2010

#### **Effective Date -** 01/01/2020

	Effect	ive Date - 01/01/2020				Supplemental		
	Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Tota	l Rate
	1	50	\$19.96	\$8.20	\$0.00	\$0.00	\$	28.16
	2	55	\$21.96	\$8.20	\$5.94	\$0.00	\$	36.10
	3	60	\$23.95	\$8.20	\$6.48	\$0.00	\$	38.63
	4	65	\$25.95	\$8.20	\$7.02	\$0.00	\$	41.17
	5	70	\$27.94	\$8.20	\$18.51	\$0.00	\$	54.65
	6	75	\$29.94	\$8.20	\$19.05	\$0.00	\$	57.19
	7	80	\$31.94	\$8.20	\$19.59	\$0.00	\$	59.73
	8	90	\$35.93	\$8.20	\$20.67	\$0.00	\$	64.80
	Notes:							·
		Steps are 750 hrs.						
	Appre	entice to Journeyworker Ratio:1:1						
PAINTER (TRA	AFFIC I	MARKINGS)	06/01/2019	\$33.95	\$7.85	\$14.88	\$0.00	\$56.68
LABORERS - ZONE	E 2		12/01/2019	\$34.81	\$7.85	\$14.88	\$0.00	\$57.54
			06/01/2020	\$35.70	\$7.85	\$14.88	\$0.00	\$58.43
			12/01/2020	\$36.59	\$7.85	\$14.88	\$0.00	\$59.32
			06/01/2021	\$37.51	\$7.85	\$14.88	\$0.00	\$60.24
			12/01/2021	\$38.42	\$7.85	\$14.88	\$0.00	\$61.15
For Apprentice	e rates see	"Apprentice- LABORER"						
PAINTER / TA	PER (B	RUSH, NEW) *	07/01/2019	\$40.16	\$8.20	\$21.45	\$0.00	\$69.81
* If 30% or more NEW paint rate	e of sur	taces to be painted are new construction	on, 01/01/2020	\$40.46	\$8.20	\$22.10	\$0.00	\$70.76
THE W Parine rate	Shall U	used.) AINTERS LOCAL 55 - ZONE 2	07/01/2020	\$41.56	\$8.20	\$22.10	\$0.00	\$71.86

01/01/2021

\$42.66

\$8.20

\$22.10

\$0.00

\$72.96

Effecti	ive Date - 07/01/2019				Supplemental		
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	50	\$20.08	\$8.20	\$0.00	\$0.00	\$28.28	
2	55	\$22.09	\$8.20	\$5.78	\$0.00	\$36.07	
3	60	\$24.10	\$8.20	\$6.30	\$0.00	\$38.60	
4	65	\$26.10	\$8.20	\$6.83	\$0.00	\$41.13	
5	70	\$28.11	\$8.20	\$18.30	\$0.00	\$54.61	
6	75	\$30.12	\$8.20	\$18.83	\$0.00	\$57.15	
7	80	\$32.13	\$8.20	\$19.35	\$0.00	\$59.68	
8	90	\$36.14	\$8.20	\$20.40	\$0.00	\$64.74	

# Apprentice - PAINTER - Local 35 Zone 2 - BRUSH NEW

#### **Effective Date -** 01/01/2020

fective Date -	01/01/2020							
ep percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rat	e	
50		\$20.23	\$8.20	\$0.00	\$0.00	\$28.4	3	
55		\$22.25	\$8.20	\$5.94	\$0.00	\$36.3	9	
60		\$24.28	\$8.20	\$6.48	\$0.00	\$38.9	6	
65		\$26.30	\$8.20	\$7.02	\$0.00	\$41.5	2	
70		\$28.32	\$8.20	\$18.51	\$0.00	\$55.0	3	
75		\$30.35	\$8.20	\$19.05	\$0.00	\$57.6	0	
80		\$32.37	\$8.20	\$19.59	\$0.00	\$60.1	6	
90		\$36.41	\$8.20	\$20.67	\$0.00	\$65.2	8	
otes:								
Steps are	e 750 hrs.							
pprentice to Jo	ourneyworker Ratio:1:1							
R (BRUSH, RE	EPAINT)	07/01/2019	\$38.22	2 \$8.20	\$21.45	\$0.00	\$67.87	
ZONE 2		01/01/2020	\$38.52	88.20	\$22.10	\$0.00	\$68.82	
		07/01/2020	\$39.62	2 \$8.20	\$22.10	\$0.00	\$69.92	
	fective Date - ep percent 50 55 60 65 70 75 80 90 otes: Steps are oprentice to Jo R (BRUSH, RH ZONE 2	fective Date -    01/01/2020      ep    percent      50    55      60    65      70    75      80    90      Potes:    Steps are 750 hrs.      Steps are 750 hrs.    Steps are 750 hrs.	factive Date -    01/01/2020      ep    percent    Apprentice Base Wage      50    \$20.23      55    \$22.25      60    \$24.28      65    \$26.30      70    \$28.32      75    \$30.35      80    \$32.37      90    \$36.41      Oprentice to Journeyworker Ratio:1:1      R (BRUSH, REPAINT)      20NE 2    01/01/2015      01/01/2020    07/01/2015	factive Date -  01/01/2020    ep  percent  Apprentice Base Wage  Health    50  \$20.23  \$8.20    55  \$22.25  \$8.20    60  \$24.28  \$8.20    65  \$26.30  \$8.20    70  \$28.32  \$8.20    70  \$28.32  \$8.20    75  \$30.35  \$8.20    80  \$32.37  \$8.20    90  \$36.41  \$8.20    oftes:    Steps are 750 hrs.    OT/01/2019  \$38.22    01/01/2020  \$38.52    01/01/2020  \$38.52    07/01/2019  \$38.52    07/01/2020  \$39.62	fective Date -    01/01/2020      ep    percent    Apprentice Base Wage    Health    Pension      50    \$20.23    \$8.20    \$0.00      55    \$22.25    \$8.20    \$5.94      60    \$24.28    \$8.20    \$6.48      65    \$26.30    \$8.20    \$7.02      70    \$28.32    \$8.20    \$18.51      75    \$30.35    \$8.20    \$19.05      80    \$32.37    \$8.20    \$19.59      90    \$36.41    \$8.20    \$20.67      Oprentice to Journeyworker Ratio:1:1      R (BRUSH, REPAINT)      ZONE 2    01/01/2020    \$38.52    \$8.20      07/01/2020    \$39.62    \$8.20	factive Date -    01/01/2020    Supplemental    Pension    Unemployment      50    \$20.23    \$8.20    \$0.00    \$0.00      55    \$22.25    \$8.20    \$5.94    \$0.00      60    \$24.28    \$8.20    \$6.48    \$0.00      65    \$26.30    \$8.20    \$7.02    \$0.00      70    \$28.32    \$8.20    \$18.51    \$0.00      70    \$28.32    \$8.20    \$19.05    \$0.00      80    \$32.37    \$8.20    \$19.59    \$0.00      90    \$36.41    \$8.20    \$20.67    \$0.00      5tes:    Steps are 750 hrs.    \$20.23    \$38.52    \$8.20    \$21.45      20NE 2    \$0/01/01/2020    \$38.52    \$8.20    \$22.10      07/01/2020    \$39.62    \$8.20    \$22.10	factive Date -    01/01/2020    Supplemental Unemployment    Total Rat      50    \$20.23    \$8.20    \$0.00    \$28.4      55    \$22.25    \$8.20    \$5.94    \$0.00    \$36.3      60    \$24.28    \$8.20    \$6.48    \$0.00    \$38.9      65    \$26.30    \$8.20    \$7.02    \$0.00    \$41.5      70    \$28.32    \$8.20    \$18.51    \$0.00    \$55.0      70    \$28.32    \$8.20    \$18.51    \$0.00    \$55.0      75    \$30.35    \$8.20    \$19.05    \$0.00    \$65.2      90    \$36.41    \$8.20    \$20.67    \$0.00    \$65.2      ottes:    Steps are 750 hrs.    \$20.67    \$0.00    \$65.2      steps are 750 hrs.    \$38.22    \$8.20    \$21.45    \$0.00      07/01/2019    \$38.22    \$8.20    \$22.10    \$0.00      01/01/2020    \$38.52    \$8.20    \$22.10    \$0.00      01/01/2020    \$38.52    \$8.20 <t< th=""></t<>	

01/01/2021

\$40.72

\$8.20

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\$22.10

\$0.00

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\$71.02

Effecti	ive Date - 07/01/2019	07/01/2019			Supplemental	
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	50	\$19.11	\$8.20	\$0.00	\$0.00	\$27.31
2	55	\$21.02	\$8.20	\$5.78	\$0.00	\$35.00
3	60	\$22.93	\$8.20	\$6.30	\$0.00	\$37.43
4	65	\$24.84	\$8.20	\$6.83	\$0.00	\$39.87
5	70	\$26.75	\$8.20	\$18.30	\$0.00	\$53.25
6	75	\$28.67	\$8.20	\$18.83	\$0.00	\$55.70
7	80	\$30.58	\$8.20	\$19.35	\$0.00	\$58.13
8	90	\$34.40	\$8.20	\$20.40	\$0.00	\$63.00

Apprentice -	PAINTER Local 35 Zone 2 - BRUSH REPAINT
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Effective Date -	01/01/2020
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	Effecti	ive Date - 01/01/2020			Supplemental			
S	Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
	1	50	\$19.26	\$8.20	\$0.00	\$0.00	\$27.46	
	2	55	\$21.19	\$8.20	\$5.94	\$0.00	\$35.33	
	3	60	\$23.11	\$8.20	\$6.48	\$0.00	\$37.79	
	4	65	\$25.04	\$8.20	\$7.02	\$0.00	\$40.26	
	5	70	\$26.96	\$8.20	\$18.51	\$0.00	\$53.67	
	6	75	\$28.89	\$8.20	\$19.05	\$0.00	\$56.14	
	7	80	\$30.82	\$8.20	\$19.59	\$0.00	\$58.61	
	8	90	\$34.67	\$8.20	\$20.67	\$0.00	\$63.54	
_ 1	Notes:							
		Steps are 750 hrs.						
1	Appre	ntice to Journeyworker Ratio:1:1						
PANEL & PICKU	JP TR	UCKS DRIVER	08/01/2019	\$34.08	\$12.41	\$12.70	\$0.00	\$59.19
TEAMSTERS JOINT C	COUNC	IL NO. 10 ZONE B	12/01/2019	\$34.08	\$12.41	\$13.72	\$0.00	\$60.21
			06/01/2020	\$34.98	\$12.41	\$13.72	\$0.00	\$61.11
			08/01/2020	\$34.98	\$12.91	\$13.72	\$0.00	\$61.61
			12/01/2020	\$34.98	\$12.91	\$14.82	\$0.00	\$62.71
			06/01/2021	\$35.78	\$12.91	\$14.82	\$0.00	\$63.51
			08/01/2021	\$35.78	\$13.41	\$14.82	\$0.00	\$64.01
			12/01/2021	\$35.78	\$13.41	\$16.01	\$0.00	\$65.20
PIER AND DOCI DECK) PILE DRIVER LOCAL	K CON	NSTRUCTOR (UNDERPINNING ANI	08/01/2019	\$48.94	\$9.90	\$21.15	\$0.00	\$79.99
PILE DRIVER	ies see "	Apprendee- FILE DRIVER	00/01/2010	¢1004	\$0.00	\$21.15	\$0.00	\$70.00
PILE DRIVER LOCAL	L 56 (ZC	DNE 1)	08/01/2019	\$40.94	\$9.90	φ <b>21.1</b> 3	φ0.00	\$/7.77

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	Effective Date - 08/01/2019		01/2019				Supplemental		
	Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	2
	1	50		\$24.47	\$9.90	\$21.15	\$0.00	\$55.52	2
	2	60		\$29.36	\$9.90	\$21.15	\$0.00	\$60.41	
	3	70		\$34.26	\$9.90	\$21.15	\$0.00	\$65.31	
	4	75		\$36.71	\$9.90	\$21.15	\$0.00	\$67.76	5
	5	80		\$39.15	\$9.90	\$21.15	\$0.00	\$70.20	)
	6	80		\$39.15	\$9.90	\$21.15	\$0.00	\$70.20	)
	7	90		\$44.05	\$9.90	\$21.15	\$0.00	\$75.10	)
	8	90		\$44.05	\$9.90	\$21.15	\$0.00	\$75.10	)
	Notes:							   	
	Appre	entice to Journe	worker Ratio:1:5						
PIPELAYER				06/01/2019	\$34.	20 \$7.85	\$14.88	\$0.00	\$56.93
LABORERS - ZONE	2			12/01/2019	\$35.	06 \$7.85	\$14.88	\$0.00	\$57.79
				06/01/2020	\$35.	95 \$7.85	\$14.88	\$0.00	\$58.68
				12/01/2020	\$36.	84 \$7.85	\$14.88	\$0.00	\$59.57
				06/01/2021	\$37.	76 \$7.85	\$14.88	\$0.00	\$60.49
				12/01/2021	\$38.	67 \$7.85	\$14.88	\$0.00	\$61.40
For apprentice	rates see '	"Apprentice- LABOI	RER"						
PLUMBER & F	PIPEFIT <i>efitters</i>	TER S LOCAL 51		09/01/2018	\$42.	04 \$10.00	\$18.20	\$0.00	\$70.24

Apprentice -	PILE DRIVER - Local 56 Zone 1
	00/01/2010

Step	ve Date - 09/01/2018	Apprentice Base Wage	Apprentice Base Wage Health		Supplemental Unemployment	Total Rate	
$\frac{\operatorname{step}}{1}$	40	\$16.82	\$10.00	\$2.50	\$0.00	\$29.32	
2	50	\$21.02	\$10.00	\$2.50 \$2.50	\$0.00 \$0.00	\$33.52	
3	60	\$25.22	\$10.00	\$7.85	\$0.00	\$43.07	
4	70	\$29.43	\$10.00	\$12.56	\$0.00	\$51.99	
5	80	\$33.63	\$10.00	\$15.70	\$0.00	\$59.33	
Notes:	Steps 2000hrs. Prior 9/1.	/05; 40/40/45/50/55/60/65/75/80/85				   	
Appre	ntice to Journeyworker l	Ratio:1:3					
UMATIC CONTRO	OLS (TEMP.)	09/01/2018	8 \$42.0	94 \$10.00	\$18.20	\$0.00	\$70.24

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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PNEUMATIC DRILL/TOOL OPERATOR	06/01/2019	\$34.20	\$7.85	\$14.88	\$0.00	\$56.93
LABORERS - ZONE 2	12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
	06/01/2020	\$35.95	\$7.85	\$14.88	\$0.00	\$58.68
	12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.57
	06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
	12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER	06/01/2019	\$34.95	\$7.85	\$14.88	\$0.00	\$57.68
	12/01/2019	\$35.81	\$7.85	\$14.88	\$0.00	\$58.54
	06/01/2020	\$36.70	\$7.85	\$14.88	\$0.00	\$59.43
	12/01/2020	\$37.59	\$7.85	\$14.88	\$0.00	\$60.32
	06/01/2021	\$38.51	\$7.85	\$14.88	\$0.00	\$61.24
	12/01/2021	\$39.42	\$7.85	\$14.88	\$0.00	\$62.15
For apprentice rates see "Apprentice- LABORER"						
POWER SHOVEL/DERRICK/TRENCHING MACHINE OPERATING ENGINEERS LOCAL 4	06/01/2019	\$48.18	\$12.00	\$15.60	\$0.00	\$75.78
	12/01/2019	\$49.33	\$12.00	\$15.60	\$0.00	\$76.93
	06/01/2020	\$50.43	\$12.00	\$15.60	\$0.00	\$78.03
	12/01/2020	\$51.58	\$12.00	\$15.60	\$0.00	\$79.18
	06/01/2021	\$52.68	\$12.00	\$15.60	\$0.00	\$80.28
	12/01/2021	\$53.83	\$12.00	\$15.60	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) OPERATING ENGINEERS LOCAL 4	06/01/2019	\$48.18	\$12.00	\$15.60	\$0.00	\$75.78
	12/01/2019	\$49.33	\$12.00	\$15.60	\$0.00	\$76.93
	06/01/2020	\$50.43	\$12.00	\$15.60	\$0.00	\$78.03
	12/01/2020	\$51.58	\$12.00	\$15.60	\$0.00	\$79.18
	06/01/2021	\$52.68	\$12.00	\$15.60	\$0.00	\$80.28
	12/01/2021	\$53.83	\$12.00	\$15.60	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OPERATOR (DEWATERING, OTHER)	06/01/2019	\$32.28	\$12.00	\$15.60	\$0.00	\$59.88
	12/01/2019	\$33.07	\$12.00	\$15.60	\$0.00	\$60.67
	06/01/2020	\$33.82	\$12.00	\$15.60	\$0.00	\$61.42
	12/01/2020	\$34.60	\$12.00	\$15.60	\$0.00	\$62.20
	06/01/2021	\$35.35	\$12.00	\$15.60	\$0.00	\$62.95
	12/01/2021	\$36.14	\$12.00	\$15.60	\$0.00	\$63.74
PECL AIMEDS				<b>.</b>	<u> </u>	
OPERATING ENGINEERS LOCAL 4	06/01/2019	\$47.69	\$12.00	\$15.60	\$0.00	\$75.29
	12/01/2019	\$48.83	\$12.00	\$15.60	\$0.00	\$76.43
	06/01/2020	\$49.91	\$12.00	\$15.60	\$0.00	\$77.51
	12/01/2020	\$51.05	\$12.00	\$15.60	\$0.00	\$78.65
	06/01/2021	\$52.14	\$12.00	\$15.60	\$0.00	\$79.74
	12/01/2021	\$53.28	\$12.00	\$15.60	\$0.00	\$80.88

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
RIDE-ON MOTORIZED BUGGY OPERATOR	06/01/2019	\$34.20	\$7.85	\$14.88	\$0.00	\$56.93
LABORERS - ZONE 2	12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
	06/01/2020	Etive DateBase WageHealthPensionSuppremental UnemploymentTotal Unemployment $01/2019$ \$34.20\$7.85\$14.88\$0.00\$56 $01/2019$ \$35.06\$7.85\$14.88\$0.00\$57 $01/2020$ \$35.95\$7.85\$14.88\$0.00\$56 $01/2020$ \$36.84\$7.85\$14.88\$0.00\$59 $01/2021$ \$37.76\$7.85\$14.88\$0.00\$66 $01/2021$ \$37.76\$7.85\$14.88\$0.00\$66 $01/2021$ \$38.67\$7.85\$14.88\$0.00\$66 $01/2021$ \$38.67\$7.85\$14.88\$0.00\$66 $01/2021$ \$37.76\$7.85\$14.88\$0.00\$66 $01/2021$ \$38.67\$7.85\$14.88\$0.00\$76 $01/2019$ \$47.69\$12.00\$15.60\$0.00\$77 $01/2020$ \$49.91\$12.00\$15.60\$0.00\$77 $01/2021$ \$52.14\$12.00\$15.60\$0.00\$77 $01/2021$ \$53.28\$12.00\$15.60\$0.00\$77 $01/2021$ \$44.64\$11.50\$15.90\$0.00\$77 $01/2020$ \$45.92\$11.50\$15.90\$0.00\$77 $01/2021$ \$48.78\$11.50\$15.90\$0.00\$77 $01/2021$ \$48.78\$11.50\$15.90\$0.00\$77 $01/2021$ \$48.78\$11.50\$15.90\$0.00\$77 $01/2021$ \$50.21 <t< td=""><td>\$58.68</td></t<>	\$58.68			
	12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.57
	06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
For apprentice rates see "Apprentice- LABORER"	12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40
ROLLER/SPREADER/MULCHING MACHINE	06/01/2019	\$47.69	\$12.00	\$15.60	\$0.00	\$75.29
OPERATING ENGINEERS LOCAL 4	12/01/2019	\$48.83	\$12.00	\$15.60	\$0.00	\$76.43
	06/01/2020	\$49.91	\$12.00	\$15.60	\$0.00	\$77.51
	12/01/2020	\$51.05	\$12.00	\$15.60	\$0.00	\$78.65
	06/01/2021	\$52.14	\$12.00	\$15.60	\$0.00	\$79.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2021	\$53.28	\$12.00	\$15.60	\$0.00	\$80.88
ROOFER (Inc.Roofer Waterproofng &Roofer Damproofg)	08/01/2019	\$44.64	\$11.50	\$15.90	\$0.00	\$72.04
ROOFERS LOCAL 33	02/01/2020	\$45.92	\$11.50	\$15.90	\$0.00	\$73.32
	08/01/2020	\$47.35	\$11.50	\$15.90	\$0.00	\$74.75
	02/01/2021	\$48.78	\$11.50	\$15.90	\$0.00	\$76.18
	08/01/2021	\$50.21	\$11.50	\$15.90	\$0.00	\$77.61
	02/01/2022	\$51.64	\$11.50	\$15.90	\$0.00	\$79.04

# Apprentice - ROOFER - Local 33

Effecti	ve Date -	08/01/2019				Supplemental		
Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	50		\$22.32	\$11.50	\$3.69	\$0.00	\$37.51	
2	60		\$26.78	\$11.50	\$15.90	\$0.00	\$54.18	
3	65		\$29.02	\$11.50	\$15.90	\$0.00	\$56.42	
4	75		\$33.48	\$11.50	\$15.90	\$0.00	\$60.88	
5	85		\$37.94	\$11.50	\$15.90	\$0.00	\$65.34	

Effective Date -		02/01/2020			Supplemental	
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	50	\$22.96	\$11.50	\$3.69	\$0.00	\$38.15
2	60	\$27.55	\$11.50	\$15.90	\$0.00	\$54.95
3	65	\$29.85	\$11.50	\$15.90	\$0.00	\$57.25
4	75	\$34.44	\$11.50	\$15.90	\$0.00	\$61.84
5	85	\$39.03	\$11.50	\$15.90	\$0.00	\$66.43
Notes:	** 1:5, 2:6 Step 1 is 2 (Hot Pitch	10, the 1:10; Reroofing: 1:4, then 1:1 000 hrs.; Steps 2-5 are 1000 hrs. Mechanics' receive \$1.00 hr. above ROOFER)				

Apprentice to Journeyworker Ratio:\*\*

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ROOFER SLATE / TILE / PRECAST CONCRETE	08/01/2019	\$44.89	\$11.50	\$15.90	\$0.00	\$72.29
ROOFERS LOCAL 33	02/01/2020	\$46.17	\$11.50	\$15.90	\$0.00	\$73.57
	08/01/2020	\$47.60	\$11.50	\$15.90	\$0.00	\$75.00
	02/01/2021	\$49.03	\$11.50	\$15.90	\$0.00	\$76.43
	08/01/2021	\$50.46	\$11.50	\$15.90	\$0.00	\$77.86
For apprentice rates see "Apprentice- ROOFER"	02/01/2022	\$51.89	\$11.50	\$15.90	\$0.00	\$79.29
SHEETMETAL WORKER	08/01/2019	\$48.10	\$13.20	\$24.12	\$2.56	\$87.98
SHEEIMEIAL WORKERS LOCAL 1/ - A	02/01/2020	\$49.75	\$13.20	\$24.12	\$2.61	\$89.68
	08/01/2020	\$51.35	\$13.20	\$24.12	\$2.66	\$91.33
	02/01/2021	\$53.00	\$13.20	\$24.12	\$2.71	\$93.03
	08/01/2021	\$54.75	\$13.20	\$24.12	\$2.76	\$94.83
	02/01/2022	\$56.50	\$13.20	\$24.12	\$2.81	\$96.63

## Apprentice - SHEET METAL WORKER - Local 17-A

Effectiv	ve Date - 08/01/2019				Supplemental	
Step	percent	Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	42	\$20.20	\$13.20	\$5.89	\$0.00	\$39.29
2	42	\$20.20	\$13.20	\$5.89	\$0.00	\$39.29
3	47	\$22.61	\$13.20	\$11.13	\$1.41	\$48.35
4	47	\$22.61	\$13.20	\$11.13	\$1.41	\$48.35
5	52	\$25.01	\$13.20	\$12.08	\$1.51	\$51.80
6	52	\$25.01	\$13.20	\$12.33	\$1.52	\$52.06
7	60	\$28.86	\$13.20	\$13.70	\$1.67	\$57.43
8	65	\$31.27	\$13.20	\$14.65	\$1.77	\$60.89
9	75	\$36.08	\$13.20	\$16.56	\$1.98	\$67.82
10	85	\$40.89	\$13.20	\$17.96	\$2.16	\$74.21

Effective Date -		02/01/2020				Supplemental	
Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	42		\$20.90	\$13.20	\$5.89	\$0.00	\$39.99
2	42		\$20.90	\$13.20	\$5.89	\$0.00	\$39.99
3	47		\$23.38	\$13.20	\$11.13	\$1.43	\$49.14
4	47		\$23.38	\$13.20	\$11.13	\$1.43	\$49.14
5	52		\$25.87	\$13.20	\$12.08	\$1.53	\$52.68
6	52		\$25.87	\$13.20	\$12.33	\$1.54	\$52.94
7	60		\$29.85	\$13.20	\$13.70	\$1.70	\$58.45
8	65		\$32.34	\$13.20	\$14.65	\$1.82	\$62.01
9	75		\$37.31	\$13.20	\$16.56	\$2.01	\$69.08
10	85		\$42.29	\$13.20	\$17.96	\$2.20	\$75.65

Notes:

Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

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Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
SPECIALIZED EARTH MOVING EQUIP < 35 TONS	08/01/2019	\$34.54	\$12.41	\$12.70	\$0.00	\$59.65
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/01/2019	\$34.54	\$12.41	\$13.72	\$0.00	\$60.67
	06/01/2020	\$35.44	\$12.41	\$13.72	\$0.00	\$61.57
	08/01/2020	\$35.44	\$12.91	\$13.72	\$0.00	\$62.07
	12/01/2020	\$35.44	\$12.91	\$14.82	\$0.00	\$63.17
	06/01/2021	\$36.24	\$12.91	\$14.82	\$0.00	\$63.97
	08/01/2021	\$36.24	\$13.41	\$14.82	\$0.00	\$64.47
	12/01/2021	\$36.24	\$13.41	\$16.01	\$0.00	\$65.66
SPECIALIZED EARTH MOVING EQUIP > 35 TONS	08/01/2019	\$34.83	\$12.41	\$12.70	\$0.00	\$59.94
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/01/2019	\$34.83	\$12.41	\$13.72	\$0.00	\$60.96
	06/01/2020	\$35.73	\$12.41	\$13.72	\$0.00	\$61.86
	08/01/2020	\$35.73	\$12.91	\$13.72	\$0.00	\$62.36
	12/01/2020	\$35.73	\$12.91	\$14.82	\$0.00	\$63.46
	06/01/2021	\$36.53	\$12.91	\$14.82	\$0.00	\$64.26
	08/01/2021	\$36.53	\$13.41	\$14.82	\$0.00	\$64.76
	12/01/2021	\$36.53	\$13.41	\$16.01	\$0.00	\$65.95
SPRINKLER FITTER	03/01/2019	\$53.08	\$9.47	\$19.60	\$0.00	\$82.15
SPRINKLER FITTERS LOCAL 550 - (Section B) Zone 2	10/01/2019	\$54.43	\$9.47	\$19.60	\$0.00	\$83.50
	03/01/2020	\$55.78	\$9.47	\$19.60	\$0.00	\$84.85
	10/01/2020	\$57.13	\$9.47	\$19.60	\$0.00	\$86.20
	03/01/2021	\$58.48	\$9.47	\$19.60	\$0.00	\$87.55

Effecti	ive Date -	03/01/2019				Supplemental		
Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	35		\$18.58	\$9.47	\$9.10	\$0.00	\$37.15	
2	40		\$21.23	\$9.47	\$9.10	\$0.00	\$39.80	
3	45		\$23.89	\$9.47	\$9.10	\$0.00	\$42.46	
4	50		\$26.54	\$9.47	\$9.10	\$0.00	\$45.11	
5	55		\$29.19	\$9.47	\$9.10	\$0.00	\$47.76	
6	60		\$31.85	\$9.47	\$10.60	\$0.00	\$51.92	
7	65		\$34.50	\$9.47	\$10.60	\$0.00	\$54.57	
8	70		\$37.16	\$9.47	\$10.60	\$0.00	\$57.23	
9	75		\$39.81	\$9.47	\$10.60	\$0.00	\$59.88	
10	80		\$42.46	\$9.47	\$10.60	\$0.00	\$62.53	

Apprentice -	SPRINKLER FITTER - Local 550 (Section B) Zone 2
Effective Date	02/01/2010

	9	75		\$39.81	\$9.47	\$10.60	\$0.00	\$:	59.88
	10	80		\$42.46	\$9.47	\$10.60	\$0.00	\$0	62.53
	Effecti Step	ive Date - percent	10/01/2019	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total	Rate
	1	35		\$19.05	\$9.47	\$9.10	\$0.00	\$3	37.62
	2	40		\$21.77	\$9.47	\$9.10	\$0.00	\$4	40.34
	3	45		\$24.49	\$9.47	\$9.10	\$0.00	\$4	43.06
	4	50		\$27.22	\$9.47	\$9.10	\$0.00	\$4	45.79
	5	55		\$29.94	\$9.47	\$9.10	\$0.00	\$4	48.51
	6	60		\$32.66	\$9.47	\$10.60	\$0.00	\$	52.73
	7	65		\$35.38	\$9.47	\$10.60	\$0.00	\$	55.45
	8	70		\$38.10	\$9.47	\$10.60	\$0.00	\$	58.17
	9	75		\$40.82	\$9.47	\$10.60	\$0.00	\$0	60.89
	10	80		\$43.54	\$9.47	\$10.60	\$0.00	\$0	63.61
	Notes:	Apprentice 40/45/50/ Steps are <b>ntice to Jo</b>	e entered prior 9/30/10: 55/60/65/70/75/80/85 850 hours urneyworker Ratio:1:3						
STEAM BOIL	ER OPE	RATOR		06/01/2019	\$47.69	\$12.00	\$15.60	\$0.00	\$75.29
OPERATING ENG	SINEERS L	OCAL 4		12/01/2019	\$48.83	\$12.00	\$15.60	\$0.00	\$76.43
				06/01/2020	\$49.91	\$12.00	\$15.60	\$0.00	\$77.51
				12/01/2020	\$51.05	\$12.00	\$15.60	\$0.00	\$78.65
				06/01/2021	\$52.14	\$12.00	\$15.60	\$0.00	\$79.74
<b>F</b>	1	"A		12/01/2021	\$53.28	\$12.00	\$15.60	\$0.00	\$80.88
For apprentice	E = E = E = E = E = E = E = E = E = E =	DELLED (	DPERATING ENGINEERS"				¢15.60	<b>*•</b> • • •	
OPERATING ENG	SINEERS L	OFELLED ( OCAL 4	DR TRACTOR DRAWN	06/01/2019	\$47.69	\$12.00	\$15.60	\$0.00	\$75.29
				12/01/2019	\$48.83	\$12.00	\$15.60	\$0.00	\$76.43
				06/01/2020	\$49.91	\$12.00	\$15.60	\$0.00	\$77.51
				12/01/2020	\$51.05	\$12.00	\$15.60	\$0.00	\$78.65
				06/01/2021	\$52.14	\$12.00	\$15.60	\$0.00	\$79.74
				12/01/2021	\$53.28	\$12.00	\$15.60	\$0.00	\$80.88

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

**Issue Date:** 09/23/2019

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TELECOMMUNICATION TECHNICIAN	09/01/2019	\$35.78	\$10.15	\$11.45	\$0.00	\$57.38
ELECTRICIANS LOCAL 225	03/01/2020	\$36.27	\$10.40	\$11.78	\$0.00	\$58.45

## Apprentice - TELECOMMUNICATION TECHNICIAN - Local 223

Effective Date - 09/01/2019

Ene	ctive Date - 09/01/2019				Supplemental		
Step	percent	Apprentice Base Wage	Health Pension		Unemployment	Total	Rate
1	0	\$0.00	\$0.00	\$0.00	\$0.00	\$	60.00
Not	es: See Electrician Apprent	ice Wages					
	Steps are 750hrs						
	Telecom Apprentice W	lages shall be the same as the Electrician	n Apprentice V	Wages			
Арр	orentice to Journeyworker	Ratio:2:3***					
TERRAZZO FINISH	IERS	08/01/2019	\$53.34	\$10.75	\$21.30	\$0.00	\$85.39
BRICKLATERS LOCAL 3	- MARBLE & IILE	02/01/2020	\$53.98	\$10.75	\$21.30	\$0.00	\$86.03
		08/01/2020	\$55.33	\$10.75	\$21.45	\$0.00	\$87.53
		02/01/2021	\$55.97	\$10.75	\$21.45	\$0.00	\$88.17
		08/01/2021	\$57.37	\$10.75	\$21.61	\$0.00	\$89.73
		02/01/2022	\$57.96	\$10.75	\$21.61	\$0.00	\$90.32

# Apprentice - TERRAZZO FINISHER - Local 3 Marble & Tile

Effecti	ive Date -	08/01/2019				Supplemental		
Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	50		\$26.67	\$10.75	\$21.30	\$0.00	\$58.72	
2	60		\$32.00	\$10.75	\$21.30	\$0.00	\$64.05	
3	70		\$37.34	\$10.75	\$21.30	\$0.00	\$69.39	
4	80		\$42.67	\$10.75	\$21.30	\$0.00	\$74.72	
5	90		\$48.01	\$10.75	\$21.30	\$0.00	\$80.06	

Effective Date -		02/01/2020				Supplemental		
Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate	
1	50		\$26.99	\$10.75	\$21.30	\$0.00	\$59.04	
2	60		\$32.39	\$10.75	\$21.30	\$0.00	\$64.44	
3	70		\$37.79	\$10.75	\$21.30	\$0.00	\$69.84	
4	80		\$43.18	\$10.75	\$21.30	\$0.00	\$75.23	
5	90		\$48.58	\$10.75	\$21.30	\$0.00	\$80.63	
Notes:								

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TEST BORING DRILLER	06/01/2019	\$40.50	\$7.85	\$16.05	\$0.00	\$64.40
LABORERS - FOUNDATION AND MARINE	12/01/2019	\$41.50	\$7.85	\$16.05	\$0.00	\$65.40
	06/01/2020	\$42.49	\$7.85	\$16.05	\$0.00	\$66.39
	12/01/2020	\$43.47	\$7.85	\$16.05	\$0.00	\$67.37
	06/01/2021	\$44.49	\$7.85	\$16.05	\$0.00	\$68.39
	12/01/2021	\$45.50	\$7.85	\$16.05	\$0.00	\$69.40
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER	06/01/2019	\$39.22	\$7.85	\$16.05	\$0.00	\$63.12
	12/01/2019	\$40.22	\$7.85	\$16.05	\$0.00	\$64.12
	06/01/2020	\$41.21	\$7.85	\$16.05	\$0.00	\$65.11
	12/01/2020	\$42.19	\$7.85	\$16.05	\$0.00	\$66.09
	06/01/2021	\$43.21	\$7.85	\$16.05	\$0.00	\$67.11
For apprentice rates see "Apprentice- LABORER"	12/01/2021	\$44.22	\$7.85	\$16.05	\$0.00	\$68.12
TEST BORING LABORER	06/01/2019	\$39.10	\$7.85	\$16.05	\$0.00	\$63.00
LABORERS - FOUNDATION AND MARINE	12/01/2019	\$40.10	\$7.85	\$16.05	\$0.00	\$64.00
	06/01/2020	\$41.09	\$7.85	\$16.05	\$0.00	\$64.99
	12/01/2020	\$42.07	\$7.85	\$16.05	\$0.00	\$65.97
	06/01/2021	\$43.09	\$7.85	\$16.05	\$0.00	\$66.99
	12/01/2021	\$44.10	\$7.85	\$16.05	\$0.00	\$68.00
For apprentice rates see "Apprentice- LABORER"						
TRACTORS/PORTABLE STEAM GENERATORS	06/01/2019	\$47.69	\$12.00	\$15.60	\$0.00	\$75.29
OFEKATING ENGINEEKS LOCAL 4	12/01/2019	\$48.83	\$12.00	\$15.60	\$0.00	\$76.43
	06/01/2020	\$49.91	\$12.00	\$15.60	\$0.00	\$77.51
	12/01/2020	\$51.05	\$12.00	\$15.60	\$0.00	\$78.65
	06/01/2021	\$52.14	\$12.00	\$15.60	\$0.00	\$79.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"	12/01/2021	\$53.28	\$12.00	\$15.60	\$0.00	\$80.88
TRAILERS FOR EARTH MOVING EQUIPMENT	08/01/2019	\$35.12	\$12.41	\$12.70	\$0.00	\$60.23
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/01/2019	\$35.12	\$12.41	\$13.72	\$0.00	\$61.25
	06/01/2020	\$36.02	\$12.41	\$13.72	\$0.00	\$62.15
	08/01/2020	\$36.02	\$12.91	\$13.72	\$0.00	\$62.65
	12/01/2020	\$36.02	\$12.91	\$14.82	\$0.00	\$63.75
	06/01/2021	\$36.82	\$12.91	\$14.82	\$0.00	\$64.55
	08/01/2021	\$36.82	\$13.41	\$14.82	\$0.00	\$65.05
	12/01/2021	\$36.82	\$13.11	\$16.01	\$0.00	\$66.24
TUNNEL WORK - COMPRESSED AIR	06/01/2019	\$51.32	\$7.85	\$16.45	\$0.00	\$75.68
LABORERS (COMPRESSED AIR)	12/01/2019	\$57.38	\$7.85	\$16.45	\$0.00	\$75.00
	06/01/2019	\$52.30	\$7.05 \$7.05	\$16.45	\$0.00	\$77.67
	12/01/2020	ФЈЈ.Ј/ \$51.75	\$1.83 \$7.85	\$16.45	\$0.00	\$11.01 \$78.65
	12/01/2020	\$34.33 \$55.37	\$7.85	\$10.43 \$16.45	\$0.00 \$0.00	\$/6.03
	10/01/2021	\$55.57	\$7.85	\$10.45 \$16.45	\$0.00 \$0.00	\$/9.0/
For apprentice rates see "Apprentice- LABORER"	12/01/2021	<b>\$30.38</b>	\$1.83	φ10. <del>4</del> 3	φ <b>0.00</b>	<b>\$00.00</b>

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE)	06/01/2019	\$53.38	\$7.85	\$16.45	\$0.00	\$77.68
LABOREKS (COMPRESSED AIR)	12/01/2019	\$54.38	\$7.85	\$16.45	\$0.00	\$78.68
	06/01/2020	\$55.37	\$7.85	\$16.45	\$0.00	\$79.67
	12/01/2020	\$56.35	\$7.85	\$16.45	\$0.00	\$80.65
	06/01/2021	\$57.37	\$7.85	\$16.45	\$0.00	\$81.67
For apprentice rates see "Apprentice- LABORER"	12/01/2021	\$58.38	\$7.85	\$16.45	\$0.00	\$82.68
TUNNEL WORK - FREE AIR	06/01/2019	\$43.45	\$7.85	\$16.45	\$0.00	\$67.75
LABORERS (FREE AIR TUNNEL)	12/01/2019	\$44.45	\$7.85	\$16.45	\$0.00	\$68.75
	06/01/2020	\$45.44	\$7.85	\$16.45	\$0.00	\$69.74
	12/01/2020	\$46.42	\$7.85	\$16.45	\$0.00	\$70.72
	06/01/2021	\$47.44	\$7.85	\$16.45	\$0.00	\$71.74
For apprentice rates see "Apprentice- LABORER"	12/01/2021	\$48.45	\$7.85	\$16.45	\$0.00	\$72.75
TUNNEL WORK - FREE AIR (HAZ. WASTE)	06/01/2019	\$45.45	\$7.85	\$16.45	\$0.00	\$69.75
LABORERS (FREE AIR TUNNEL)	12/01/2019	\$46.45	\$7.85	\$16.45	\$0.00	\$70.75
	06/01/2020	\$47.44	\$7.85	\$16.45	\$0.00	\$71.74
	12/01/2020	\$48.42	\$7.85	\$16.45	\$0.00	\$72.72
	06/01/2021	\$49.44	\$7.85	\$16.45	\$0.00	\$73.74
For apprentice rates see "Apprentice- LABORER"	12/01/2021	\$50.45	\$7.85	\$16.45	\$0.00	\$74.75
VAC-HAUL	08/01/2019	\$34.54	\$12.41	\$12.70	\$0.00	\$59.65
TEAMSTERS JOINT COUNCIL NO. 10 ZONE B	12/01/2019	\$34.54	\$12.41	\$13.72	\$0.00	\$60.67
	06/01/2020	\$35.44	\$12.41	\$13.72	\$0.00	\$61.57
	08/01/2020	\$35.44	\$12.91	\$13.72	\$0.00	\$62.07
	12/01/2020	\$35.44	\$12.91	\$14.82	\$0.00	\$63.17
	06/01/2021	\$36.24	\$12.91	\$14.82	\$0.00	\$63.97
	08/01/2021	\$36.24	\$13.41	\$14.82	\$0.00	\$64.47
	12/01/2021	\$36.24	\$13.41	\$16.01	\$0.00	\$65.66
WAGON DRILL OPERATOR	06/01/2019	\$34.20	\$7.85	\$14.88	\$0.00	\$56.93
LABORERS - ZONE 2	12/01/2019	\$35.06	\$7.85	\$14.88	\$0.00	\$57.79
	06/01/2020	\$35.95	\$7.85	\$14.88	\$0.00	\$58.68
	12/01/2020	\$36.84	\$7.85	\$14.88	\$0.00	\$59.57
	06/01/2021	\$37.76	\$7.85	\$14.88	\$0.00	\$60.49
	12/01/2021	\$38.67	\$7.85	\$14.88	\$0.00	\$61.40
For apprentice rates see "Apprentice- LABORER"		•••••	• • • • •			••••
WASTE WATER PUMP OPERATOR	06/01/2019	\$48.18	\$12.00	\$15.60	\$0.00	\$75.78
OPERATING ENGINEERS LOCAL 4	12/01/2019	\$49.33	\$12.00	\$15.60	\$0.00	\$76.93
	06/01/2020	\$50.43	\$12.00	\$15.60	\$0.00	\$78.03
	12/01/2020	\$51.58	\$12.00	\$15.60	\$0.00	\$79.18
	06/01/2021	\$52.68	\$12.00	\$15.60	\$0.00	\$80.28
	12/01/2021	\$53.83	\$12.00	\$15.60	\$0.00	\$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER PLUMBERS & PIPEFITTERS LOCAL 51	09/01/2018	\$42.04	\$10.00	\$18.20	\$0.00	\$70.24
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER	/GASFITTER"					

Outside Electrical - East

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CABLE TECHNICIAN (Power Zone)	09/01/2019	\$28.83	\$8.75	\$1.86	\$0.00	\$39.44
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	08/30/2020	\$29.67	\$9.25	\$1.89	\$0.00	\$40.81
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables)	09/01/2019	\$40.84	\$8.75	\$10.02	\$0.00	\$59.61
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	08/30/2020	\$42.03	\$9.25	\$10.27	\$0.00	\$61.55
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN CDL	09/01/2019	\$33.64	\$8.75	\$9.86	\$0.00	\$52.25
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	08/30/2020	\$34.62	\$9.25	\$10.07	\$0.00	\$53.94
For apprentice rates see "Apprentice- LINEMAN"			***			
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs)	09/01/2019	\$26.43	\$8.75	\$1.79	\$0.00	\$36.97
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	08/30/2020	\$27.20	\$9.25	\$1.82	\$0.00	\$38.27
For apprentice rates see "Apprentice- LINEMAN"		+= /	***			<i>+•••</i> ,
EQUIPMENT OPERATOR (Class A CDL)	09/01/2019	\$40.84	\$8.75	\$14.10	\$0.00	\$63.69
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	08/30/2020	\$42.03	\$9.25	\$14.35	\$0.00	\$65.63
For apprentice rates see "Apprentice- LINEMAN"		+	***			
EQUIPMENT OPERATOR (Class B CDL)	09/01/2019	\$36.04	\$8.75	\$10.65	\$0.00	\$55.44
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	08/30/2020	\$37.09	\$9.25	\$10.87	\$0.00	\$57.21
For apprentice rates see "Apprentice- LINEMAN"	00/00/2020	<i>QU</i> 1.0 <i>7</i>	\$7.20	• • • • • •	• • • • •	<i>\$67.21</i>
GROUNDMAN	09/01/2019	\$21.62	\$8.75	\$1.65	\$0.00	\$32.02
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	08/30/2020	\$22.25	\$9.25	\$1.67	\$0.00	\$33.17
For apprentice rates see "Apprentice- LINEMAN"	00/30/2020	<i><b>Q</b>22.23</i>	¢7.20	+		ψυυ.17
GROUNDMAN -Inexperienced (<2000 Hrs.)	09/01/2019	\$26.43	\$8.75	\$1.79	\$0.00	\$36.97
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	08/30/2020	\$27.20	\$9.25	\$1.82	\$0.00	\$38.27
For apprentice rates see "Apprentice- LINEMAN"	00/50/2020	Ψ27.20	Ψ2.20	<i><i><i>v</i></i><sup>1.0</sup><i><sup>2</sup></i></i>	<i>\</i>	<i>\$30.21</i>
JOURNEYMAN LINEMAN	09/01/2019	\$48.05	\$8.75	\$17.19	\$0.00	\$73.99
OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104	08/30/2020	\$49.45	\$9.25	\$17.48	\$0.00	\$76.18

\$0.00

\$0.00

\$3.55

\$3.55

\$0.00

\$0.00

Effect	ive Date -	09/01/2019				Supplemental	
Step	percent		Apprentice Base Wage	Health	Pension	Unemployment	Total Rate
1	60		\$28.83	\$8.75	\$3.36	\$0.00	\$40.94
2	65		\$31.23	\$8.75	\$3.44	\$0.00	\$43.42
3	70		\$33.64	\$8.75	\$3.51	\$0.00	\$45.90
4	75		\$36.04	\$8.75	\$5.08	\$0.00	\$49.87
5	80		\$38.44	\$8.75	\$5.15	\$0.00	\$52.34
6	85		\$40.84	\$8.75	\$5.23	\$0.00	\$54.82
7	90		\$43.25	\$8.75	\$7.30	\$0.00	\$59.30
Effect	ive Date -	08/30/2020				Sunnlemental	

Apprentice -	LINEMAN (Outside Electrical) - East Local 104
Dee de D	00/01/2010

Effective Date - 08/30/2020
Effective Date - 08/30/2020

St	tep	percent	Apprentice Base Wage	Health	Pension	Unemployment	Tot	al Rate
1		60	\$29.67	\$9.25	\$3.39	\$0.00		\$42.31
2	2	65	\$32.14	\$9.25	\$3.46	\$0.00		\$44.85
3	3	70	\$34.62	\$9.25	\$3.54	\$0.00		\$47.41
4	ł	75	\$37.09	\$9.25	\$5.11	\$0.00		\$51.45
5	5	80	\$39.56	\$9.25	\$5.19	\$0.00		\$54.00
6	5	85	\$42.03	\$9.25	\$5.26	\$0.00		\$56.54
7	7	90	\$44.51	\$9.25	\$7.34	\$0.00		\$61.10
N	otes:							
A	ppren	tice to Journeyworker Ratio:1:2						
TELEDATA CAB OUTSIDE ELECTRICA	LE SP	LICER Kers - EAST LOCAL 104	02/04/2019	\$30.73	\$4.70	\$3.17	\$0.00	\$38.60
TELEDATA LINE OUTSIDE ELECTRICA	EMAN 11 Wori	/EQUIPMENT OPERATOR Kers - East local 104	02/04/2019	9 \$28.93	\$4.70	\$3.14	\$0.00	\$36.77
TELEDATA WIR	EMAN	V/INSTALLER/TECHNICIAN KERS - EAST LOCAL 104	02/04/2019	9 \$28.93	\$4.70	\$3.14	\$0.00	\$36.77

01/31/2016

01/31/2016

\$18.51

\$16.32

TREE TRIMMER

OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104

This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is not on the ground. This classification does not apply to wholesale tree removal.

TREE TRIMMER GROUNDMAN

OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104

This classification applies only to tree work done: (a) for a utility company, R.E.A. cooperative, or railroad or coal mining company, and (b) for the purpose of operating, maintaining, or repairing the utility company's equipment, and (c) by a person who is using hand or mechanical cutting methods and is on the ground. This classification does not apply to wholesale tree removal.

\$22.06

\$19.87

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

#### All steps are six months (1000 hours.)

Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

#### \*\* Multiple ratios are listed in the comment field.

- \*\*\* APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.
- \*\*\*\* APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.



Briggs Engineering & Testing A Division of PK Associates, Inc.

Daedalus Projects, Inc. c/o Ms. Tiesha Jarrett 1 Faneuil Hall Marketplace South Market Building, Suite 4195 Boston, MA, 02109-2717 August 5, 2019 Briggs Project No. 30829

### RE: Geotechnical Investigation Report Proposed Police Station 100 Main Street, Carver, MA

Briggs Engineering & Testing, *A Division of PK Associates* (Briggs) has completed our investigation of the subsurface conditions at the above referenced location and completed this Geotechnical Report. These services were accomplished in accordance with your authorization of Proposal No. MA. 02.1754.1 dated May 9. 2019.

# 1.0 Project Location and Description

The site is located in the central part of Carver about 2 miles southeast of Route 44 interchange at Route 58 (Main Street). Vaughan Pond is about 0.5 mile west of the site and Atwood Reservoir is located about 2.5 miles south of the site. The site is on the east side of the intersection of Main and Center Streets. Carver Fire Station is located about 200 feet south of the proposed building area.

Proposed construction will be an irregular shaped one story, slab on grade building in the central part of the project site. The proposed building area is currently a grassy area with few trees and landscape isles around the trees. A fenced-in water shower feature is located near the center of the proposed building area and is about 10 by 10 feet. A treed area extends across the north part of the site and about 20 feet into the north part of the building area.

A detached car-port and out-building are proposed east-northeast of the proposed building. Asphalt paved areas are proposed to the north and east of the proposed building area. Site sewage disposal infiltration area is located northwest of the building. Potential storm-water soil absorption areas are proposed to the northeast, east and west of the building. Refer to the attached Figure 1 for site layout.

100 Weymouth Street, Unit B1, Rockland, MA 02370 ph 781-871-6040, fax 781-871-7982 Topography at the proposed site is relatively level and with few gently sloped landscape and/or treed areas. The site is located along a ridge with Main Street near the crest of the ridge. Topography slopes generally down to the west and east of Main Street with gentle to moderate slopes. Topographic contours are included in attached Figure 1.

Several utilities including electric, natural gas, telephone and water are supplied to the surrounding buildings and are available to the subject project buildings. A water line, marked by Carver DPW extends west across the north part of the proposed building area. No other existing public utilities were identified on the subject project site by Dig Safe utility clearance or DPW.

### 2.0 Subsurface Explorations

The subsurface conditions at the Site were explored under the supervision of the undersigned Briggs' Geotechnical Dept. Manager. The explorations consisted of advancing nine (9) test borings at or near the proposed buildings as shown on attached Figure 1. Final boring depths, approximate existing ground surface (GS) at boring and proposed top of foundation (TOF) are tabulated as follows:

Boring	Boring Depth	Existing G.S.	Proposed T.O.F.
B-1	32 ft	100.5	102 approx.
B-2	32 ft	101	same
B-3	78 ft Refusal	101	u
B-4	27 feet	100.5	u
B-5	72 ft Refusal	100.5	"
B-6	22 feet	101	"
B-7	22 feet	101	11
B-8	32 feet	100.5	"
B-9	27 feet	101.5	"

The borings were advanced on June 24 through June 27, 2019 by Sage Environmental Drilling of Pawtucket, RI. All borings were drilled using a rubber tracked Geo-Probe drill rig with split spoon samples collected every five feet or more frequently as indicated on the test boring logs. Soils between sample depths were drilled using solid casing and drill and wash techniques. Borings were accomplished via ASTM D1586, "Penetration Test and Split Barrel Sampling of Soils". Standard Penetration Tests (SPT) as noted on the attached test boring logs. A groundwater observation/monitoring well was installed at Boring B-3. Field permeability tests were performed at borings B-1, B-2, B-6 and B-7 for storm-water infiltration design.

Soil samples for all explorations were field classified by Briggs' Geotechnical Dept. Manager, David Geisser on a full-time basis using the Bermister Soil Classification System. Soil descriptions by Briggs are presented in the attached test boring logs and discussed below. Strata change depths are noted in the test boring logs.

#### 3.0 Subsurface Conditions

Soils stratigraphy consists of sandy topsoil over subsoil underlain by granular soils with mostly sands and silty sands. A layer of sand and silt was found in B-3, B-5 and B-8 below the sandy layer. Gravelly silty sands were found in B-3 below 49 feet BGS. These soils are discussed below:

**Topsoil or Root Mat** – Silty sands with little to some (10 to 35%) non-plastic fines (silt), trace or no gravel and trace (less than 10%) organic content was encountered in all borings from ground surface to depths of 0.7 to 1.0 foot. The topsoil is generally dark brown to black and loose to medium dense with N-Values<sup>1</sup> ranging from 4 to 13.

**Subsoil** – Silty sands with no gravel, little to some silt and few root fibers (less than 1%) was encountered in all borings except B-4, B-8 and B-9 below topsoil to depths of 1.3 to 2.0 feet BGS. The subsoil is generally brown to orange brown. These granular deposits are loose to medium with N-Values for the combined topsoil and subsoil as listed above for the topsoil layer.

**Gravelly Sand Fill** - Silty sands with little gravel and little silt was encountered in B-4 and B-9 below topsoil to depths of 6.5 and 1.3 feet, respectively. The fill layer is generally brown to dark brown and loose to medium with N-Values ranging from 4 to 8.

**Outwash Deposits -** Undisturbed sands and silty sands were encountered **in all** borings immediately below the fill layer and extending to depths of 32, 63 and 24 feet BGS at deep borings B-3, B-5 and B8, respectively. These granular deposits have generally none to trace gravel and trace to some silt. These soils are generally light brown to brown and stratified. These sandy deposits are loose to dense with SPT N-Values ranging from 5 to 35.

**Sand and Silt** - Undisturbed sands and silts of roughly equal percentages were encountered B-3 from 32 to 49 feet BGS, in B-5 at 63 to 68 feet BGS and in B-8 from 24 to 32 feet BGS. This deposit was found below the stratified sandy layers and are generally light brown to grey brown and stratified. These silty deposits are loose to medium dense with SPT N-Values ranging from 7 to 14.

**Gravelly Silty Sands and Broken Rock -** Undisturbed sands and rock with varying gravel and little to some silt were encountered B-3 from 49 to 78 feet BGS and in B-5 from 68 to 72 feet BGS all borings immediately below the fill layer and extending to depths of 32, 63 and 24 feet BGS at deep borings B-3, B-5 and B8, respectively. These soils are generally light brown to brown and stratified. These gravelly deposits are medium dense to very dense with SPT N-Values ranging from 26 to greater than 100.

**Refusal** – Casing refusals were encountered in B-3 at 76 feet and B-5 at 71 feet. Split spoon sampler refusals were at 78 and 72 feet BGS at B-3 and B-5.

<sup>&</sup>lt;sup>1</sup> SPT N-Value is the number of blows for a 140.1b, hammer falling freely through 30 inches, required to advance the standard split spoon sampler the last 12 inches of an 18 inch sampling interval.

### 3.1 Groundwater

Upon completion of each test boring and at later times up to 4 hours later, a tape measure with hollow "plunker" device was lowered into the bore-hole to measure water depths. All borings were advanced via drive and washed casing methods starting at 10 feet introducing water to about 2 to 5 feet BGS for samples collected at 10 feet and deeper. Soil samples were moist to dry above 10 feet. Soils below 10 feet were moist to 20 feet BGS, possibly due to the introduction of water for casing advancement. Soils below 20 feet were wet, likely due to stabilized groundwater and possibly elevated by introduction of water for casing washing.

Groundwater was allowed to stabilized for 10 minutes prior to reading groundwater depth as the casing at each boring was extracted 20 feet prior to measuring groundwater. A monitoring well was installed at B-3 to 22 feet BGS after extracting casing to 23 feet BGS. All bore-holes collapsed immediately upon extracting casing to 20 or 23 feet BGS with water in each boring at about 16 to 17 feet BGS at about 10 to 15 minutes after extracting casing to the 20 or 23 feet depth BGS. Casing was then extracted another 5 feet and each borehole immediately collapsed at 15 feet with no accumulated groundwater on soils. Groundwater was measured at 18 feet in the well at B-3 at 18 hours after completion of the boring. Therefore groundwater is between 15 and 18 feet in all borings.

Groundwater levels may be affected by local anomalous conditions such as underground utilities or confining silty or clayey soils as well as seasonal factors and thus may not represent the level to be encountered in the future. Generally, groundwater levels are highest in the spring and lowest in the late fall. The borings were completed in late June when groundwater levels are typically deeper.

### 3.2 Permebility Tests

Briggs pumped water through a hose into the each borehole at B-1, B-2, B-6 and B-7. Water was injected after the casing was extracted to about 5 to 13 feet BGS in each boring. Water was pumped at 14 inches per minute and did not accumulate in the borehole. Therefore permeability is faster than 14 inches per minute. This corresponds to 0.07 minutes per inch (4.3 seconds per inch). Therefore the stratified sands are highly pervious materials. Permeability test depths for each (4) bore-holes are tabulated as follows:

Test Depth (BGS)
5.0
11.0
12.7
6.0

# 3.2 Title V Percolation Tests

Briggs personnel directed and monitored the excavation of test pits and completed percolation tests via Massachusetts Title V policy within the proposed sewage disposal

area located immediately northwest of the proposed Police Station building. The test pits and percolation testing were witnessed by Carver Health Dept. representative. The testing procedures and results are provided in a separate report.

## 4.0 FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

#### 4.1 Foundation Design

We recommend that the proposed buildings be supported on continuous wall and spread footings bearing on the undisturbed inorganic outwash soils (silty sands or sands) and/or Structural Fill or Crushed Stone over the alluvial sandy subgrade. All buildings are slab on grade foundations with slabs at elevations slightly higher than adjacent street grades and grades around the proposed buildings.

Soils at proposed footing grades and deeper have N-Values averaging about 8 or 9 blows per foot within the upper 30 feet and increasing N-Values below that depth. The minimum N-Value is 5 within the proposed foundation stress zones. The stress zones extend down and out from all sides of footings at a 45-degree angle. Proof rolling would be as discussed in Section 4.3 of this report.

Footings resting on proof rolled inorganic granular soils at a minimum depth of 5 feet below proposed finished exterior grades and a minimum footing width of 4 feet should be sized for an allowable bearing capacity of 2000 pounds per square foot (psf). Interior footings are typically shallower than the exterior footings but must extend a minimum 5 feet below slab and have the 4 feet minimum width to support 2000 psf vertical pressure. Total settlement due to the compression of the bearing soils should be less than 1 inch and the total differential settlement should be less than 1/2 inch and should pose no significant structural problems.

Exterior footings should be a minimum of 4.0 feet below finished grade to provide adequate protection against frost heave action. The 4-foot frost depth would also apply to foundations in un-heated interior areas, if any. The minimum 5 foot footing burial depths will satisfy the frost protection requirements. All footings should be installed at relatively consistent depths. Footings should not extend deeper than a line drawn from adjacent footings at a 2H:1V slope extending down from the higher footings.

#### **Stepped Footings**

Should elevation of wall footings vary along walls, the footings should step up and down at a 1 vertical to 2 horizontal series of steps or flatter to transition up from lower to higher footing elevation, if any.

#### Other Geotechnical Design Parameters – Retaining Walls

Based on proposed site layout and elevations, all foundation walls will retain less than 4 feet of un-balanced backfills and therefore do not require design as earth retaining walls. Should any earth retaining walls become required then these walls must be

designed using the following lateral earth pressure design parameters and construction requirements:

Where foundation walls are restrained, lateral earth pressure on foundation walls should approach the "at rest" condition rather than active earth pressure conditions because lateral yielding will be limited. For horizontal drained backfill with no surcharge (and no hydrostatic pressure) an equivalent hydrostatic pressure of 60 psf per foot of depth is recommended. The force should be applied at a distance of H/3 above the base of the wall where H is the wall height for both at rest and active conditions.

Where lateral yielding will not be restrained, walls should approach "active" conditions rather than at rest earth pressure conditions because. For horizontal drained backfill with no surcharge (and no hydrostatic pressure) an equivalent hydrostatic pressure of 45 psf per foot of depth is recommended. The force should be applied at a distance of H/3 above the base of the wall where H is the wall height for both at rest and active conditions.

For surcharge loads behind the wall, we recommend a horizontal pressure equal to 50% of the vertical surcharge load with the force applied at a point H/2 above the base of the wall. Walls must also be designed to resist seismic loads in accordance with 780 CMR 16.00 of the Massachusetts State Building Code.

A safety factor of 1.5 must be applied to the ultimate resistance to calculate the allowable sliding and overturning resistance.

A coefficient of friction of 0.40 to resist sliding between mass concrete and soil is recommended. In addition to sliding resistance, retaining walls may be designed to resist lateral loads with the passive resistance of the soil in front of the wall provided that the soil will not be removed. An equivalent fluid pressure of 200 pcf may be used to calculate the net passive resistance against the footings. This value assumes that structural backfill will be placed and compacted as recommended within 5 feet laterally of the structural element or out to naturally deposited soil, whichever is closer. The top of the passive zone should start 1 foot below ground surface.

Over-compaction of wall backfill can significantly increase lateral pressure above the recommended design value. Therefore, during backfilling of foundation excavations, light, manually operated compaction equipment must be employed within a zone defined by a 1 horizontal by 2 vertical slope extending from the edge of the wall footing, but no less than 5 feet laterally from the outside edge of the wall. A foundation perimeter drain is recommended to mitigate build up of water (hydrostatic pressure) against the backfilled sides of proposed foundation walls in below grade areas and retaining walls. Refer to Section 4.4 for details.

Basement level earth retaining walls and site retaining walls (if any) must be designed to support retained fills, vertical loads of structures, sloped backfill on retained soil sides (if any) and any other surcharge loads on retained soil sides of walls. All basement

level retaining walls, shallow foundations adjacent to below grade space (if any) and site retaining walls should be designed with foundation drains on retained soil side of walls. Refer to Section 4.4 for details regarding recommended foundation drain installation.

#### 4.2 Seismic Design

The undisturbed granular subgrade, compacted Structural and Granular Fills and Crushed Stone are not susceptible to liquefaction during the postulated seismic event given their gradation, depth to groundwater and relative densities within the depths explored. Soil relative density is generally increasing with depth to the maximum depth of 78 feet. Also, much of the explored soils are sands with varying gravel and silt content with gradation not susceptible to liquefaction during postulated seismic event. This evaluation is in accordance with the International Building Code, 9th Edition with Massachusetts State Amendments.

The explored soils for the proposed buildings are Seismic Site Classification D in accordance with Table 20.3-1 of ASCE 7-10 as the average N-Value for each boring is between 15 and 50 in the upper 100 feet of soil depth. Seismic parameters for Sandwich as found in Table 1604.11 of the 9<sup>th</sup> editions of the Massachusetts Building Code are S<sub>s</sub> = 0.182 and S<sub>1</sub> = 0.061.

#### 4.3 Excavation

Topsoil, subsoil and existing fill (If any) must be excavated from all proposed structural areas to the surface of the undisturbed sands and silty sands then deeper to footing subgrades. The deepest fill and organic soils were encountered to 6.5 feet BGS at B-4 and 2.5 feet at B-9. Fill and organic soil layers extended to 2 feet or less at the other seven borings. The topsoil, subsoil and fill (if any) must be excavated from foundation stress zones plus under entire slabs, concrete walkways and pavement areas. The stress zone is the volume of soil under footing plus wedges of soil extending down and out from all edges of footing at a 45-degree angle.

Due to loose sandy soils, all footing excavations must extend an additional one foot depth to 6 feet BGS. Excavation in the vicinity of B-4 may extend deeper due to fill soils found to 6.5 feet at that boring. Resulting sandy subgrade must be proof rolled as discussed in Section 4.3.1, then covered with a one foot thick lift of crushed stone on filter fabric upon the proof rolled sandy subgrade.

In areas where fills are required to reach footing grades, the lateral excavation of unsuitable fill and organic soils from under footing stress zones must extend laterally outside the outside edge of footing a distance equal to the height of fill above undisturbed inorganic sandy bearing subgrade to BOF grade (resulting in a 45 degree angle slope of Structural Fill under all footing areas) or as indicated in IBC, 9<sup>th</sup> Edition, whichever is greater lateral excavation. Based on the observed fill at B-4 and 1 foot over-excavation and proof rolling of subgrade, the lateral over-excavation should be about one foot as a minimum.

Unsupported excavations should slope up from the bottom of excavation in compliance with OSHA guidelines/standards. If excavation to proposed foundation grades extend deeper than 4 feet below footing grade, then these excavations should slope away from the excavation areas. This will occur where existing grades are roughly 4 feet below proposed slab grade and excavation of topsoil and subsoil extends below BOF grade. If the Contractor chooses to use trench boxes or other lateral earth support measures, the lateral support systems must be designed by the Contractors' Engineer.

Excavation subgrade should be witnessed by a Geotechnical Engineer to confirm that organic, loose or fill soils do not exist at proposed footing areas or other structural areas. The Geotechnical Engineer would also determine if the bearing subgrade relative density is consistent with the test boring data and has been properly proof rolled. The Engineer would also determine if the subgrade has become disturbed by excavation, water movement or dewatering activities.

Buried bricks in fill were encountered in B-4 to 6.5 feet BGS. An old building formerly occupied the site according to the plan provided by the Architect. The former building is marked with a dashed line and extends between borings B-3 and B-8 with B-4 located in the central part of the old building. The bricks in fill may be associated with the former building. Other foundation or debris materials might be encountered and must be removed from future building and pavement areas.

Excavation effort should be easy to moderate to reach the undisturbed, inorganic granular subgrade. Bedrock removal is not anticipated as refusals were not encountered within anticipated excavation depths (10 feet maximum). However, if bedrock extends above footings, slabs or proposed utility elevations, then removal can be accomplished by blasting, hoe ramming or hydraulic wedge and splitting methods depending on local, state and federal regulations.

Boulders and cobbles may be encountered in soils within the proposed excavation zone. An excavator would typically be used to remove soils, cobbles and boulders in proposed foundation areas.

### 4.3.1 Proof Rolling

Footing subgrades should be proof rolled at footing subgrade elevation at 6 feet below exterior finished grades and at least 1 foot below proposed BOF grade, whichever is deeper. Loose soils were found in the borings at or below footing grades and require densification prior to forming and placing concrete footings. This will reduce differential settling. The roller should be a minimum 800-pound static weight vibratory roller or plate. The rolling should be accomplished by making at least 10 passes and should be witnessed by a Geotechnical Engineer or designee. Any weak, soft, spongy or unstable zones should be excavated and replaced with compacted Structural Fill as discussed in Section 4.6 of this report.

## 4.3.2 Subgrade Protection

As noted above, all footing areas must be over-excavated one foot deeper than BOF grades, proof rolled and covered with filter fabric, then crushed stone to footing grade. The filter fabric should be Mirafi 140N or equivalent. The crushed stone would then be compacted by making 4 passes with the 800-pound static weight roller/plate compactor operating in full vibratory mode. This will protect the footing bearing surfaces from rainfall, foot and construction equipment traffic.

Open excavations in the proposed slab areas will be in sandy soils with generally less than 8% silt and will be easily disturbed by foot traffic and construction equipment traffic. After removing all topsoil and subsoil and any old fill such as found in B-4 to 6.5 feet BGS, the resulting sandy subgrade should be proof rolled by making 4 passes using the 800 pound vibratory compactor then immediately covered with a 6 inch to 1 foot thick lift of compacted Structural Fill to provide a working surface for equipment. This Structural Fill protective layer may need occasional moistening and re-compaction as it may become weakened and softened in dry warm weather if driven over. Refer to Section 4.6 for gradation and compaction recommendations for crushed stone and Structural Fill.

## 4.4 Water Control

Groundwater is deeper than 15 feet based on the explorations conducted in this investigation. Water seepage could occur at shallower depths due to rainfall as perched water seeps through the ground.

Subgrades that become wet by rain should not be traveled on or they may become disturbed. Disturbed sandy soils should be excavated and be replaced by compacted lifts of crushed stone wrapped by filter fabric in proposed structural areas. These conditions are not expected as soils within excavation depths contain about 15% silt or less and are above observed groundwater.

Water infiltration into excavations should be monitored during the construction phase. Damp proofing should be applied to all below grade foundation footings and walls.

Retaining wall drains are recommended to prevent buildup of water along the backfilled side of retaining walls, if any. No foundation perimeter drain is warranted unless basement areas become part of the design. The present design has no below grade space. If no retaining walls or below grade space is proposed, then no perimeter drains are warranted.

Drainage discharge should be selected by the project Civil Engineer. Briggs can provide retaining wall drain discharge options if any retaining walls become proposed. Discharge locations must be compliant with local, state and federal regulations.

All backfilling must be placed "in the dry" after water is pumped to at least 6 inches below the base of excavations. Briggs does not expect that dewatering will be necessary based on observed water depths and proposed excavations shallower than 10 feet BGS. Bockfills must be adequately compacted as discussed in Section 4.6 prior to placing additional fill.

Surface drainage should be directed away from excavations during construction so that the bearing surfaces do not become softened by water flow or puddling. Rapid water movement can also scour soils and undermine foundations, therefore surface water protection such as earth berms should be constructed. This can be accomplished with proper grading or construction of small dikes at the edge of the excavation.

Damp-proofing of all foundations is recommended. The damp-proofing should reduce but not eliminate moisture infiltration through foundation walls. Vapor barrier or retarder should be installed under all slab areas if specified by the Architect. Briggs does not provide any warrantee against moisture infiltration or mildew or bacterial growth in the below grade space.

#### 4.5 Proposed Slabs

A minimum 12-inch thick layer of Structural Fill is recommended immediately beneath all proposed slabs after removal of fill and organic soils down to the undisturbed inorganic granular subgrade. The surface organic soils must be also removed from proposed pavement and other structural areas such as transformer pads, etc.

Backfill above footing grade to within 12 inches of underside of interior or exterior slabs, pavements or concrete walkways can be Granular Fill as referenced in Section 4.6. However, Granular Fill must not be used in foundation stress zones.

A modulus of vertical subgrade reaction of 100 pound per cubic inch (pci) would apply to slabs resting on compacted Structural Fill over the undisturbed, inorganic granular subgrade or Granular Fill.

Hydrostatic uplift design will not be necessary for proposed slabs at depths of proposed slab on grade. Additional investigations may be necessary to evaluate need for uplift design if any slabs are to be constructed deeper than 10 feet BGS.

#### 4.6 Backfill and Compaction

Silty sands, gravelly silty sands and sands excavated in proposed footing and slab areas can be reused as Granular Fill to within one foot of the underside of pavement and slabs provided these inorganic soils can be compacted to 95% of their maximum dry unit weight and gradation meets the recommendations listed below in Section 4.6. Some of the sandy soils with about 15% silt or greater may be moisture sensitive and will be difficult to adequately compact if they becomes wet by rain or if they are excavated below the water table. Wet silty sands should be segregated from dry silty sands and sands so that the dry materials might be re-useable as compacted Granular Fill provided they meet the Granular Fill gradation recommendations presented herein.

As previously noted, the silty sand subgrade soils are moisture sensitive and should be protected from disturbance due to water movement or foot traffic if they are wet. This

material may be reusable as Granular Fill if it remains dry to moist. Otherwise the material should be stockpiled separately and may require offsite disposal. The sandy soils free of organic matter should be compactible if moist to wet and wil require moistening if dry.

Structural Fill should be placed on the subgrade soils to underside of footings and within the stress zones of all footings. Gradation for Structural Fill is listed later in this section. The foundation stress zone is the volume of soil extending down and out from all sides of the footing at a 45-degree angle.

Structural Fill should also be used as backfill against the exterior side of foundation walls extending out 3 feet from the foundation walls and vertically down to the bottom of footing elevation or perimeter drain. Another option would be a foundation drainage curtain. The drainage board "curtain" would be attached to the exterior face of foundation wall to the bottom of footing grade and contacting the foundation drain to allow drainage. The curtain consists of drainage channels usually in a high density plastic that allow water to flow down to a collecting and disposal perimeter drain at footing grade. The channels are separated from backfill soils by a filter fabric material. The use of an approved drainage board can eliminate the need for imported Structural Fill outside the basement walls and will also increase reuse of site silty sands as backfill in this zone.

Within the areas excavated for footings, walls, and other limited areas where large compaction equipment cannot work, we recommend that the fill be placed in loose lifts no more than six inches in thickness and be compacted with small hand manipulated machines such as pneumatic compactors, vibratory compactors, etc. In areas where large vibratory compactors such as a Raygo 400A or equivalent can be used, we recommend that the loose lift thickness not exceed 12 inches.

All backfill placed in load bearing areas including under non-Structural Slabs and under footings should be compacted to a minimum of 95% of the maximum dry density as determined by the test designated modified ASTM D1557.

Crushed stone layers requires compaction by making at least three passes by a vibratory plate compactor or vibratory roller with minimum static weight of 400 pounds per 12 inch maximum lift thickness. No compaction testing will be necessary for the crushed stone fills. Crushed stone fills thicker than 12 inches should be placed in one-foot lifts and be monitored by a Technician or Geotechnical Engineer.

#### Backfill Materials Gradation Recommendations:

Crushed stone should have the following gradation:

CRUSHED STONE					
	Percent Passing				
U.S. Sieve Size & Number	Maximum	Minimum			
1 inch		100			
3/4 inch	100	90			
1/2 inch	50	10			
3/8 inch	20	0			
No. 4	5	0			

Structural Fill should consist of well-graded natural sands and gravel or crushed concrete. Structural Fill should be free from excessive plastic fines, organic matter and deleterious material including asphalt, and should have the following gradation:

RECOMMENDED STRUCTURAL FILL GRADATION					
	Percent Passing				
U.S. Sieve Size & Number	Maximum	Minimum			
2/3 lift thickness	100	100			
1 inch	100	60			
No. 4	85	25			
No. 20	60	10			
No. 50	35	4			
No. 200	8*	0			

\* Backfill within three (3) feet laterally of earth retaining walls or basement walls shall have 5% or less material passing the #200 sieve.

Granular Fill under proposed building space should be free of appreciable asphalt content as this can off-gas into occupied space causing possible health concerns. Granular Fill should consist of well graded natural sands and gravel free from excessive plastic fines, organic matter and deleterious material, and should have the following gradation:

RECOMMENDED GRANULAR FILL GRADATION					
	Percent Passing				
U.S. Sieve Size & Number	Maximum	Minimum			
2/3 lift thickness	100	100			
1 inch	100	60			
No. 4	90	25			
No. 200	25	0			

#### 5.0 Limitations and Exclusions

All the professional opinions presented in this report are based solely on the scope of work conducted and sources referred to in our report. The data presented by Briggs in this report were collected and analyzed using generally accepted industry methods and practices at the time the report was generated. This report represents the conditions, locations, and materials that were observed at the time the field-work was conducted. No inferences regarding other conditions, locations, or materials, at a later or earlier time may be made based on the contents of the report. No other warranty, express or implied is made.

This report was prepared for the sole use of our client. The use of this report by anyone other than our client or Briggs is strictly prohibited without the express prior written consent of Briggs. Portions of the report may not be used independently of the entire report.

The above recommendations and conclusions are based on our evaluation of the obtained data presented in the text. We would welcome the opportunity to monitor the pertinent phases of the foundation construction; thus, if differences are found between the field conditions described herein and those encountered during construction, we can modify our recommendations in a timely and professional manner.

Thank you for engaging our services to undertake this project. If you have any questions, please do not hesitate to contact us at your convenience.

Very truly yours, Briggs Engineering & Testing

Dand UK

David W. Geisser Geotechnical Dept. Manager

DWG:BDB:dg Enclosures: Figure 1 – Location Plan Test Boring Logs



Bart D. Bauer Professional Engineer



	SAGEL	nviro	inine	inta),	linc.					GEOTECH BORING LOG			
PROJECT:	Car	-ve.		Poli	ce	Stat	200	1	во	RING NO. <u>B-1</u>			
LOCATION: 100 Main St Carver MA										PAGE 1 OF			
DRILLING CO:		Sa	ge					-	DA	TE STARTED: 6-27-19			
EQUIPMENT:	610	Are	Pbe	. 70	DATE FINISHED: 6-27-19,								
DRILLED BY:	.51	Per	ry	· .				_	SU	RFACE ELEVATION: $100, 5$ TF			
GROUNDWA	TER OBSER	VATIO	NS							WELL WELL			
NOT EN	ICOUNTERED: At	- 16	715	- after	6.2	hours				TYPE:			
	At			after		hours				SIZE ID:			
							E:						
	CAMPLE					Strata		Samala II		LITHOLOGY			
DEPTH	TYPE		SAMPLE	R (inches)	)	Change	No.	Pen	Rec	(Description of materials)			
(feet)		0-6	6-12	12-18	18-24	(feet)				Surface: 6CASS			
0-2	6	4	2	2	3		1	24	18	Topsoil- fthe Sand, little Silt			
		,				0.8		الالتحاديب وهي محادي	C SETTIMONIA CONTAN	trace organic, dk brown			
							1			Elt sauge Long			
						1,6	2mgaariik(Maran		COLLONDORNES	on the second			
5-7		wing	8	8	-7		2	24	16	tarple Silt brown			
10-12		2	2	3	4		3	24	18	similar to above			
15.17		1	2	2	N		U.	211	10				
		1		5				29	10	Dimilar to above, ary			
20-22		2	4	2	2		5	24	20	Silta Sand- flan, littlee)			
		,								Silt: light brown			
25-27		.3	5	4	4		6	24	18	Similar to above			
20.37		2	2	ů.	U		7	211	10	Sand Alan Jana An			
20.70		La	2	- 1				24	10	Site light brown			
							-			stratified.			
			[]	î.j	ίL.		1	1					
							{			Bottom of sorny			
							1			at 25 pero			
							-						
				1			-						
			1	0									
							-						
				* 1									
<u></u>			52										
	ward ward and a second	l											

GENERAL REMARKS:

NA - Not Analyzed ND - Not Detected (sample < 1ppm) BSG - Below Surface Grade

	SACE		) MHR4	intel.	me.					GEOTECH BORING	106	
PROJECT: Carver Police Station										RING NO. B-Z		
LOCATION: 100 Main St Canver MA										PAGE 1 OF		
DRILLING CO:		Sa	ge	~		DATE STARTED: 6-27-19						
EQUIPMENT:	64	20	201	<i>je</i>	78	DATE FINISHED:						
DRILLED BY:	5	p.e.	10	1.		SURFACE ELEVATION: $100.5 TF$						
GROUNDWA NOT EN	ITER OBSER		NS 10.5	after after	0.2	hours hours	÷.			WELL    WI      CASING    SCR      TYPE:	ELL :EEN 	
DEPTH	TYPE	SAMPLER (inches)				Change	No. Pen		Rec	(Description of materials)		
(feet)		0-6	6-12	12-18	18-24	(feet)				Surface: 6 Ca.S.S		
0-2	55	2	3	3	3	10	1	24	14	Topsoil- fthe Sand, litt	He Silt	
						110	Add to be in the line of	and the second sec	(Ethiological and	Subsoul - Flan Sand	SUNT.	
						2.0				5117, orange brown	, MOIS	
							_	2.1	11	Sand- flm traces	Grave	
5-7		6	9	8	0		2	27	16	trace(+) Silt, brou	won	
10-12		9	3	3	4		3	24	16	Similar to abe	ve.	
15-17		2	3	3	3		4	24	18	Similar to above,	dry.	
20-22		2	4	3	4		5	24	16	SILTA Sand- Flm. litt	le	
	8					-				Silt, light brown,		
										stratified, wet		
25-27	-	3	5	4	_5_		6	24	18	Similar to abe	ove	
30.32		3	4	4	6		7	24	16	sand - Am, trac	eA3	
							1			SIF. light brows	m	
			- /		el.		1			stratt tied.		
										Rattom of Bar	ne.	
										At 32 Alet	- 8	
							1			and different and the state of		
				1_								
				e			1					
				35 - J 								
			52	-			-					
1.91							-	1				

NA - Not Analyzed ND - Not Detected (sample < 1ppm) BSG - Below Surface Grade

	SAGE	Envir	onme	ental,	GEOTECH BORING LOG									
PROJECT:	Ce	an	er.	Po	lici	вс	BORING NO. B-3P							
LOCATION: 100. Main St Carver MA										PAGE 1 OF Z				
DRILLING CO:		5	ag	R		DATE STARTED: 6-24-19								
EQUIPMENT:	Ga	DPI	2	be	78	DATE FINISHED:		6-25-19						
DRILLED BY: SPECTY										SURFACE ELEVATION:				
GROUNDWA	TER OBSE	RVATIO	NS		*		WELL WELL							
NOT EN	COUNTERED	: .t//	0.2	- after	0,2	CASING SCREEN TYPE:								
	Δ	.t	<u>.</u>	after		SIZE ID:								
SAMPLING	SAMPLE	T	HAMMER	BLOWS	ON	Strata	i i i i i i i i i i i i i i i i i i i	Sample II	)					
DEPTH (feet)	TYPE		SAMPLER (inches)			Change	No.	Pen	Rec	(Description of materials)				
0-2	SS	2	4	5	4	(reet)	/	21	11.	Surface: Fores	st Mat			
							- /	67	16	Topsoil-flm	Littles, It,			
			1			0.7				Trace organ	rie, dk brown			
	,									SUSSOIL-	Hm Sand			
						10	1			Timbe orm, f	ew root fiber			
5-7	55	8	8	9	9	1.8	7		CHE MAN THE OWNER	Grad Cl	1/11/			
							6			Sand- He,	little Gravel,			
10-12	55	3	3	3	3		3			trace (+) S	itt, brown			
										tace sit	, traceGravel			
10.10			1-7-	1			1			stratified	A TOTOL OF SWA			
15-17	55	t	5	3	4		4			Sand-fl.	m, trace(+)			
20-22			1	2	4		<			SIH, brow	m, stratified			
NO-2 F		1	6	3			0			Similar 7	o above, we			
25-27		4	4	5	6		6			Sand - A/m	, trace Silt			
										brown to 1	ight brown			
										strantied	, wet			
30-32		3	5	4	5	32	7							
36-20		9	8	2	11		~			Sand & Silt	- non plastic,			
		6	3	5	4		6			some fm	Sand, light			
40-42		2	4	3	2		9			brown, we	it stratified.			
15-47	A	2	4	4	4	40	10			Clayey Silt-	Slightly plastic			
50-52		16	12	14	13	71	11			Gravelly Sil	ty Sand - P/C			
55-57		38	25	34	25		12			grey.	, some silt,			
60-62		100	36	103			13			Similar to	aboye, piece			
										of blue a.	ney granite			
05115511	BUG			1						Droken in s	sampler.			
GENERAL REMA	ARKS:						5 A 5	11.3		NA - Not Anal	vzed			
										ND - Not Dete	cted (sample < 1ppm)			
PROJECT:         Carver Police Station         BORING NO.         B3           100 Main St Carver, MA         PAGE 1 OF         2           DRILLD RC:         Sace         0-25-19           EQUIPMENT:         Scope Police 7822 DT         DATE FIRISHED:         0-25-19           DRILLD R:         Situation         Ior 29-19         SURFACE ELEVATION:         Ior 29-19           BRILLD R:         Situation         NOT ENCOUNTERCO         NELL         WELL         WELL           NOT ENCOUNTERCO         Air (0, 2 are (0, 1) thours         Nours         Surface         Ior 29-19           SMAPLEN         Situation         Nours         Surface         Ior 29-19           SMAPLENCOUNTERCO         Nours         Surface         Ior 29-19           SMAPLENCOUNTERCO         Nours         Surface         Ior 29-19           SMAPLING         SMAPLE INDERS         Nours         Surface         Ior 29-19           SMAPLING         SMAPLE INDERS         Nours         Surface         Ior 29-19           SMAPLING         SMAPLE INDERS         Surface         IITHOLOCY         Ior 29-19           GROUNDATER COBSERVATIONS         Surface         IITHOLOCY         Ior 29-19           GROUNDATER COBSERVATHORS         Su		SAGE	Enviro	onme	ental,	Inc.					GEOTECH BORING LOG			
--	--	-----------	--------	---	-----------------	------------	------------------	----------------------	--	-----	---			
SAMPLIE       HAMMER BLOWS ON SAMPLE       Strata Change       Sample D No.       LITHOLOGY (Description of materials)         62-64       55       39       36       21       2.2       14       24       16       Surface: Gravel y Strate Sinth         62-64       55       39       36       21       2.2       14       24       16       Gravel y Strate Sinth         62-64       19       16       13       13       15       24       12       Strate: Gravel y Strate Sinth       Gravel y Inthe Sinth         62-64       19       16       13       13       15       24       12       Strate Sinth       Gravel y Inthe Sinth         64       19       16       13       13       15       24       12       Strate Sinth       Gravel y Inthe Sinth         70-72       70       73       60       42       Strate Sinth       Gravel y Sinty Sand- Sinth       Strate Sinth         75-77       110       122       116       128       Strate Sinth       Strate Sinth       Strate Sinth         75-77       110       122       12       Gravel y Sinty Sand- Sinth       Strate Sinth       Strate Sinth       Strate Sinth         75-77       110       <	PROJECT: LOCATION: DRILLING CO: EQUIPMENT: DRILLED BY: GROUNDWA NOT EN			e lan e e e e r s biz	after	0.2	A	BO PA DA SU	RING NO. $133$ GE 1 OF $2-$ TE STARTED: $6-25-19$ TE FINISHED: $10-29-19$ RFACE ELEVATION: $1014/-$ WELL WELL CASING SCREEN TYPE: SIZE ID:					
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	CALCUNC.				DI OLIVÍC (		<b>6</b>	2.01 2.01						
62-64       55       39       36       21       22       14       24       10       Gravely Sitty Sand-file       Filte       514         64-66       19       16       13       13       15       24       12       Sitty Sand-file       514         64-66       19       16       13       13       15       24       12       Sitty Sand-file       514         67       67       67       67       67       67       67       67       67         70       73       60       42       67       67       67       67       67         70       73       60       42       67 </td <td>DEPTH (feet)</td> <td>TYPE</td> <td>0-6</td> <td>SAMPLE 6-12</td> <td>R (inches 12-18</td> <td>) 18-24</td> <td>Change (feet)</td> <td>No.</td> <td>Pen</td> <td>Rec</td> <td>(Description of materials)</td>	DEPTH (feet)	TYPE	0-6	SAMPLE 6-12	R (inches 12-18	) 18-24	Change (feet)	No.	Pen	Rec	(Description of materials)			
C4-66       19       16       13       13       15       24       12       Silty Sand-fle, trace         Grabel, 11HleSIH.       Casing Penetrotion       difficult below 67F         10-72       70       73       60       42       Gravelly Silty Sand- Similar to 5-14.         75-77       110       122       116       128       Similar to above, Few broken granite, pieces.         71-78       175       210       12       Granute plugged Sampler         CASING REFUSAL       AT       76       FT-         WATER MDNITORING       WELL SET AT 22 FT       WATER AT 18 FT AT         18       HOURS.       18       HOURS.	62-64	55	39	36	21	22		14	24	0	Surface: Gravelly Silty Sands file Some Gravel, Jittle Silt			
70-72       70       73       60       42       Gravelly Silty Sand- Similar to S-14.         75-77       110       122       110       125       Similar to s-14.         75-77       110       122       112       Similar to solve, Few broken granite.         71-78       175       112       2       Granute plugged Sampler         71-78       175       12       2       Granute plugged Sampler         71-78       175       210       12       2       Granute plugged Sampler         71-78       175       210       12       2       Granute plugged Sampler         71-78       175       210       12       2       Granute plugged Sampler         72       70       75       12       2       Granute plugged         72       70       75       12       2       Granute plugged         74       76       FT-       WATER MONITORING       WELL SET AT 22 FT         70       75       18       18       18	64-66	•	19	16	13	13		15	24	12	Silty Sand-flc; trace			
70-72     70     73     60     42     Gravelly Silty Sand- Similar to S-14.       75-77     110     122     110     128     Similar to above, Few broken granite.       71-78     175     210     12     2     Grante plugged Sample       71-78     175     210     12     2     Grante plugged Sample       70     73     60     42     44     44       75-77     110     12     2     Grante plugged Sample       71-78     175     210     12     2     Grante plugged Sample       70     75     4     4     76     FT-       70     76     77     12     76     77       70     75     77     76     77       70     75     77     76     77       70     76     77     76     77       70     76     77     76     77       70     76     77     77     77       70     78     76     77     77       70     76     77     77     77       70     77     77     77     77     77       70     77     77     77     77     77 <t< td=""><td></td><td></td><td></td><td>1 -</td><td>1</td><td>7</td><td></td><td></td><td></td><td></td><td>Casing Penetrotion difficult below 675t</td></t<>				1 -	1	7					Casing Penetrotion difficult below 675t			
75-77     110     122     116     128     Similar to above, Few broken granite, pieces.       71-78     175     210     12     2     Grante plugged sampler       CASING REPUSAL     AT 76 FT-       WATER MONITORING       UNATER AT 18 FT AT 18 FT AT 18 HOURS.	70-72		70	73	60	42		-		•	Gravelly Silty Sand- Similar to 5-14.			
72-78     175 ZIO     12 Z     Grante plugged       Sompler     CASING REFUSAL       AT 76 FT-       WATER MONITORING       WELL SET AT ZZ FT       WATER AT 18 FT AT       18 HOURS-	75-77		110	/22	116	/28					Similar to above, few broken granite, pieces.			
AT 76 FT- WATER MONITORING WELL SET AT 22 FT WATER AT 18 FT AT 18 HOURS.	77-78		175	210		A			12	2	Granite plugged Sample CASING REFUSAL			
WATER AT 18FT AT 18 HOURS.											AT 76 FT- WATER MONITORING WELL SET AT ZZFT			
						•					WATER AT 18FT AT 18 HOURS.			
		2000 2	-					. * .						

NA - Not Analyzed ND - Not Detected (sample < 1ppm) BSG - Below Surface Grade

9.

	SAGE	Envir	onme	ental,	Inc.					GEO	TECH BORING LOG	
PROJECT:	Ca	10	e/	Po	lice	e sta	ah	M	BC	DRING NO.	B-4	
OCATION:	10	00	M	ar	S.	+ Car	ve.	_	PA	GE 1 OF		
DRILLING CO:	50	290	2	,		~		_	DA	DATE STARTED: 6-25-1		
QUIPMENT:	6	<u>e</u> pe	210	5e	78.	120	7	_	DA	TE FINISHED:	6-25-19	
DRILLED BY:	5	ler	ry					25	SU	RFACE ELEVATION:	100.57-	
GROUNDWA	TER OBSER	VATIO	NS							WELL	WELL	
NOT EN	ICOUNTERED: At		6.0	- after	0.1	hours				CASING	SCREEN	
	At			after		hours				SIZE ID:		
SAMPLING	SAMDLE			PLOWE		Chaoba		Comenta I				
DEPTH	TYPE		SAMPLE	R (inches	) 	Change	No.	Rec	(Description	n of materials)		
(feet)		0-6	6-12	12-18	18-24	(feet)				Surface:	12	
0-2	55	3	7	6	5		1	24	20	TOPSOIL-1	Ic Sand, trace	
						1	-			Gravel, litt	le silt, trace	
		21		<u> </u>						or qualit a	+ Grown	
										little Grave	I Jiff of DCI	
5-7		2	4	4	4	1.5	2	2.4	16	brown.,		
						0.2	_			Similar to	above, little bri	
10-12		2	2	3	3		3	24	18	Sand - fle	, trace HSIH	
10 01										light bro	wh, dry	
15-17			3	2	3		4	24	22	Similarto	a sove, stratitie	
20-72		2	2	3	3		5	24	74	sand-flc.	trace (-) Silt	
									21	light brow	m, wet,	
										strat Ae S	-	
25-27		Ч	5	5	5		6	24	18	Similar	to above.	
							-					
										Bottomof	Boring	
										at 27 f	24	
							1					
							-					
							1					
							1			8.		

	SAGE	Envir	onme	ental,	Inc.					GEOTECH BORING LOG
PROJECT: LOCATION: DRILLING CO: EQUIPMENT: DRILLED BY:	Ca 10 6-	rve so so	Ma Ma age Ste	roli e se	ce St Pe	State Car 822	-	BO PA DA DA SU	DRING NO. B-5 GE 1 OF I GE 1 OF G - 26 - 19 G - 27 - 19 G -	
GROUNDWA NOT E	GROUNDWATER OBSERVATIONS NOT ENCOUNTERED: At									WELL WELL CASING SCREEN TYPE: SIZE ID:
SAMPLING	SAMDLE			BLOW/S		Strata	an da T	Sample I		
DEPTH (feet)	TYPE	0-6	SAMPLE 6-12	R (inches	5) 18-24	Change (feet)	No.	Pen	Rec	(Description of materials)
0-2	SS	2	2	2	3	0.0	/	24	16	Surface: Mulch TSpssil- Alm Sand, little Silt, trace organic, dicbroup
						4.5				Subsoil Am Sand
						113'		a for the set of the first set		Some Silt, occasional root fibers, orange brown
5-7	SS	7	7	6	5		2	24	18	Sand-fle, trace Gravel trace Silt, light
10-12	SS	2	3	2	4		3	24	ZO	brown, strattfied, dry Sand-fle, trace Silt
15-17	53	2	3	3	3		4	24	20	Similar to above.
20-22	SS	1	3	2	4		N	24	18	Sand-Am, trace Silt, light brown, stratified,
25-27	22	2	3	5	5		6	24	20	Similar to above
30-32	-	Ч	Ч	6	4		7	24	18	Similar to above
35-37	V	4	5	5	5		8	24	20	Similar to above
40-42	V	6	4	6	6		9	24	20	Similar to above
45-47		5	5	6	.6		10	24	20	Similar to above
50-52	55	9	3	4	4		/1	24	18	Silty Sand-flm, some
55-57		3	5	.5	S		12	24	18	silt, stratified, wet
60-62		13	16	19	20	1.2	13	24	20	Similar to above, blue gre
65-67	V	15	18	18	24	68	14	24	16	Silt and Sand-Fim, light
70-72		68	88	200	220	U	15	24	10	Silfy Sand - fle, Some Gravel
GENERAL REM	ARKS:			8	CAS A7	NG A	ZEF FT	isa	L	NA - Not Analyzed ND - Not Detected (sample < 1ppm) BSG - Below Surface Grade

	SAGE	Enviro	onme	ental,	Inc.					GEOT	FECH BORING LOG	
PROJECT:	Car	ve	r	Pol	1 EC	- Stai	1701	1	во	RING NO.	B6	
LOCATION:	10	00	M	ain	- S-	r Ca	ru	2/	PAGE 1 OF			
DRILLING CO:	~<	Sac	je			- 1			DATE STARTED: 6-25-19			
EQUIPMENT:	6	eó	Bro	, Se	78	220	7	-	DATE STARLED			
DRILLED BY:	S	Pe	err	4					SU	RFACE ELEVATION:	101 t/-	
GROUNDWA NOT EN	ATER OBSER NCOUNTERED: At		NS 7, /	after after	0,2	_		WELL CASING TYPE: SIZE ID:	WELL SCREEN			
SAMPLING SAMPLE HAMMER BLOWS ON Strata Sample											N OGY	
DEPTH	TYPE		SAMPLE	R (inches	)	Change	No.	Pen	Rec	(Description	of materials)	
(feet)		0-6	6-12	12-18	18-24	(feet)				Surface: 600 S	C	
0-2	55	3	3	3	Ч	,	1	24	18	TO PSDILT 5	FlmSand -	
						1.0				little Silt, to	tace ogginic	
							1			111	n Sand-	
						7.0	~			LITTLE (+) OIL	els Aroncebrou	
2-4	55	6	5	5	8	Lic	-			Silty Sand.	- fle trace	
							-			gravel, littled	-) SIH, brown	
	10		a		10					Carl - Act	race Gravel.	
3-1	53	6	0	11	10					trace Sil	f stratified	
							1			light br	- Mus	
10-12	SS	2	2	3	4					S. D. CLA	+ trace S.It	
							]			Stret ford	1 light brown	
							1			- I - I - I - COL	inger or o	
18 17		5	2	0	2							
13=1/	55	6	2	6	5					Similar +	o above-	
20-22	65	2	.1	6	P		1 -			Sindar	to should	
00-02	Jas	9	4	3	5					Jinciar	1 NO MORVE	
										Bottom of	- Boring	
										at 22 f	t-	
										- ( )	-	
							1					

GENERAL REMARKS:

	SAGE I	Enviro	onme	ntal,	Inc.			GEOT	ECH BORING LOG		
PROJECT:	Car	ver	- 1	201	RC	Stat	101	2	BC	PRING NO.	B-7
LOCATION:	100	M	an	18	+ c	Carve	/	_	PA	GE 1 OF	
DRILLING CO:		Sa	ge	,				-	DA	TE STARTED:	6-25-19
EQUIPMENT: _	6-	06	240	be	78	220	7	_	DA	TE FINISHED:	6-25-19
DRILLED BY: _	1	> •	ŀ€		4			-	SU	RFACE ELEVATION:	101 f/-
GROUNDWA		VATIO	NS		9					WELL	WELL
At $16.9$ after $0.2$ hours										TYPE:	
	At			after		hours				SIZE ID:	
			100.0000000	Sens Central A					er avroe		
SAMPLING	SAMPLE	] н	AMMER	BLOWS C	D	LITHO	LOGY				
DEPTH (feet)	TYPE	0-6	SAMPLE	R (inches)	18-24	Change (feet)	No.	Pen	Rec	(Description	of materials)
0-2	55	3	2	2	2	(1881)	1	24	18	Surface: Gra	SS.
						,	· /	21		Topsoil-7	E/m Sand-
						1				Some Dilli	what argani
										5255011- +	In Sand
						17				little Silf,	trace 14'organ
5-7	SS	8	8	9	9		-	0.1	101	brown,	
							6	24	18	Sand - +/1	n trace dilt
10 -	5.6		~	0	-		-	0.11		light bro	Jun I
1.012	22	3	L	4r	L		3	24	16	Similal T	above
15-17	<<	2	7.	3	4		//	24	d		- / · · · ·
/			See	2	/		9	24	18	Similar	To above
20-22	55	3	4	6	6		5	24	17	Similar -	to above
								101		Onnen	V
											0
										Bottome	Baring
										at 22	ift.
						A STREET			-		

GENERAL REMARKS:

	SAGE	Enviro	onme	ental,	Inc.					GEOTECH BORING LOG
PROJECT: LOCATION: DRILLING CO: EQUIPMENT: DRILLED BY: GROUNDWA NOT EN			/ un 2~( NS 6.4	Pol St after after	0,3	BO PA DA SU	DRING NO. $B-D$ GE 1 OFIINTE STARTED: $G-27-19$ INTE FINISHED: $G-27-19$ RFACE ELEVATION: $IOO.5 H/-$ WELLWELLCASINGSCREENTYPE:SIZE ID:			
SAMPLING DEPTH (feet)	SAMPLE TYPE	0-6	AMMER SAMPLE 6-12	BLOWS C R (inches)	DN ) 18-24	Strata Change (feet)	No.	Sample II Pen	D Rec	LITHOLOGY (Description of materials)
0-2	SS	3	4	3	2		1	24	18	Surface: Mulch Topso, 1- AM, Some S, 17, trace organic, dk brown Sutha Sund-Alc trace
5-7	<i>\$\$</i>	9	9	10	10		2	24	18	Gravel, little Silt, orange brown Sand- fle, trace Silt light brown
10-12	55	2	3	3	3		3	24	22	Smilar to above stratified.
15-17	55	2	3	3	3		4	24	22	Smilar to above.
20.22	55	2	2	3	3	24	5	24	20	Similar to above, wet
25-27	55	5	5	7	7		6	24	20	Sand and Silt - non plastic, light brown
	9.2				0					Bottom of Boring at 32 feet

GENERAL REMARKS:

	SAGE	Envir	onme	ental,	Inc.					GEOTI	CH BORING LOG	
PROJECT: LOCATION: DRILLING CO: EQUIPMENT: DRILLED BY: GROUNDW/ NOT EI	ATER OBSER		e 2// NS	after after	1ce Ca 78 0,3	- - -	BO PAI DA SUI	RING NO. GE 1 OF TE STARTED: TE FINISHED: RFACE ELEVATION: WELL CASING TYPE: SIZE ID:	B9 6-27-19 6-27-19 101-5 ff- WELL SCREEN			
SAMPLING SAMPLE HAMMER BLOWS ON Strata Sample DEPTH TYPE SAMPLER (inches) Change No. Pen										LITHOL	OGY	
DEPTH (feet)	TYPE	0-6	6-12	R (inches	18-24	Change (feet)	No.	Pen	Rec	(Description o	f materials)	
0-2-	<u>45</u>	3	4	4	6	0,51	/	24	18	Surface: Grass Topsoil - flm Silt, trace &	Sand, 1, He Drsamic, black	
						1.3'				liffle OGrav dank brou	dfzn-fic, vel, tracesilt	
						2.5			little silt accasional			
57	55	10	.9	10	8					Sand-fle Infle Ersitt	- Frace Gravel	
10-12	55	3	3	4	4					Sand-flu stratified,	, trace silt, light brown	
15-17		4	3	3	3					Similar +	p above	
20-22		5	4	4	4					Similar +	above	
63=01			0	4						Spartar		
										Bottom of B at 27 fe	laring-	
											×	
	ADVC.											



Briggs Engineering & Testing A Division of PK Associates, Inc.

July 5, 2019

Daedalus Projects, Inc. c/o Ms. Tiesha Jarret Briggs 1 Faneuil Hall Marketplace South Market Building, Suite 4195 Boston, MA 02109-2717

# RE: Field Permeability Tests – June 26 and 27, 2019 Proposed Police Station Facilities Main Street at Center Street, Carver, MA

# Introduction

In accordance with the Request For Proposal from Daedalus Projects, Inc. and your authorization of Briggs proposal No. MA.02.1754.1 dated May 9, 2019, Briggs advanced nine test borings and performed four permeability tests as discussed herein.

# Permeability Testing Methods and Locations

Permeability tests were performed at boring locations B-1, B-2, B-6 and B-7 as shown on the attached Figure 1. Tests at B-1 and B-7 were performed at 10 feet Below Ground Surface (BGS). Tests at B-2 and B-5 were performed at 15 feet BGS within the boreholes. These tests were performed by spraying water through a hose using a pump and water storage tank into each bore-hole for about 5 minutes. The hose was removed and water depth measured. Each hole was dry immediately after removing hose. Additional water was injected for another 10 minutes with the same result at each permeability test bore-hole.

# Permeability Testing Results

The water was then pumped into a 5-gallon bucket and the rate of hose flow was measured at 14 inches per minute. This is equivalent to 0.07 minute per inch of water flow/percolation into the sandy subgrade. Therefore permeability rates in each test

location are faster than 0.07 minute per inch since this rate of flow would not fill the hole any measureable height in 10 minutes. Therefore the medium dense sandy subgrade with trace silt content is highly permeable.

If you have any questions, please do not hesitate to contact us at your convenience.

Very truly yours, Briggs Engineering & Testing

and U.

David W. Geisser Geotechnical Department Manager

DWG:dg Enclosure: Site Sketch



Briggs Engineering & Testing A Division of PK Associates, Inc.

August 7, 2019

Daedalus Projects, Inc. c/o Ms. Tiesha Jarret Briggs 1 Faneuil Hall Marketplace South Market Building, Suite 4195 Boston, MA 02109-2717

# RE: Title V Field Percolation Tests – June 26, 2019 Proposed Police Station Facilities Main Street at Center Street, Carver, MA

At the request of Daedalus Projects, Inc., Briggs completed monitoring and evaluating soil and groundwater conditions in test pits and performed percolation tests via Massachusetts Title V protocol. Tests were performed within the proposed septic disposal area as shown on the attached sketch.

Stephen P. Reynolds, Licensed Soil Evaluator completed these services. Carver DPW provided a tracked excavator to complete the test pit excavations. Carver Health Agent, Kevin Forque observed all Deep Observation Hole test pits and all percolation tests.

Soil conditions and groundwater conditions are noted in the four attached "Onsite Review Sheets". Percolation tests revealed faster than 2 minutes per inch percolation rate at each test location, resulting in "Site Passed" status per the attached reports.

If you have any questions, please do not hesitate to contact us at your convenience.

Very truly yours, Briggs Engineering & Testing

and UK

David W. Geisser Geotechnical Department Manager

DWG:dg Enclosure: Sketch and Title V Reports (4)

www.briggsengineering.com Offices in Boston, MA and Cumberland, RI 100 Weymouth Street, Unit B1, Rockland, MA 02370 ph 781-871-6040, fax 781-871-7982

# <u>PROPOSED POLICE STATION, MAIN ST., CARVER, MA</u> <u>On-site Review</u>

Deep Hole Number TP-102	Date	7/26/19	Time	am	Weather <u>clear</u>	<u>r 80's</u>
Location (identify on site plan_						_
Land Use undeveloped, p	olayground		_Slope (%)	2 %	_Surface Stones	no
Vegetation trees, shrubs,	grass		Landform			
Position on landscape (sketch of	on back)					
Distances from:						
Open Water Body	500' +	feet	Drain	age Way_	NA	feet
Possible Wet Area	500' +	feet	Prope	rty Line	20′ +	feet
Drinking Water Well	100′ +	feet	Other			feet

		DEEP OBS	SERVATION	HOLE LOG	*
Depth from	Soil	Soil Texture	Soil Color	Soil	Other (Structure, Stones, Boulders,
Surface	Horizon	(USDA)	(Munsell)	Mottling	Consistency, % gravel)
0 – 12″	Α	Sandy Loam	10YR-3/3		
12 – 30″	В	Loamy Sand	10YR-6/8		
30 - 96″	C <sub>1</sub>	Sand	2.5Y-7/4	none	Medium to fine
					Hole collapsing

Parent Material (geologic) Glacial outwash	1		_ Depth to Bedrock:	NA
Depth to Groundwater: Standing Water in	the Hole:	none	_Weeping from Pit Face:	none
Estimated Seasonal High Ground Water:	> 120"			

	Percolation Test*	:
Date:	Time:	
Observation Hole #		
Depth of Perc		
Start Pre-soak		
End Pre-soak		
Time at 12"		
Time at 9"		
Time at 6"		
Time (9"-6")		
Rate Min./Inch	< 2 min/in	
*Minimum of 1 percolation	on test must be performed in both the	e primary area AND reserve area.

Performed By:	Steve Reynolds -SE 2029
Witnessed By:	Kevin Forgue - Carver Health Agent

# <u>PROPOSED POLICE STATION, MAIN ST., CARVER, MA</u> <u>On-site Review</u>

Deep Hole Number TP-103	Date	7/26/19	Time	am	Weather clear	<u>r 80's</u>
Location (identify on site plan_						_
Land Use undeveloped, p	blayground		_Slope (%)	2 %	_Surface Stones	no
Vegetation trees, shrubs, g	grass		Landform			
Position on landscape (sketch c	n back)					
Distances from:						
Open Water Body	500' +	feet	Drain	age Way_	NA	feet
Possible Wet Area	500' +	feet	Prope	erty Line	20′+	feet
Drinking Water Well	100′ +	feet	Othe			feet

DEEP OBSERVATION HOLE LOG*							
Depth from	Soil	Soil Texture	Soil Color	Soil	Other (Structure, Stones, Boulders,		
Surface	Horizon	(USDA)	(iviunseii)	wottling	Consistency, % graver)		
0 – 12″	А	Sandy Loam	10YR-3/3				
12 – 30″	В	Loamy Sand	10YR-6/8				
30 - 120″	C <sub>1</sub>	Sand	2.5Y-7/4	none	Medium to fine		
					Hole collapsing		

Parent Material (geologic) Glacial outwash			_ Depth to Bedrock:	NA
Depth to Groundwater: Standing Water in	the Hole:	none	_Weeping from Pit Face:	none
Estimated Seasonal High Ground Water:	> 120″			

	Percolation Test*	
Date:	Time:	
Observation Hole #		
Depth of Perc		
Start Pre-soak		
End Pre-soak		
Time at 12"		
Time at 9"		
Time at 6"		
Time (9"-6")		
Rate Min./Inch	< 2 min/in	
*Minimum of 1 percolation	n test must be performed in both the p	rimary area AND reserve area.
e passed: 🔽 Site	failed:	

Performed By:	Steve Reynolds -SE 2029
Witnessed By:	Kevin Forgue - Carver Health Agent

# <u>PROPOSED POLICE STATION, MAIN ST., CARVER, MA</u> <u>On-site Review</u>

Deep Hole Number TP-104	Date	7/26/19	Time	am	Weather clear	<u>r 80's</u>
Location (identify on site plan_						_
Land Use undeveloped, p	olayground		_Slope (%)	2 %	_Surface Stones	no
Vegetation trees, shrubs, g	grass		Landform			
Position on landscape (sketch c	n back)					
Distances from:						
Open Water Body	500' +	feet	Drain	age Way_	NA	feet
Possible Wet Area	500' +	feet	Prope	erty Line	20′ +	feet
Drinking Water Well	100′ +	feet	Other			feet

DEEP OBSERVATION HOLE LOG*							
Depth from	Soil	Soil Texture	Soil Color	Soil	Other (Structure, Stones, Boulders,		
Surface	Horizon	(USDA)	(Munsell)	Mottling	Consistency, % gravel)		
0 – 10″	А	Sandy Loam	10YR-3/3				
10 – 28″	В	Loamy Sand	10YR-6/8				
30 - 96″	C <sub>1</sub>	Sand	2.5Y-7/4	none	Medium to fine		
					Hole collapsing		

Parent Material (geologic) Glacial outwash	1		_ Depth to Bedrock:	NA
Depth to Groundwater: Standing Water in	the Hole:	none	_Weeping from Pit Face:	none
Estimated Seasonal High Ground Water:	> 120"			

Percolation Test*					
Date: 7-26-19	Time:				
Observation Hole #	TP-104				
Depth of Perc	48" – 66"				
Start Pre-soak	10:30				
End Pre-soak	10:45				
Time at 12"	25 gal				
Time at 9"					
Time at 6"					
Time (9"-6")					
Rate Min./Inch	< 2 min/in				
*Minimum of 1 percolation test n	nust be performed in both the prim	nary area AND reserve area.			

Site passed: X	Site failed:
Performed By:	Steve Reynolds - SE 2029
Witnessed By:	Kevin Forgue - Carver Health Agent

# <u>PROPOSED POLICE STATION, MAIN ST., CARVER, MA</u> <u>On-site Review</u>

Deep Hole Number TP-101	Date <u>7/26/</u>	<u>19</u> Time	am	Weather clear	<u>80's</u>
Location (identify on site plan					-
Land Use undeveloped, play	ground	Slope (%)	2 %	_Surface Stones	no
Vegetation trees, shrubs, gras	S	Landform			
Position on landscape (sketch on b	ack)				
Distances from:					
Open Water Body 50	<u>)0' + feet</u>	Drai	nage Way_	NA	feet
Possible Wet Area 50	<u>)0' + feet</u>	Prop	erty Line	20′+	feet
Drinking Water Well 10	<u>)0' + feet</u>	Othe	er		feet

DEEP OBSERVATION HOLE LOG*							
Depth from	Soil	Soil Texture	Soil Color	Soil	Other (Structure, Stones, Boulders,		
Surface	Horizon	(USDA)	(Munsell)	Mottling	Consistency, % gravel)		
0 – 12″	А	Sandy Loam	10YR-3/3				
12 – 30″	В	Loamy Sand	10YR-6/8				
30 - 96″	C <sub>1</sub>	Sand	2.5Y-7/4	none	Medium to fine		
					Hole collapsing		

Parent Material (geologic) Glacial outwash	1		_ Depth to Bedrock:	NA
Depth to Groundwater: Standing Water in	the Hole:	none	_Weeping from Pit Face:	none
Estimated Seasonal High Ground Water:	> 120"			

Percolation Test*				
Date: 7-26-19	Time:			
Observation Hole #	TP-101			
Depth of Perc	46" – 64"			
Start Pre-soak	10:50			
End Pre-soak	11:05			
Time at 12"	25 gal			
Time at 9″				
Time at 6"				
Time (9"-6")				
Rate Min./Inch	< 2 min/in			
*Minimum of 1 percolation test must be performed in both the primary area AND reserve area.				

Site passed: X	Site failed:
Performed By:	Steve Reynolds - SE 2029
Witnessed By:	Kevin Forgue - Carver Health Agent



### SECTION 01 01 00 - SUMMARY OF WORK

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 PROJECT DESCRIPTION

- A. The Project consists of a New Facility for the Carver Police Department, Carver, MA, as shown and described on Contract Documents as prepared by Jacunski Humes Architects, LLC, 15 Massirio Drive, Suite 101, Berlin, CT.
- B. The Work consists of site development, site improvements, and the construction of a new, one-story, slab-on-grade, police facility, separate Storage Outbuilding, and related improvements as indicated on the contract documents and specified herein.
- C. Sitework under the responsibility of the <u>General Trades Contractor and</u> <u>applicable Filed Sub-Bid Contractors</u> shall consist of
  - 1. Placement and maintenance of erosion and sedimentation control measures, final grading, and removal of all erosion / sedimentation control measures upon establishment of stable grass areas.
  - 2. Underground storm water installations beyond 10' from building line including catch basin structures and tops, drain manhole and water quality structures and frame /covers, underground detention structures, outflow piping, placement of crushed stone bedding, and all associated piping.
  - 3. Underground rain water collection system from bottom of aluminum downspouts to connections to storm water systems, including stormwater retention systems, piping, downspout boots, and final connections to new aluminum downspouts.
  - 4. Power distribution and site lighting and installation of all site electrical work including conduits, concrete pole bases, fittings, wiring, and warning tape as indicated on the contract documents. General Trades Contractor to be responsible for all trenching, bedding material, backfill.
  - 5. Installation of underground holding tank and all accessories including trenching, bedding material, backfill and connections to drain locations.
  - 6. Paving, line striping, curbing, and proper base materials as indicated on the drawings.
  - 7. Installation of all sidewalks, including bedding materials and handicap accessible curbs cuts / detectable warning strips where indicated on the drawings.

- 8. Installation of directional signs and provisions for future road sign where indicated on the drawings (lighting, conduit, and wiring by Electrical Contractor).
- 9. Installation of flagpoles, including foundations and bedding material, where indicated on the drawings (lighting, conduit, and wiring by Electrical Contractor).
- 10. Installation of metal edging and stone drip beds around building exterior including metal edging, support stakes, stone bedding materials where indicated on the drawings.
- 11. Sanitary lines to extend a minimum of 10' from the building foundation line (all other work by Owner for the completion of the sanitary system).
- 12. Installation of all chain link fencing, vinyl privacy fencing, posts, concrete post support, and gates where indicated on the drawings. Installation of all underground conduits as indicated on the drawings for future motorized gate operator at chain link slide gate.
- 13. Spreading and establishment of final grades with topsoil / loam and seeding to provide an established lawn area. (All topsoil to be provided to the project site by the Owner, see below)
- 14. Emergency generator installations including conduits, concrete pad and rebar, wiring, placement, piping, and exhaust piping including trenching, bedding material, backfill.
- 15. Installation of concrete pad at dumpster location.
- 16. Concrete mechanical pads and concrete aprons (including bedding material and rebar) in support of work required by the General Trades Contractor and / or Filed Sub-bid Trades.
- D. The <u>**Owner**</u> to be responsible for all equipment, materials, labor, and installations concerning the following:
  - 1. Site clearing and grubbing including tree removals and stumps to established contract limit lines.
  - 2. Removal / disposal of all existing playground equipment, protective mulch material, chain link fencing within established contract limit lines.
  - 3. Removal / disposal of existing water feature including demolition and removal of existing water line from source.
  - 4. Supply to the project site all required topsoil / loam for use by the General Trades Contractor. Owner to provide topsoil / loam suitable for use including loading, transportation, and placement from trucks as directed by the General Trades Contractor. (Spreading to established final grades to be by the General Trades Contractor)
  - 5. Removal and disposal of all clean soil overburden from the project site. General Trades Contractor to stockpile all soils to determine quantity of overburden to be removed from the project site. All established overburden will be loaded, transported, and legally disposed of by the Owner. For the purposes of bidding, the General Trades Contractor and the Town of Carver to assume that all existing soils are "clean".
  - 6. Underground sanitary, beyond 10' from building foundation line including concrete septic tank, piping, leaching fields, distribution box. Owner to provide all trenching, bedding materials, labor, inspections, and backfill to

subgrades as indicated on the contract documents and further directed by the General Trades Contractor.

- 7. Installation of all landscaping products and irrigation systems including connections to water service, piping, irrigation heads, drip irrigation within planting beds, mulch material, weed barriers, and fertilizers. (General Trades Contractor to furnish and install all metal edging and stone drip edge material).
- 8. Integrated Technology Systems including, but not limited to, CCTV monitoring and recording systems, access control systems, cell check systems, audio monitoring and recording systems, interview room recording systems and associated wiring needs (infrastructure only by Electrical Contractor).
- 9. Telephone system equipment, Data systems equipment (infrastructure <u>and</u> <u>wiring</u> by Electrical Contractor).
- 10. Furniture, Fixtures, and loose equipment (FF&E) including procurement and placement.
- 11. High density filing systems and equipment. (General Trades Contractor to make provisions for depressed rail installations as indicated on the contract documents).
- 12. Radio Communications Tower, including concrete footings, reinforcing bars, anchor bolts, erection, antenna placement, and cabling.
- 13. Radio Communications Equipment including racks, equipment, wiring, and grounding.
- 14. Communications console furniture including monitor arms and monitors.
- 15. E911 equipment including racks, equipment, grounding, power requirements, UPS system.
- E. The General Trades Contractor is advised that the site is town-owned property and that the Town of Carver may be performing sitework operations for Owner's elected improvements of the project site. The Owner shall coordinate all necessary site activities with, and through, the General Trades Contractor and Owner's Project Manager (OPM).

# 1.3 WORK UNDER OTHER CONTRACTS

A. Separate contracts will be issued by the Town of Carver for certain additional work as deemed necessary for the completion of the Carver Police Facility and related sitework. The installation of new material under these separate contracts may be required prior to the Substantial Completion of the Contract for Construction. The General Trades Contractor and Filed Sub-bidders shall be required to coordinate their work with and allow access to the work by separate Contractors of the Owner.

# 1.4 WORK SEQUENCE

A. The construction sequence and schedule shall be determined by the General Trades Contractor working in cooperation with all Trade Contractors employed for the purpose of fulfilling this Contract for Construction. The General Trades Contractor shall submit, in writing, a Construction Schedule to the Architect prior to the initiation of any on-site operations and in accordance with Construction Time stipulated within section 1.5 – Construction Time. The Architect, Owner's Project Manager, and Awarding Authority shall review and approve the submitted Construction Schedule prior to the initiation of any on-site operations.

### 1.5 <u>CONSTRUCTION TIME</u>

- A. The Contractor shall furnish all materials, labor, and equipment to complete the project <u>within four hundred (400) calendar days</u> of Owner's Notice to Proceed.
- B. The Contractor shall achieve Substantial Completion (as defined in AIA Document G704) <u>within four hundred (400) calendar days</u> of Owner's Date of Commencement / Notice to Proceed. Date of Commencement shall be established as the date of Notice to Proceed from the Awarding Authority.
- C. All punchlist work for the new construction and sitework shall be completed within thirty (30) days after the date of Substantial Completion as indicated above.
- D. The term "Substantial Completion" or "substantially complete" as used in the contract documents shall be deemed to refer to Substantial Completion of all contracted scope of work.
- E. The term "Contract Time" as used in the contract documents shall mean the time period from the date of commencement until the Substantial Completion. Such period may be extended in accordance with the provisions of the Contract Documents.
- F. If the General Trades Contractor, or Filed Sub-bid Contractor, fails to achieve Substantial Completion according to the General Trades Contractor's schedule and the Construction Time listed above, the General Trades Contractor / Filed Sub-bid Contractor shall pay to the Owner liquidated damages as outlined in Section 01010 1.6 Liquidated Damages.

# 1.6 <u>LIQUIDATED DAMAGES</u>

- A. The General Trades Contractor / Filed Sub-bid Contractor understands that upon completion of the Project the Owner will obtain numerous benefits from use and operation of a new state-of-the-art Police Headquarters and expanded sitework and parking. Delay in Substantial Completion will cause delay in the Owner's ability to use the training classroom in the new building and delays in completion may also require the Owner to incur additional costs for compensation to the Architect, the Owner's Project Manager, and other consultants or contractors of the Owner for extended or additional services in connection with the Project.
- **B.** If General Trades Contractor fails to achieve Substantial Completion according to the General Trades Contractor's schedule and the Construction

Time indicated above, the General Trades Contractor shall each pay to the Owner the amount of <u>\$1,000 per calendar day</u> as liquidated damages to cover the losses, expenses, damages and liabilities of the Owner arising out of such breach of contract by the General Trades Contractor as herein set forth.

- C. The parties have agreed upon the daily amounts specified above not as a penalty but as liquidated damages, fixed and agreed upon herein because of the impracticability of fixing and ascertaining the actual damages the Owner would, in such circumstances, sustain. Such amounts may be retained from time to time by the Owner from payments then or thereafter due the General Trades Contractor / Filed Sub-bid Contractor or, to the extent not so retained, shall be paid promptly by the Contractor or its surety to the Owner. The rights and remedies of the Owner provided herein are in addition to any other rights or remedies provided under the Contract Documents or by operation of law. None of the following shall constitute a waiver of the Contractor's or its surety's obligations to pay damages to the Owner:
  - 1. Acceptance of the Work or any portion thereof or payment to the Contractor or its surety therefore;
  - 2. Completion of the Work or any portion thereof or use or occupancy thereof by the Owner or separate contractors; or
  - 3. The Owner's requiring or permitting the Contractor or its surety to complete the Work or any part thereof.

### 1.7 <u>CONTRACTOR USE OF PREMISES</u>

- A. General: Limit use of the premises to construction activities in areas indicated.
  - 1. Confine operations to areas within Contract limit lines indicated on the Contract Documents. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed without prior authorization from the Awarding Authority.
  - 2. Confine the parking of workers, and construction vehicles, and the storage of construction materials to a designated staging area to be determined by the General Trades Contractor with approval by the Awarding Authority.
  - 3. Keep entrances serving the premises clear and available to the Awarding Authority and Awarding Authority's employees at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.

# 1.8 <u>OWNER OCCUPANCY</u>

- A. Completion Requirements: Timely completion of the project is critical. Aggressive construction scheduling and careful monitoring of critical path milestones cannot be overemphasized.
- B. New Buildings: Develop a comprehensive construction schedule for the Work within the new building. The Awarding Authority is to relocate to the new building upon Substantial Completion.

- 1. Make all building and energy systems operational before Owner occupancy including, but not necessarily limited to the following:
  - a. Emergency lighting systems.
  - b. Fire rated enclosures.
  - c. Handicapped accessibility.
  - d. Hardware requirements.
  - e. All other work necessary directed by the local Building Official and Fire Marshal and authorities having jurisdiction (AHJ).
- 2. All costs associated with performance of the Work at premium rates will be borne by the Contractor.
- C. Partial Owner Occupancy: The Owner reserves the right to place and install equipment in completed areas of the building, prior to Substantial Completion, provided that such placing does not interfere with completion of the Work. Such placing of equipment shall not constitute acceptance of the total Work.
  - 1. If required by the General Trades Contractor and upon approval of the Owner, a Certificate of Substantial Completion can be executed for a specific portion of the Work to be utilized by the Owner prior to complete Owner occupancy.
  - 2. Obtain a Certificate of Occupancy from local building officials prior to Owner occupancy.
  - 3. Prior to any partial Owner occupancy, mechanical and electrical systems shall be fully operational. Required inspections and tests shall have been successfully completed. Upon occupancy the Owner will provide operation and maintenance of mechanical and electrical systems in occupied portions of the building.

# 1.9 <u>INTENT</u>

- A. These Specifications with the accompanying Drawings are intended to describe and illustrate all material, labor, and equipment necessary to complete the **New Police Facility for the Carver Police Department, Carver, MA**.
- B. For convenience of reference, these Specifications are separated into titled Divisions and Sections. Such separations shall not, however, operate to make the Architect an arbiter to establish limits to Contracts between the General Trades Contractor and Subcontractors. The Divisions of the Specifications do not necessarily define the limits of the Contractor's subcontracts, the work of any one subcontract may include items specified in several Divisions or Sections. The General Trades Contractor may sublet work not assigned to Trade Contractors as he sees fit, but it is his responsibility to see that all work shown on the Drawings and/or specified is completed in accordance with the Contract.
- C. Furnish all materials and accomplish all work in strict accordance with the grades or standards of materials, standards of workmanship, and manufacturer's specifications listed or mentioned in these documents.

- D. The listing or mention of materials shall be sufficient indication that all such materials shall be furnished by the General Trades Contractor, in accordance with the grades or standards indicated, free from defects impairing strength, durability or appearance and in sufficient quantity for the proper and complete execution of the work, unless specifically stated otherwise.
- E. The listing or mention of any method of installation, erection, fabrication or workmanship shall not operate to make the General Trades Contractor an agent, but shall be for the sole purpose of setting a standard of quality for the finished work. The General Trades Contractor is free to use any alternate method, provided only that, prior to the start of the work, such alternate method is approved in writing by the Architect, as resulting in quality equal to that intended by these documents. Unless an alternate method is approved, all work shall be in strict accordance with all methods if installation, erection, fabrication and workmanship listed or mentioned herein.

### 1.10 SOCIAL SECURITY TAXES

A. The General Trades Contractor and each Subcontractor shall pay the taxes measured by the wages of all their employees as required by the Federal Social Security Act and all amendments thereto, and accept the exclusive liability for said taxes. The General Trades Contractor shall also indemnify and hold the Owner, and its respective officers, agents and servants harmless on account of any tax measured by the wages aforesaid of employees of the General Trades Contractor and his subcontractors, assessed against the Owner under authority of said law.

# 1.11 <u>UNEMPLOYMENT INSURANCE</u>

A. The General Trades Contractor and each Subcontractor shall pay unemployment insurance measured by the wages of his employees as required by law and accept the exclusive liability for said contributions. The General Trades Contractor shall also indemnify and hold harmless the Owner, and its respective officers, agents and servants on account of any contribution measured by the wages of aforesaid employees of the General Trades Contractor and his Subcontractors, assessed against the Owner under authority of law.

# 1.12 OCCUPATIONAL SAFETY AND HEALTH ACT

- A. The General Trades Contractor shall comply with the requirements of the Occupational Safety and Health Act of 1970 and the Construction Safety Act of 1969, including all standards and regulations which have been promulgated by the Governmental Authorities which administer such Acts and said requirements, standards and regulations are incorporated herein by reference.
- B. The General Trades Contractor shall comply with said regulations, requirements and standards and require and be directly responsible for compliance therewith on the part of his agents, employees, material men and Subcontractors; and shall

directly receive and be responsible for all citations, assessments, fines or penalties which may be incurred by reason of his agents, employees, material men or Subcontractors failing to so comply.

C. The General Trades Contractor shall indemnify the Owner, Owner's Project Manager and Architect and save them harmless from any and all losses, costs and expenses, including fines and reasonable attorney's fees incurred by the Owner, Project Manager and Architect by reason of the real or alleged violation of such laws, ordinances, regulations and directives, Federal, State, and Local, which are currently in effect or which become effective in the future, by the General Trades Contractor, his Subcontractors or material men.

PART 2 - PRODUCTS (Not applicable).

PART 3 - EXECUTION (Not applicable).

END OF SECTION 01 01 00

#### SECTION 01 23 00 - ALTERNATES

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section specifies administrative and procedural requirements for Alternates.
- B. Definition: An Alternate is an amount proposed by Bidders and stated on the Bid Form for certain construction activities defined in the Bidding Requirements that may be added to or deducted from Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems or installation methods described in Contract Documents.
- C. Coordination: Coordinate related Work and modify or adjust adjacent Work as necessary to ensure that Work affected by each accepted Alternate is complete and fully integrated into the project.
- D. Notification: Immediately following the award of the Contract, prepare and distribute to each party involved, notification of the status of each Alternate. Indicate whether Alternates have been accepted, rejected or deferred for consideration at a later date. Include a complete description of negotiated modifications to Alternates.
- E. Schedule: A "Schedule of Alternates" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials and methods necessary to achieve the Work described under each Alternate.
  - 1. Include as part of each Alternate, miscellaneous devices, accessory objects and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

#### PART 2 - PRODUCTS (Not Applicable)

#### PART 3 - EXECUTION

#### 3.1 <u>SCHEDULE OF ALTERNATES</u>

- A. <u>ADD Alternate No. 1</u>: General Trades Contractor and related Filed Sub-Bid Contractors are to provide all labor, equipment, materials, and whatever else necessary to furnish and install <u>Storage Outbuilding</u> vertically from the concrete slab construction as indicated on the drawings and specified herein.
  - 1. Sections of the Specifications affected by this Alternate include, but are not limited to:

a.	06 10 00	ROUGH CARPENTRY
b.	06 17 54	WOOD TRUSSES
c.	06 60 00	PLASTIC FABRICATIONS
d.	07 21 13	SPRAY CELLULOSE INSULATION
e.	07 31 13	ASPHALT SHINGLES (FILED SUB-BID)
f.	07 46 46	FIBER CEMENT SIDING
g.	07 84 00	FIRESTOPPING
h.	07 92 00	JOINT SEALERS (FILED SUB-BID)
i.	08 11 13	STEEL DOORS AND FRAMES
j.	08 36 13	OVERHEAD SECTIONAL DOORS
k.	08 71 00	DOOR HARDWARE AND DOOR SCHEDULE
1.	08 80 00	GLASS AND GLAZING
m.	08 91 19	LOUVERS AND VENTS
n.	09 21 00	GYPSUM BOARD ASSEMBLIES
0.	09 51 13	ACOUSTICAL CEILINGS (FILED SUB-BID)
p.	09 90 00	PAINTING (FILED SUB-BID)
q.	10 22 13	WIRE MESH PARTITIONS
r.	10 44 16	FIRE EXTINGUISHERS
s.	22 00 00	PLUMBING (FILED SUB-BID)
t.	23 00 00	HVAC (FILED SUB-BID)
u.	26 00 00	ELECTRICAL (FILED SUB-BID)

- 2. **<u>BASE BID</u>** Sections of the Specifications related to this Alternate include, but are not limited to:
  - a. 03 10 04 CONCRETE FORMWORK
  - b. 03 20 04 CONCRETE REINFORCEMENT
  - c. 03 30 04 CAST-IN-PLACE CONCRETE
  - d. DIVISION 31 EARTHWORK
  - e. DIVISION 32 EXTERIOR IMPROVEMENTS
  - f. DIVISION 33 UTILITIES

END OF SECTION 01 23 00

#### SECTION 01 29 00 – PAYMENT PROCEDURES

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements governing the Contractor's Applications for Payment.
- B. This Section specifies administrative and procedural requirements governing each prime Contractor's Applications for Payment.
  - 1. Coordinate the Schedule of Values and Applications for Payment with the Contractor's Construction Schedule, List of Subcontracts, and Submittal Schedule.
- C. The Contractor's Construction Schedule and Submittal Schedule are included in Section "Submittals".

### 1.3 <u>SCHEDULE OF VALUES</u>

- A. Coordinate preparation of the Schedule of Values with preparation of the Contractor's Construction Schedule.
- B. Each prime Contractor shall coordinate preparation of its Schedule of Values for its part of the Work with preparation of the Contractors' Construction Schedule.
  - 1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
    - a. Contractor's construction schedule.
    - b. Application for Payment form.
    - c. List of subcontractors.
    - d. Schedule of allowances.
    - e. Schedule of alternates.
    - f. List of products.
    - g. List of principal suppliers and fabricators.
    - h. Schedule of submittals.

- 2. Submit the Schedule of Values to the Architect and Owner's Project Manager at the earliest feasible date, but in no case later than 7 days before the date scheduled for submittal of the initial Application for Payment.
- 3. Sub-Schedules: Where the Work is separated into phases that require separately phased payments, provide sub-schedules showing values correlated with each phase of payment.
- C. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values.
  - 1. Identification: Include the following Project identification on the Schedule of Values:
    - a. Project name and location.
    - b. Name of the Designer.
    - c. Project number.
    - d. Contractor's name and address.
    - e. Date of submittal.
  - 2. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:
    - a. Generic name.
    - b. Related Specification Section.
    - c. Name of subcontractor.
    - d. Name of manufacturer or fabricator.
    - e. Name of supplier.
    - f. Change Orders (numbers) that have affected value.
    - g. Dollar value.
    - h. Percentage of Contract Sum to the nearest one-hundredth percent, adjusted to total 100 percent.
  - 3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several line items so that individual line items shall not exceed \$25,000 in value.
  - 4. Round amounts off to the nearest whole dollar; the total shall equal the Contract Sum.
  - 5. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored but not yet installed, provide separate line items on the Schedule of Values for initial

cost of the materials for each subsequent stage of completion, and for total installed value of that part of the Work.

- 6. Unit Cost Allowances: Show line item value of unit cost allowances as a product of unit cost times measured quantity as estimated from the best indication in the Contract Documents.
- 7. Margins of Cost: Show line items for indirect costs, and margins on actual costs, only to the extent that such items will be listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete including its total cost and proportionate share of general overhead and profit margin.
  - a. At the Contractor's option, temporary facilities and other major cost items that are not direct cost of actual work-in- place may be shown as separate line items in the Schedule of Values or distributed as general overhead expense.
- 8. Schedule Updating: Update and resubmit the Schedule of Values when Change Orders or Construction Change Directives result in a change in the Contract Sum.

### 1.4 <u>APPLICATIONS FOR PAYMENT</u>

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Owner's Project Manager and paid for by the Owner.
  - 1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.
- B. Payment Application Times: Each progress payment date is as indicated in the Agreement. The period of construction work covered by each Application or Payment is the period indicated in the Agreement.
- C. Payment Application Times: The date for each progress payment is the 1<sup>st</sup> day of each month. The period of construction Work covered by each Application for Payment is the month prior to the date for each progress payment and starting the day of the preceding period.
  - 1. A Draft Application for Payment shall be submitted to the Owner, Architect, and Owner's Project Manager on the date of the last scheduled Job Meeting of the month preceding the payment application time.
  - 2. Final Application for Payment shall be prepared in triplicate (3 copies) and incorporate the revision comments as requested by the Owner, Owner's Project Manager, or Architect.

- D. Payment Application Forms: Use AIA Document G 702 and Continuation Sheets G 703 as the form for Application for Payment.
- E. Suppliers, Trade and Subcontractors will be required to submit copies of their Certified Payroll forms to the Construction Manager for the current Application Period. The Construction Manager shall be responsible for transferring all Certified Payroll forms to the Owner's Project Manager. Owner has the right to withhold payments if required Certified Payroll forms are not being provided in a timely manner.
- F. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Owner. Incomplete applications will be returned without action.
  - 2. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
  - 3. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.
- G. Transmittal: Submit FIVE (5) executed final copies of each Application for Payment to the Owner's Project Manager by means ensuring receipt within 24 hours; one copy shall be complete, including waivers of lien and similar attachments, when required.
  - 1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Owner's Project Manager.
- H. Waivers of Mechanics Lien: With each Application for Payment submit waivers of mechanics liens from subcontractors or sub- subcontractors and suppliers for the construction period covered by the previous application.
  - 1. Submit partial waivers on each item for the amount requested, prior to deduction for retainage, on each item.
  - 2. When an application shows completion of an item, submit final or full waivers.
  - 3. The Owner reserves the right to designate which entities involved in the Work must submit waivers.
  - 4. Waiver Delays: Submit each Application for Payment with the Contractor's waiver of mechanics lien for the period of construction covered by the application.

- a. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of Work covered by the application who could lawfully be entitled to a lien.
- 5. Waiver Forms: Submit waivers of lien on forms, and executed in a manner, acceptable to Owner.
- I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:
  - 1. List of subcontractors.
  - 2. List of principal suppliers and fabricators.
  - 3. Schedule of Values.
  - 4. Contractor's Construction Schedule (preliminary, if not final).
  - 5. Schedule of principal products.
  - 6. Schedule of unit prices.
  - 7. Submittal Schedule (preliminary if not final).
  - 8. List of Contractor's staff assignments.
  - 9. List of Contractor's principal consultants.
  - 10. Copies of building permits
  - 11. Copies of authorizations and licenses from governing authorities for performance of the Work.
  - 12. Initial progress report.
  - 13. Report of pre-construction meeting.
  - 14. Certificates of insurance and insurance policies.
  - 15. Performance and payment bonds (if required).
  - 16. Data needed to acquire Owner's insurance.
  - 17. Initial settlement survey and damage report, if required.
- J. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment. This application shall reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- K. Administrative actions and submittals that shall proceed or coincide with this application include:
  - 1. Occupancy permits and similar approvals.
  - 2. Warranties (guarantees) and maintenance agreements.
  - 3. Test/adjust/balance records.
  - 4. Maintenance instructions.
  - 5. Meter readings.
  - 6. Start-up performance reports.
  - 7. Change-over information related to Owner's occupancy, use, operation and maintenance.
  - 8. Final cleaning.

- 9. Application for reduction of retainage, and consent of surety.
- 10. Advice on shifting insurance coverages.
- 11. Final progress photographs.
- 12. List of incomplete Work, recognized as exceptions to Designer's Certificate of Substantial Completion.
- L. Final Payment Application: Administrative actions and submittals, which must precede or coincide with submittal of the final payment Application for Payment, include the following:
  - 1. Completion of Project closeout requirements.
  - 2. Completion of items specified for completion after Substantial Completion.
  - 3. Assurance that unsettled claims will be settled.
  - 4. Assurance that Work not complete and accepted will be completed without undue delay.
  - 5. Transmittal of required Project construction records to Owner.
  - 6. Certified property survey.
  - 7. Proof that taxes, fees and similar obligations have been paid.
  - 8. Removal of temporary facilities and services.
  - 9. Removal of surplus materials, rubbish and similar elements.
  - 10. Change of door locks to Owner's access.

<u>PART 2 – PRODUCTS</u> (Not Applicable to this Section.)

<u>PART 3 – EXECUTION</u> (Not Applicable to this Section.)

END OF SECTION 01 29 00

# SECTION 01 31 00 - PROJECT COORDINATION

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section specifies administrative and supervisory requirements necessary for Project coordination including, but not necessarily limited to:
  - 1. Coordination.
  - 2. Progress Meetings.
  - 3. Administrative and supervisory personnel.
  - 4. General installation provisions.
  - 5. Cleaning and protection.
- B. Requirements for the Contractor's Construction Schedule are included in Section 01 10 00, "Summary of Work".
- C. Requirements for the Scheduling and Coordination of Tests and Inspections are included in Section 01 40 00, "Quality Requirements".

### 1.3 COORDINATION

- A. Coordination: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, connection, and operation. No claim for extra compensation or extension of Contract time will be allowed for conditions resulting from a lack of said coordination and cooperation.
  - 1. Where installation of one part of the work, is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.
  - 2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.

- B. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
  - 1. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of schedules.
  - 2. Installation and removal of temporary facilities.
  - 3. Delivery and processing of submittals.
  - 4. Progress meetings.
  - 5. Project Close-out activities.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

### 1.4 PRE-CONSTRUCTION CONFERENCE

- A. The General Trades Contractor will schedule a pre-construction conference and organizational meeting at the Project site no later than 15 days after execution of the Agreement and prior to commencement of construction activities. Attend the meeting to review responsibilities and personnel assignments.
- B. Attendees: The General Trades Contractor, Owner, Owner's Project Manager, Architect and their consultants, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.
  - 1. Notify and arrange for attendance by all parties except the Owner's Project Manager, Architect and Owner.
- C. Agenda: Items of significance that could affect progress will be discussed, including such topics as:
  - 1. Tentative construction schedule.
  - 2. Critical Work sequencing.
  - 3. Designation of responsible personnel.
  - 4. Procedures for processing field decisions and Change orders.
  - 5. Procedures for processing Applications for Payment.
  - 6. Distribution of Contract Documents.
  - 7. Submittal of Shop Drawings, Product Data and Samples.
  - 8. Preparation of record documents.
  - 9. Use of the premises.
  - 10. Office, Work and storage areas.

- 11. Equipment deliveries and priorities.
- 12. Safety procedures.
- 13. First aid.
- 14. Security.
- 15. Housekeeping.
- 16. Working hours.

### 1.5 <u>SUBMITTALS</u>

- A. Coordination Drawings: Prepare and submit coordination Drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.
  - 1. Show the interrelationship of components shown on separate Shop Drawings.
  - 2. Indicate required installation sequences.
  - 3. Comply with requirements contained in Section 01 33 00, "Submittals and Product Substitutions."
  - 4. Refer to Divisions 22, 23, 26, and 28 for specific coordination drawing requirements for plumbing, mechanical, and electrical installations.
- B. Staff Names: Within fifteen (15) days of Notice to Proceed, submit a list of the Contractor's principal staff assignments, including the Superintendent and other personnel in attendance at the site; identify individuals, their duties and responsibilities; list their addresses and telephone numbers.

### 1.6 <u>COORDINATION MEETINGS</u>

- A. Conduct project coordination meetings at regularly scheduled times convenient for all parties involved. Project coordination meetings are in addition to regular progress meetings. Coordination meetings with the Architect and OPM shall occur no less that three (3) times throughout the construction period.
- B. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.
- C. Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

### 1.7 **PROGRESS MEETINGS**

A. The General Trades Contractor will take part in progress meetings at the Project site on a weekly basis. Coordinate dates of meetings with preparation of the payment request.

- B. Attendees: Notify each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities, to attend these meetings. Persons familiar with the Project and authorized to conclude matters relating to progress shall be represented.
- C. Agenda: Review and correction or approval of minutes of the previous progress meeting. Review of other items of significance that could affect progress. Topics for discussion as appropriate to the current status of the Project.
  - 1. Contractor's Construction Schedule: Prepare a written report including progress since the last meeting. Determine where each activity is in relation to the General Trades Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
  - 2. Review of present and future needs of each entity present, including such items as:
    - a. Interface requirements.
    - b. Time (two-week look ahead schedule)
    - c. Sequences.
    - d. Deliveries.
    - e. Off-site fabrication problems.
    - f. Access.
    - g. Site utilization.
    - h. Temporary facilities and services.
    - i. Hours of Work.
    - j. Hazards and risks.
    - k. Housekeeping.
    - 1. Quality and Work standards.
    - m. Change Order Proposals.
    - n. Documentation of information for payment requests (last meeting of the month)
- Reporting: The Owner's Project Manager will prepare and distribute copies of minutes of the meeting to Owner, Architect, and General Trades Contractor. General Trades Contractor shall distribute copies to others who should be informed of decisions.
  - 1. Schedule Updating: Revise the construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue the revised schedule concurrently with the report of each meeting.
  - 2. General Contractor shall provide <u>at each scheduled Job Meeting</u> a detailed, 2-week look-ahead schedule outlining in detail all planned construction activities to occur, or planned for, from the date of each Job Meeting.

PART 2 - PRODUCTS (Not Applicable)

### PART 3 - EXECUTION

#### 3.1 GENERAL INSTALLATION PROVISIONS

- A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.
- C. Inspect materials or equipment immediately upon delivery and again prior to installation. Reject damaged and defective items.
- D. Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.
- E. Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to the Architect for final decision.
- F. Recheck measurements and dimensions, before starting each installation.
- G. Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.
- H. Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.
- I. Mounting Heights: Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Architect for final decision.

### 3.2 CLEANING AND PROTECTION

A. During handling and installation, clean and protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
B. Clean and maintain completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

C. Limiting Exposures: Supervise construction activities to ensure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

- 1. Excessive static or dynamic loading.
- 2. Excessive internal or external pressures.
- 3. Excessively high or low temperatures.
- 4. Thermal shock.
- 5. Excessively high or low humidity.
- 6. Air contamination or pollution.
- 7. Water or ice.
- 8. Solvents.
- 9. Chemicals.
- 10. Light.
- 11. Radiation.
- 12. Puncture.
- 13. Abrasion.
- 14. Heavy traffic.
- 15. Soiling, staining and corrosion.
- 16. Bacteria.
- 17. Rodent and insect infestation.
- 18. Combustion.
- 19. Electrical current.
- 20. High speed operation,
- 21. Improper lubrication.
- 22. Unusual wear or other misuse.
- 23. Contact between incompatible materials.
- 24. Destructive testing.
- 25. Misalignment.
- 26. Excessive weathering.
- 27. Unprotected storage.
- 28. Improper shipping or handling.
- 29. Theft.
- 30. Vandalism.

END OF SECTION 01 31 00

## SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>DEFINITIONS</u>

The following definitions apply to this section of the specifications:

- A. Owner: The Owner is defined as the Owner, Owner's Representative, Owner's Project Manager (OPM), or Program Manager.
- B. Provisional Project Construction Schedule: The schedule of construction activities, as prepared by the Owner, which gives all project stakeholders an estimated amount of time for the construction phase of the Project.
- C. Project Construction Schedule: The detailed CPM Construction Schedule prepared by the General Trades Contractor for the duration of the Construction Phase of the Project.
- D. Interim Project Construction Schedule: The detailed 90-day "look-ahead" CPM Project Construction Schedule prepared by the General Trades Contractor as a prelude to the Project Construction Schedule. The Interim Project Construction Schedule is based on the milestones indicated in the Provisional Project Construction Schedule. This Schedule is required for the Contractor to receive payment for work performed during the first 60 days of the Project. The purpose of this schedule is to give the Contractor adequate time to plan and schedule all of the work for the Project, while they are mobilizing and beginning to perform work.
- E. Master Project Schedule: A schedule prepared by the Owner to track all activities of the entire Project.
- F. Updated Project Construction Schedule: The Project Construction Schedule prepared each month by the General Trades Contractor in support of their request for payment.
- G. Revised Project Construction Schedule: The Project Construction Schedule that has been changed by the General Trades Contractor, during the course of construction, and approved by the Owner. The Revised Project Construction

Schedule may include changes in logic, changes in the durations of the activities, changes in the sequencing of the work, and fragments.

- H. Recovery Project Construction Schedule: The Project Construction Schedule prepared by the General Trades Contractor to support their efforts to recover lost time during the Project.
- I. CPM (Critical Path Method): Critical Path Method (CPM) is a system for planning, scheduling, controlling, and monitoring progress on a Project. The CPM system uses networks of activities interrelating time and dollars to monitor progress on Projects. CPM uses network analysis to identify those tasks, which are on the critical path, where any delay in the completion of these tasks will lengthen the project timescale, unless action is taken. The system provides a means of evaluating delays and impacts caused by changes and delays attributed to Owners and Contractors.
- J. Critical Path: The longest continuous sequence of activities through the network schedule that establishes the minimum overall project duration and contains no float.
- K. Activity: An activity is defined as any portion or element of work, action, and/or reaction that is precisely described, readily identifiable and is a function of a logical sequential process.
  - 1. Critical Activity Activities on the Critical Path. They must start and finish on the planned start and finish dates, otherwise there will be a delay in the completion of the Project.
  - 2. Predecessor Activity an activity that must be completed before a given activity can be started.
  - 3. Successor Activity an activity that succeeds another activity.
- L. Float: Any activity not on the critical path will have a certain amount of leeway or float time associated with it. Float time is defined as the amount of time between the earliest start date and the latest start date or between the earliest finish date and the latest finish date of a chain of activities in Project Construction Schedule. Float Time is the amount of time that an activity can slip past its duration without delaying the rest of the project.
- M. Fragnet: The subdivision of a project network diagram into segments, usually representing some form of subproject (change).
- N. Milestone: A clearly identifiable point in a project or set of activities that commonly denotes a reporting requirement or completion of a key component of a project.
- O. Phasing: The process of segregating activities into a series of sequential phases.
- P. Delay: An interruption or hindrance to planned progress.

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#### 1.3 <u>GENERAL REQUIREMENTS</u>

- A. The work under this contract will be planned, scheduled, executed and reported using the Critical Path Method, hereinafter referred to as CPM.
- B. The primary objectives for developing and maintaining a Project Construction Schedule are to insure the adequate planning, scheduling and execution of the construction activities so they may be performed in an orderly and expeditious manner, within the Contract Time and the Milestone Dates stipulated by the Contract; to provide optimum coordination between Contractors; to establish the basis for measuring and monitoring individual Contractor progress and overall project progress; to detect problems for the purpose of taking corrective action to maintain the Master Project Schedule; and to provide a mechanism or tool for determining and monitoring such corrective actions.
- C. The Provisional Project Construction Schedule prepared for this project, is made available by the Owner as an aid to the Contractor. It is intended that Contractor's actual Project Construction Schedule include the milestone dates indicated in the Provisional Project Construction Schedule. However, the services provided by the owner, the existence of schedules, networks, vector charts or any other charts or services prepared or performed by the Owner shall in no way relieve the Contractor of the responsibility of complying with all of the requirements of the Contract Documents, including but not limited to the responsibility of planning, scheduling and coordinating the work. The Contractor is required to comply with all control procedures specified herein and with any reasonable changes that may be necessary, in the opinion of the Owner, during the contract duration.
- D. All Milestone dates or specific dates listed in these specifications, or elsewhere in the Contract Documents represent only the major items of construction/erection work or interface dates. The Milestone dates indicated are considered essential to the satisfactory performance of this contract and to the coordination of all work on the project. The Milestone dates listed are not intended to be a complete listing of all work under this Contract or of all interfaces with other project Contractors. The Milestone dates listed represent the latest allowable completion dates. Earlier completion dates may be established as agreed by the Contractor and the Owner.
- E. If the General Trades Contractor should desire or intend to complete the work earlier than any required Milestone or Completion date, the Owner shall not be liable to the General Trades Contractor for any costs or other damages should the General Trades Contractor be unable to complete the Work before such Milestone or Completion date. The duties, obligations and warranties of the Owner to the General Trades Contractor shall be consistent with and applicable only to the completion of the Work on the Milestone and Completion dates

required in the Owner-Contractor Agreement unless the Owner and General Trades Contractor otherwise agree in writing.

- F. The General Trades Contractor shall maintain, as part of its organization, a staff of sufficient size, knowledgeable in the use and application of Scheduling Application and whose responsibility will be to prepare input information for the Project Construction Schedule, monitor progress, provide input for updating and revise logic diagrams when necessary.
- G. The General Trades Contractor is required to adhere to the Milestone Dates as set forth in the General and Supplemental Conditions, Provisional Project Construction Schedule, or as determined elsewhere in the contract documents.
- H. Float time is not for the exclusive use or benefit of ether the General Trades Contractor or the Owner. The Contractors work shall proceed according to early start dates, and the Owner shall have the right to reserve and apportion float time according to the needs of the project. The General Trades Contractor acknowledges and agrees that actual delays, affecting paths of activities containing float time, will not have any affect upon contract completion times, providing that the actual delay does not exceed the float time associated with those activities.
- I. Extensions of time for performance as described in the Contract Documents will be granted only to the extent that time adjustment for the activity or activities affected by any condition or event which entitles the General Trades Contractor to a time extension exceed the total float or slack along the path of activities affected at the time of Notice to Proceed of a Change Order or the commencement of any delay or condition for which an adjustment is warranted under the Contract Documents, pursuant to paragraph 1.07 Requested Time Adjustment Schedule.

## 1.4 POST AWARD ACTIVITIES

- A. The General Trades Contractor shall perform the following activities after receipt of the Notice to Proceed:
  - 1. Immediately after Notice to Proceed, the General Trades Contractor shall begin the preparation of his Interim Project Construction Schedule and the Project Construction Schedule. The General Trades Contractor shall assemble, with the assistance of his Subcontractors and Suppliers, information regarding the project that includes but is not limited to:
    - a. A detailed Interim Project Construction Schedule or Project Construction Schedule that represents the General Trades Contractor's best judgment of how he shall prosecute and complete the work in compliance with the Contract Milestone Dates and any Specific Dates stipulated in the Contract. The level of detail required in the Contractor's schedule should generally be a function of the complexity of the work

- b. The identity and duration of all activities to be included in this Interim Project Construction Schedule and the Project Construction Schedule. Activities shall meet the following criteria:
  - 1. Activity descriptions shall be clear and concise. The beginning and end to each activity shall be readily verifiable.
  - 2. Responsibility for each activity shall be identified with a single performing organization.
  - 3. The level of detail of the Network shall be such that <u>no</u> <u>activity shall have a duration longer than fourteen (14)</u> <u>calendar days</u>, except for procurement and General Conditions Activities or except at the discretion of the Owner. Include written two week look ahead for Architect's review.
  - 4. Identify phasing and location of activities as required.
- c. The identity of long lead items and delivery dates of all major pieces of equipment or materials.
- d. The identity of any potential problems or constraints related to the implementation of the Interim Project Construction Schedule and/or the Project Construction Schedule.

The Owner will be available, during normal working hours, to consult with the General Trades Contractor if questions arise while the contractor assembles the information required for the Interim Project Construction Schedule and/or the Project Construction Schedule.

- B. The General Trades Contractor shall, within fourteen (14) calendar days following receipt of the Notice to Proceed, submit to the Owner an Interim Project Construction Schedule, in Critical Path Method format (or CPM), for his construction/erection scope of work for the first 90-days of the Project, compatible in Primavera P3 format. The Owner will review the General Trades Contractor's Interim Project Construction Schedule to determine if it meets the specific requirements of the Provisional Project Schedule. The General Trades Contractor shall, within sixty (60) calendar days following the receipt of the Notice-to-Proceed, submit to the Owner the Project Construction Schedule in the same format indicated above. The Owner will review the General Trades Contractor's Project Construction Schedule to determine if it meets the specific requirements of the Provisional Project Schedule. The form of submittal for the Interim Project Construction Schedule and the Project Construction Schedule including logic diagrams is as follows:
  - 1. The General Trades Contractor shall submit to the Owner a computer disk in Primavera P3 or compatible format and two (2) full size printed copies of his proposed contract activities. The Interim Project Construction Schedule and the Project Construction Schedule shall consist of a network diagram with activity descriptions and durations and supporting data that will explain the General Trades Contractor's planning of the work.
  - 2. The network diagram shall show:

- a. The order and interdependencies of the General Trades Contractors activities and the major points of interface or interrelation with the activities of others, including Specific Dates for completion.
- b. Conformance with and identification of the specified mandatory Milestone dates specified in the Contract Documents.
- c. The description and quantity of work by activity.
- d. For all equipment and materials fabricated or supplied for this Project, the network shall show a sequence of activities including:
  - 1. Procurement
  - 2. Engineering and Preparation of Submittals
  - 3. Approval of Submittals
  - 4. Fabrication/Manufacturing
  - 5. Delivery
  - 6. Erection/installation
- e. Delivery of Owner-furnished material and equipment.
- f. Critical Path (or Paths).
- g. Training of Owner personnel on Equipment
- h. Testing of equipment and materials.
- i. A complete detailed sequence of operations of the work within the time limits specified in the contract.
- C. The Interim Project Construction Schedule and the Project Construction Schedule shall indicate an early completion date for the project that is no later than the project's required completion date. All activity duration's shall be given in calendar days. The Interim Project Construction Schedule and the Project Construction Schedule shall also indicate each of the following:
  - 1. Interfaces with the work of outside Contractors, e.g., utilities, power, and with any separate Contractor.
  - 2. Detailed description of the activity along with the coding and phasing, if applicable.
  - 3. Estimated duration time for each activity.
  - 4. Early start date for each activity.
  - 5. Late start date for each activity.
  - 6. Early finish date for each activity.
  - 7. Late finish date for each activity.
  - 8. Float available for each path of activities containing float.
  - 9. Identification of all critical path activities in the mathematical analysis.
  - 10. The critical path for the project, with said path of activities being clearly and easily recognizable on the time-scaled network diagram.
  - 11. The relationship between all non-critical activities and activities on the critical path shall be clearly shown on the network diagram.
  - 12. The responsibility code for the Contractor or Subcontractor performing each activity or portion thereof.

- 13. For each activity, the identification of all predecessor and successor activities.
- 14. For each activity, the number of man-hours required to compete each activity.
- D. The General Trades Contractor shall submit, with the Interim Project Construction Schedule and the Project Construction Schedule, a narrative report indicating anticipated allocation of the following resources and work shifts to be utilized on the project.
  - 1. Labor resources
  - 2. Equipment resources
  - 3. Whether work will be performed on a single, double or triple shift, and whether it is to be done on a 4, 5, 6 or 7-day work week basis.
  - 4. Construction logic and a summary of the sequence of the work.
  - 5. An explanation of the coding and/or phasing used.
- E. It is to be expressly understood and agreed by the General Trades Contractor that the Interim Project Construction Schedule and the Project Construction Schedule is an estimate to be revised from time-to-time as progress proceeds, and that the Owner does not guarantee that General Trades Contractor can start work activities on the "early start" or "late start" dates or complete work activities on the "early finish" or "late finish" date shown in the Interim Project Construction Schedule and the Project Construction Schedule, or as same may be updated or revised; nor does the Owner guarantee that General Trades Contractor can proceed at all times in the sequence established by said schedule. If the Contractor's Interim Project Construction Schedule and the Project Construction Schedule indicates that the Owner or a separate Contractor is to perform an activity by a specific date, or within a certain duration, the Owner or any separate Contractor under contract with Owner shall not be bound to that date or duration unless the Owner expressly and specifically agrees in writing to same, the Owner's overall review and approval or acceptance of the Interim Project Construction Schedule and the Project Construction Schedule does not constitute an agreement to specific dates, durations or sequences for activities of the Owner or any separate Contractor.
- F. The Owner will review the General Trades Contractor's Interim Construction Project Schedule and the Construction Project Schedule, including logic diagrams and computer-generated mathematical analysis, for compatibility with the Contract Documents. If required, a meeting will be held between the Owner and General Trades Contractor to resolve any conflicts between the Contractor's Interim Project Construction Schedule and/or the Project Construction Schedule and the Contract Documents. The General Trades Contractor shall revise his schedule as required by the Owner to support the Contract Documents and shall submit his revised schedule to the Owner within fourteen (14) days.
- G. Within fourteen (14) calendar days following acceptance of the Interim Project Construction Schedule or the Project Construction Schedule, the General Trades Contractor will provide two (2) full size printed copies and electronic copy of

the General Trades Contractor's Interim Project Construction Schedule or the Project Construction Schedule and a computer listing of all network activities, and an electronic file copy on a disk (CD) to the Owner. The Owner shall review the Interim Project Construction Schedule or the Project Construction Schedule, and after the Owner agrees that it conforms to the Contract Documents, the General Trades Contractor's Interim Project Construction Schedule or the Project Construction Schedule will be used to monitor progress of the work and support requests for payment.

- H. The General Trades Contractor will develop and maintain the Master Project Schedule, of which the Contractor's Interim Project Construction Schedule or the Project Construction Schedule will be made a part. This Master Project Schedule will be the controlling schedule document utilized for managing overall project progress.
- I. Within ninety (90) calendar days following the receipt of the Notice to Proceed, the General Trades Contractor shall participate in a meeting with the Owner to review, evaluate and approve the Project Construction Schedule.
- J. If the General Trades Contractor thereafter desires to make changes in its method of operating and scheduling, he shall follow the procedures set out in paragraph 1.05, Network Revisions, of this section.
- K. Approval by the Owner of the General Trades Contractor's Interim Project Construction Schedule or the Project Construction Schedule is advisory only and shall not relieve the Contractor of the responsibility for accomplishing the Work within each and every Contract-required Milestone and Completion date. Omissions and errors in the approved Interim Project Construction Schedule or the Project Construction Schedule shall not excuse performance that is not in compliance with the contract.

Approval by the Owner in no way makes them an insurer of the Interim Project Construction Schedule's or the Project Construction Schedule's success nor shall it make the Owner liable for time or cost overruns from its shortcomings. The Owner hereby disclaims any obligation or liability by reason of Owner approval of or acquiescence to the Interim Project Construction Schedule or the Project Construction Schedule.

- L. The General Trades Contractor shall include in the Project Construction Schedule all procurement related activities that lead to the delivery of materials to the site in a timely manner. The schedule of off-site activities shall include, but is not limited to, the following:
  - 1. Dates for submittals, ordering, manufacturing, or fabricating, and delivery of equipment and materials. Long lead items requiring more than one month between ordering and delivery to site shall be clearly noted.

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- 2. All significant activities to be performed by the Contractor during the fabrication and erection/installation in a Contractor's plant or on a job site, including materials/ equipment purchasing.
- 3. The General Trades Contractor's drawings and submittals to be prepared and submitted to the Owner and Architect
- M. The General Trades Contractor shall be solely responsible for expediting the delivery of all material they intend to furnish, so that the construction progress shall be maintained according to the current schedule for the Work as approved by the Owner.
- N. The General Trades Contractor shall advise the Owner, in writing, whenever they anticipate that the delivery date of any material and/or equipment furnished by the General Trades Contractor for installation will be later than the delivery date shown on the schedule, subject to schedule updates.
- O. Submittals, equipment orders and similar items are to be treated as schedule activities, and shall be given appropriate activity numbers.
- P. The General Trades Contractor, in developing his procurement schedule, will confirm and verify that the off-site activities do not control the Critical path of on-site activities.

# 1.5 <u>COMPUTER COST AND SCHEDULE REPORTS</u>

- A. Every month the General Trades Contractor will provide a Preliminary Computer Generated Update Report for the Owner and Architect to use to determine the percent complete and remaining duration of all activities. The data approved in this report shall be used, by the General Trades Contractor, to update the Project Construction Schedule on a Monthly Basis. This report shall be submitted along with the submission of the application for payments. The General Trades Contractor's Project Manager and/or Superintendent, and the Owner shall meet at the job site for the purpose of reviewing the General Trades Contractor's report of actual progress, and obtaining from the General Trades Contractor (following his meeting with all concerned Subcontractors and suppliers) up-to- date and accurate progress data. <u>Applications for payments will not be processed</u> without the Updated Project Construction Schedule.
- B. Report Content:
  - 1. The Preliminary and Final Monthly Update Reports shall include the following minimum information for each activity sorted by activity number, by remaining float (from the least to the most), and by late start date, in chronological order:
    - a. Activity number
    - b. Activity codes
    - c. Activity description
    - d. Estimated duration in days

- e. Early and late start dates (or Actual if in Progress or Completed)
- f. Early and late finish dates (or Actual if in Progress or Completed)
- g. Percentage of activity completed as of the previous report (Proposed Current % of Activity Completed)
- h. Remaining duration as of Previous Report
- i. Proposed current remaining duration
- C. All updated Preliminary and Final Monthly Reports will be distributed to the Owner and Architect as follows:
  - 1- Paper Copy
  - 1- Electronic Copy (PDF format)
- D. The General Trades Contractor shall also submit a narrative report with the Preliminary and Final Monthly Reports which shall Include, but not be limited to, a description of problem areas, current and anticipated delaying factors and their impact, an explanation of corrective action taken, any newly planned activities, and any proposed logic revisions for a Recovery Schedule. The narrative report shall also include:
  - 1. <u>A description of the actual work accomplished during the reporting period</u>
  - 2. A list of major equipment delivered and/or installed during the reporting period.
  - 3. A list of major equipment remaining to be delivered to the Project Site including the current availability and anticipated jobsite delivery date
  - 4. Changes or additions to Contractor's supervisory personnel since the preceding progress report
- E. In addition to the above, the General Trades Contractor may be required to submit from time to time the following reports:
  - 1. <u>Critical Items Report</u>: The General Trades Contractor shall submit periodically to the Owner a Critical Items Report identifying items by cause and impact that are, or will, seriously affect the General Trades Contractor's progress or ability to perform work in accordance with the current General Trades Contractor Construction Schedule.

Such reports will not be required more than once every sixty (60) days and shall be furnished in sufficient detail to define the cause and potential impact of any actual or anticipated changes in material or equipment deliveries (Contractor or owner-furnished manpower, availability, weather conditions, or other items critical to maintaining the schedule.

#### 1.6 <u>NETWORK REVISIONS</u>

A. Should the General Trades Contractor, after approval of the Initial Project Construction Schedule, desire to change his plan of construction, he shall submit his requested revisions to the Owner and Architect along with a written statement of the revisions including a description of the logic for rescheduling the work, methods of maintaining adherence to intermediate milestones and Specific Dates and the reasons for the revisions. The General Trades Contractor shall revise his Project Construction Schedule to include the effect of changes, acts of God, or other conditions or events that have affected the network. If the requested changes are acceptable to the Owner and Architect, the Contractor will incorporate them into the Project Construction Schedule, in the next reporting period.

- B. When the Owner orders changes by Change Order which have the potential to impact the Milestone Dates as set forth in the General and Supplemental Conditions, Provisional Project Construction Schedule, or as determined elsewhere in the contract documents, the General Trades Contractor shall prepare a Network (fragnet) and provide it to the Owner and Architect for concurrence or revision as the Owner deems necessary. After the network has been mutually agreed upon, the General Trades Contractor will incorporate it into the Project Construction Schedule. Change Order logic will affect only those activities and performance dates directly concerned. Adjustments in scheduled intermediate Completion Dates or for the Contract as a whole, will be considered only to the extent that there is insufficient remaining float to absorb these changes.
- C. Any change to the approved Project Construction Schedule must be approved in writing by the Owner.
- D. Neither the updating or revision of the Project Construction Schedule nor the submission, updating, change or revision of any report or schedule submitted to the Owner by the General Trades Contractor under this Section nor the Owner's review or concurrence of any such report or schedule shall have the effect of amending or modifying, in any way, the Contract Time, any Contract Completion Date, or Contract Milestone Dates or of modifying or limiting in any way the Contractors obligations under this Contract.

# 1.7 <u>RECOVERY SCHEDULE</u>

- A. If the General Trades Contractor's schedule, to the extent that any of the mandatory specific or milestone dates or completion dates, fall behind by 14 days or more, or in the opinion of the Owner are in jeopardy, the General Trades Contractor shall be required to, at no extra cost to the Owner, prepare and submit to the Owner a supplementary Recovery Schedule, in a form and detail appropriate to the need, to explain and display how he intends to reschedule those activities to regain compliance with the Project Construction Schedule during the Immediate subsequent pay period.
- B. The General Trades Contractor and Owner shall do the following after determination of the requirement of a Recovery Schedule:
  - 1. Within three (3) calendar days, the General Trades Contractor shall meet with the Owner to present and review a draft version of the Recovery Schedule. The Recovery Schedule shall represent the Contractor's best judgment as to how he shall reorganize his work so that he may return to

the completion dates indicated in the Project Construction Schedule within the immediate subsequent pay period. The Recovery Schedule shall be prepared to a similar level of detail as the Project Construction Schedule and shall have a maximum duration of one (1) month that shall coincide with the pay period.

- 2. Within five (5) calendar days, the General Trades Contractor shall participate in a conference with the Owner to review and evaluate and approve the final Recovery Schedule. Any revisions required as a result of this review shall be resubmitted by the Contractor for approval within two (2) calendar days of the conference. The approved Recovery Schedule shall then be the Schedule which the Contractor shall use in planning, organizing, directing, coordinating, performing and executing the Work (including all activities of subcontractors, equipment vendors and suppliers) for its one (1) month duration, to regain compliance with the Project Construction Schedule.
- C. Five (5) calendar days prior to the expiration of the Recovery Schedule, the Owner and the General Trades Contractor will meet at the job site for the normal monthly update and to determine the effectiveness of the Recovery Schedule and to determine whether the Contractor has regained compliance with the Project Construction Schedule. At the direction of the Owner, one of the following will happen:
  - If, in the opinion of the Owner, the General Trades Contractor is still behind schedule, the General Trades Contractor will prepare another Recovery Schedule, at the Contractors expense, pursuant with 1.06 (A&B) of this Section, to take effect during the immediate subsequent pay period.
  - 2. If, in the opinion of the Owner, the General Trades Contractor has sufficiently regained compliance with the Project Construction Schedule, the use of the Project Construction Schedule will be resumed.

## 1.8 <u>REQUESTED TIME ADJUSTMENT SCHEDULE</u>

A. The Updated Project Construction Schedule submitted by General Trades Contractor shall not show a completion date later than the Contract Time, subject to any time extensions approved by Owner; provided, however, that if the General Trades Contractor believes he is entitled to an extension of the Contract Time under the Contract Documents, the General Trades Contractor shall submit to the Owner, with each progress payment update, a separate schedule analysis (entitled "Requested Time Adjustment Schedule"), indicating suggested adjustments in the Contract Time which should, in the opinion of General Trades Contractor, be made in accordance with the contract Documents by time extension, due to changes, delays or conditions occurring during the past month or previously, or which are expected or contemplated by General Trades Contractor (whether such conditions are excusable under the Contract or are alleged to be due to Contractor or Owner fault), this separate schedule, if submitted, shall be time-scaled utilizing a computer generated and computer drawn network analysis schedule, unless otherwise approved by the Owner and shall be accompanied or preceded by a formal time extension request as required by the Contract and a detailed narrative justifying the time extension requested.

The network analysis should include all of the related activities that have led the General Trades Contractor to believe that they have been delayed. The Requested Time Adjustment Schedule should indicate where the delay began and ended, and where activities could not start because of the delay. If a delay occurred, but the schedule indicates that the predecessor activity could not have begun due to some other delay, then this would not be a cause for requesting a time extension for that particular instance. If a delay occurred, and some of the successor work was able to start, then this would be considered a partial delay, which may or may not be a cause for a time extension.

- B. The time extension request shall include schedule forecasts that predict the actual Project Completion Date, and any separable portions thereof specified by the Owner plus a forecast of the actual achievement of any milestones listed in the Contract Agreement.
- C. To the extent any time extension requests are pending at the time of any update in the Construction Schedule, the "Requested Time Adjustment Schedule" shall also be updated each month, to reflect any adjustments made by Contractor in the logic, sequence or duration of any activities in the Construction Schedule, or any time extensions previously granted by Owner, and to reflect actual or expected progress, in order that the "Requested Time Adjustment Schedule" shall clearly and accurately reflect the General Trades Contractor's actual intention and proposed time adjustments as of the latest update.
- D. The Owner shall have no obligation to consider any time extension request unless the requirements of the Contract Documents, and specifically, but not limited to these requirements, are complied with; and the Owner shall not be responsible or liable to General Trades Contractor for any constructive acceleration due to failure of the Owner to grant time extensions under the Contract Documents should the General Trades Contractor fail to substantially comply with the submission requirements and the justification requirements of this Contract for time extension requests. The General Trades Contractor's failure to perform in accordance with the Project Construction Schedule shall not be excused, nor be chargeable to the Owner, because the General Trades Contractor has submitted time extension requests or the "Requested Time Adjustment Schedule."

# 1.9 <u>COORDINATION</u>

A. The General Trades Contractor shall coordinate his work with that of other Contractors and shall cooperate fully with the Owner in maintaining orderly progress toward completion of the work as scheduled. The Owner's decisions regarding priority between the General Trades Contractors work and the work of

# CONSTRUCTION PROGRESS DOCUMENTATION

other Contractors at the site shall be final and shall not be cause for extra compensation or extension of time, except where extension of time is granted because of a delay for which the General Trades Contractor is otherwise entitled to an extension of time under the Contract Documents.

- B. The milestone dates referred to in the Contract Documents for delivery of Owner furnished equipment and materials and interface activities of other General Trades Contractors on the site are based on dates set forth in separate contracts with the Owner and represent the best information available at the time.
- C. The failure of the Owner-furnished equipment and materials to arrive as scheduled, or the failure of other Construction Contractors to meet their schedule, shall not be justification for an extension of time, except where such failure causes, in the opinion of the Owner, an unreasonable delay In the General Trades Contractors work, in which case the provisions of the General Conditions regarding extensions of time and extra work shall apply.
- D. The General Trades Contractor shall keep himself, and his Subcontractors, advised at all times during the course of the work regarding the delivery status of the Owner-furnished equipment and materials and of the progress of construction work being performed under separate contracts.
- E. The Owner will, upon written request by the General Trades Contractor, furnish information that may be available to the Owner.

#### 1.10 CONTRACTOR COVENANTS AND GUARANTEES

- A. The General Trades Contractor covenants and guarantees that the General Trades Contractor will not:
  - 1. Misrepresent to the Owner its planning scheduling or execution of the work.
  - 2. Utilize schedules materially different from those made available by the General Trades Contractor to the Owner or any Subcontractor or separate the Contractors for the direct execution and coordination of the Work, or which are not feasible or realistic.
  - 3. Prepare schedules, updates, revisions or reports for the work which do not accurately reflect the actual intent or reasonable and actual expectations of Contractor and its Subcontractor as to:
    - a. The sequences of activities,
    - b. The duration of activities,
    - c. The responsibility of activities,
    - d. Resources availability,
    - e. Labor availability or efficiency,
    - f. Foreseeable weather conditions,
    - g. The percentage complete of any activity,
    - h. Completion of any item of work or activity,
    - i. Project milestone completion,

- j. Delays, slippage's, or problems encountered or expected,
- k. Subcontractor requests for time extensions or delay claims of subcontractors,
- 1. If applicable, the float time available.
- B. The General Trades Contractor's failure to substantially comply with the foregoing covenant and guarantee shall be a substantial and material breach of contract which will permit the Owner to terminate the Contract for default, or withhold payments under the Contract Documents, and shall entitle the Owner to the damages afforded for misrepresentation or fraud by these Contract Documents or applicable law.
- C. Should the General Trades Contractor fail to substantially comply with the provisions of the Contract Documents relating to planning and scheduling the work by the Project Construction Schedule, and the Owner shall have the right, at their option, to retain the services of scheduling consultants or experts (including attorneys if necessary, in their opinion) to prepare a schedule in accordance with the Contract Documents and to review and analyze same, in order to allow the Owner to evaluate the program of the Work by the Contractor, to determine whether the General Trades Contractor is substantially complying with the Contract Documents, and to direct such action on the part of the Contractor, as permitted by the Contract Documents, as required to ensure, under the Owner's schedule prepared hereunder, that the General Trades Contractor will comply with such schedule. All costs incurred by the Owner in preparing the schedule hereunder shall be charged to the General Trades Contractor's account. If the General Trades Contractor fails to substantially comply with the scheduling and execution of the work requirements of the Contract Documents, the Contractor hereby agrees, in such instance, to comply with such schedules, as the Owner develops, or directs, and activity sequences and duration's as the Owner may reasonably require, without additional cost to the Owner (subject only to cost adjustments for such changes in the work as the Owner may direct), to ensure completion within the Contract Time.

#### 1.11 DEFAULT

A. Failure of the General Trades Contractor to substantially comply with the requirements of this Section shall constitute reason that the General Trades Contractor is failing to prosecute work with such diligence as will ensure its completion within the Contract times and shall be considered grounds for termination by the Owner.

END OF SECTION 01 32 00

# SECTION 01 33 00 – SUBMITTAL PROCEDURES

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section specifies administrative and procedural requirements for submittals required for performance of the Work, including;
  - 1. Schedule of Values
  - 2. Shop Drawings
  - 3. Product Data
  - 4. Samples
- B. This Section specifies administrative and procedural requirements for handling requests for substitutions made after award of the Contract.
- C. Administrative Submittals: Refer to other Division-1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to:
  - 1. Applications for payment.
  - 2. Performance and payment bonds.
  - 3. Insurance certificates.
  - 4. List of Subcontractors.
- D. Inspection and test reports are included in Section 01 40 00 "Quality Control Services."
- E. Information pertaining to Operation and Maintenance Data is included in Section 01 78 32 "Operation and Maintenance Data".
- F. Refer to Section 01 29 00 "Payment Procedures" for Schedule of Values requirements for preparation, format, and submittal procedures.

#### 1.3 <u>SUBMITTAL PROCEDURES</u>

A. Coordination: Within 15 days of the Contract award, submit to the Architect a comprehensive Submittals Log listing each item to be submitted and the date proposed to be submitted. Coordinate with the Architect in the preparation and processing of submittals with performance of construction activities. Transmit

each submittal sufficiently in advance of performance or related construction activities to avoid delay.

- 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals and related activities that require sequential activity.
- 2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.
  - a. The Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
  - b. Coordinate transmittal of all submittals requiring color selection so that comprehensive selection can be processed.
- 3. Processing: Allow sufficient review time so that installation will not be delayed as a result of the time required to process submittals, including time for re-submittals.
  - a. Allow two (2) weeks for initial review. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. The Architect will promptly advise the General Trades Contractor when a submittal being processed must be delayed for coordination.
  - b. If an intermediate submittal is necessary, process the same as the initial submittal.
  - c. Allow two (2) weeks for reprocessing each submittal.
  - d. No extension of Contract Time will be authorized because of failure to transmit submittals to the Architect sufficiently in advance of the Work to permit processing.
- B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
  - 1. Provide a space approximately 4" x 5" on the label or beside the title block on Shop Drawings to record the Contractor's review and approval markings and the action taken.
  - 2. Include the following information on all submittals:
    - a. Name of item being submitted.
    - b. Number and title of appropriate Specification Section.
    - c. Drawing number and detail references, as appropriate.
    - d. Name of manufacturer.
    - e. Name, address and telephone number of supplier.
    - f. Bid Package number and name.
    - g. Project Name.
    - h. Date.
    - i. Name, address and telephone number of Contractor.
    - j. Name, address and telephone number of Subcontractor.
    - k. Name, address and telephone number of Architect.

- C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Architect using a transmittal form. Submittals received from sources other than the Contractor will be returned without action.
- D. Number of copies:
  - 1. <u>If hard copies are provided</u>: Submit six (6) copies to Architect, and one (1) copy to Owner's Project Manager of all shop drawings and product data. Submit two (2) each of all samples.
  - 2. <u>If electronic copies are provided</u>: Submit one (1) electronic copy in PDF format to both the Architect and Owner's Project Manager. General Trades Contractor will be required to limit file sizing to 6MB, maximum, or utilize a file sharing technology at the expense of the General Trades Contractor.
  - 3. The General Trades Contractor shall be required to furnish <u>hard copies</u> only for all material requiring a selection for color, texture, or finish.

## 1.4 **DEFINITIONS**

- A. Substitutions: Requests for changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by the Contractor after award of the Contract are considered requests for "substitutions." The following are not considered substitutions:
  - 1. Substitutions requested by Bidders during the bidding period, and accepted prior to award of Contract, are considered as included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
  - 2. Revisions to Contract Documents requested by the Owner or Architect.
  - 3. Specified options of products and construction methods included in Contract Documents.
  - 4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

## 1.5 <u>SCHEDULE OF VALUES</u>

- A. Coordinate preparation of the Schedule of Values with preparation of the General Trades Contractor's Construction Schedule.
  - 1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:
    - a. General Trades Contractor's construction schedule.
    - b. Application for Payment form.
    - c. List of subcontractors.
  - 2. Submit the Schedule of Values to the Architect at the earliest feasible date, but in no case later than seven (7) days before the date scheduled for submittal of the initial Application for Payment.

- B. Format and Content: Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values.
  - 1. Forms: Use AIA Document G702 and Continuation Sheets G703, as the form for the Schedule of Values.
  - 2. Identification: Include the following Project identification on the Schedule of Values:
    - a. Project name and location.
    - b. Name of the Architect.
    - c. Project number.
    - d. Contractor's name and address.
    - e. Date of submittal.
  - 3. Arrange the Schedule of Values in a tabular form with separate columns to indicate the following for each item listed:
    - a. Generic name.
    - b. Related Specification Section.
    - c. Change Orders (numbers) that have affected value.
    - d. Dollar value.
    - e. Percentage of Contract Sum to the nearest one-hundredth percent, adjusted to total 100 percent.
  - 4. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. <u>Break principal subcontract amounts down into several line</u> <u>items that do not exceed \$25,000 in total value</u>. Coordinate breakdown amounts with the Contractor's Applications for Payment.
  - 5. Round amounts off to the nearest whole dollar; the total shall equal the Contract Sum.
  - 6. For each part of the Work where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
  - 7. Show temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items in the Schedule of Values.

# 1.6 <u>SHOP DRAWINGS</u>

- A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not considered Shop Drawings.
- B. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates and similar drawings. Include the following information:
  - 1. Dimensions.

- 2. Identification of products and materials included.
- 3. Compliance with specified standards.
- 4. Notation of coordination requirements.
- 5. Notation of dimensions established by field measurement.
- 6. Sheet Size: Except for templates, patterns and similar full size Drawings, submit Shop Drawings on sheets at least 8 <sup>1</sup>/<sub>2</sub>" x 11", but no larger than 24" x 36".
- 7. Do not use Shop Drawings without an appropriate final stamp indicating action taken in connection with construction.

#### 1.7 PRODUCT DATA

- A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams and performance curves. Where Product Data must be specially prepared because standard printed data is not suitable for use, submit as "Shop Drawings."
  - 1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:
    - a. Manufacturer's printed recommendations.
    - b. Compliance with recognized trade association standards.
    - c. Compliance with recognized testing agency standards.
    - d. Application of testing agency labels and seals.
    - e. Notation of dimensions verified by field measurement.
    - f. Notation of coordination requirements.
  - 2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
  - 3. Submittals: Submit copies of each required submittal; submit additional copies where required for maintenance manuals.
    - a. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
  - 4. Distribution: Furnish copies of final submittal to Architect for distribution to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities.
    - a. Do not proceed with installation until an approved copy of Product Data applicable is in the installer's possession.
    - b. Do not permit use of unmarked copies of Product Data in connection with construction.

#### 1.8 <u>SAMPLES</u>

A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include

partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture and pattern.

- 1. Mount, display, or package Samples in the manner specified to facilitate review of qualities indicated. Prepare Samples to match the Architect's Sample. Include the following:
  - a. Generic description of the Sample.
  - b. Sample source.
  - c. Product name or name of manufacturer.
  - d. Compliance with recognized standards.
  - e. Availability and delivery time.
- 2. Submit Samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
  - a. Where variation in color, pattern, texture or other characteristics are inherent in the material or product represented, submit multiple units that show approximate limits of the variations.
  - b. Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.
- 3. Preliminary submittals: Where Samples are for selection of color, pattern, texture or similar characteristics from a range of standard choices, submit a full set of choices for the material or product.
  - a. Preliminary submittals will be reviewed with the Architect indicating selection or other action.
  - b. Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.
- 4. Submittals: Except for samples illustrating assembly details, workmanship, fabrication techniques, connections, operation and similar characteristics, samples will not be returned, unless so requested in advance.
- 5. Maintain sets of returned samples, at the Project site, for quality comparisons throughout the course of construction.
  - a. Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

## 1.9 <u>SUBSTITUTION REQUESTS</u>

- A. Substitution Request Submittal: Requests for substitution will be considered if received within 60 days after commencement of the Work. Requests received more than 60 days after commencement of the Work may be considered or rejected at the discretion of the Architect.
  - 1. Submit 3 copies of each request for substitution for consideration. Submit requests in the form and in accordance with procedures required for Change Order proposals.

- 2. Identify the product, or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers, complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
  - a. Product Data, including Drawings and descriptions of products, fabrication and installation procedures.
  - b. Samples, where applicable or requested.
  - c. A detailed comparison of significant qualities of the proposed substitution with those of the work specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect.
  - d. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate Contractors, which will become necessary to accommodate the proposed substitution.
  - e. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
  - f. Cost information, including a proposal of the net change, if any in the Contract Sum.
  - g. Certification by the Contractor that the substitution proposed is equal-to or better in every significant respect to that required by the Contract Documents, and that it will perform adequately in the application indicated. Include the Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.
- 3. Architect's Action: Within one week of receipt of the request for substitution, the Architect will request additional information or documentation necessary for evaluation of the request. Within 2 weeks of receipt of the request, or one week of receipt of the additional information or documentation, which ever is later, the Architect will notify the General Trades Contractor of acceptance or rejection of the proposed substitution. If a decision on use of a proposed substitute cannot be made or obtained within the time allocated, use the product specified by name.

# 1.10 COORDINATION DRAWINGS

A. Refer to Section 01 31 00 "Project Coordination" before materials are purchased or work is begun, prepare and submit to the Architect, coordination drawings showing the size and location of all equipment and piping lines relevant to the complete system. Ensure that these drawings are compatible and correctly annotated and cross-referenced at their interfaces.

# SUBMITTAL PROCEDURES

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- B. The General Trades Contractor shall be responsible for the coordination of all mechanical and electrical work. Before materials are fabricated or work begun, he shall submit to the Architect complete coordination drawings in the form of reproducible (vellum) transparencies at not less that 1/4 inch scale. Congested areas and sections through shafts shall be prepared at not less than 3/8 inch scale, such areas being as determined by the Architect. The General Trades Contractor may request electronic files, from the Architect, to generate the indication of the building shell background for the Coordination Drawings. Maximum sheet size shall be 30" x 42".
- C. Coordination drawings shall indicate the necessary offsets for all ductwork, piping, conduit, and other items to clear the work of all other trades and to maintain the required ceiling height and partition layout. Each subcontractor shall indicate both top and bottom elevations of their equipment taking into account hangers, flanges, and other accessories.
- D. Prepare Coordination Drawings as follows:
  - 1. The General Trades Contractor shall require the HVAC Subcontractor to prepare original drawings showing all his/her equipment, ducts, and piping on these transparencies
  - 2. The General Trades Contractor shall have vellum transparencies made therefrom.
  - 3. The General Trades Contractor shall then require the PLUMBING Subcontractor to indicate all plumbing piping and heating lines.
  - 4. The General Trades Contractor shall then require the FIRE PROTECTION Subcontractor to indicate all his/her equipment and piping on these transparencies.
  - 5. The General Trades Contractor shall then require the ELECTRICAL Subcontractor to indicate all his/her equipment and conduit lines on these transparencies.
  - 6. The General Trades Contractor shall resolve conflicts and then submit these transparencies to the Architect for review.
- E. Coordination drawings shall bear the signature of all Subcontractors involved indicating that all space conditions have been satisfactorily resolved. In addition, the drawings shall bear the contractor's stamp bearing the notation: DRAWINGS HAVE BEEN CHECKED AND COORDINATED WITH ALL TRADES. Drawings without these notations will not be accepted by the architect.
- F. If any space conflicts cannot be resolved by the contractor, he shall immediately notify the architect and request disposition of the conflict.
- G. Coordination drawings are for the contractor's and architect's use during construction and shall not be construed as replacing any shop, as-built, or record drawings required elsewhere in these contract documents.

H. Architect's review of coordination drawings shall not relieve the contractor from his overall responsibility for coordination of all work performed pursuant to the contract or from any other requirement of the contract.

# 1.11 SUBMITTAL REQUIREMENTS FOR COMMISSIONING

- A. Normal Submittals:
  - 1. Submit copy of normal submittals for equipment to be commissioned to Commissioning Authority (CxA).
  - 2. CxA will review and approve normal submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with Architect's and General Trades Contractor's review.
  - 3. Provide copy of the Design Team's review comments to the CxA.
  - 4. Repeat this process for any resubmissions.
- B. Data for Commissioning: The following information shall be included in all submittals of commissioned equipment and systems.
  - 1. Detailed manufacturer's installation and start-up procedures.
  - 2. Operating, troubleshooting, and maintenance procedures.
  - 3. Fan and pump curves.
  - 4. Full warranty information, with responsibilities of Owner to keep warranty in force clearly defined.
  - 5. Installation and checkout materials actually shipped inside equipment and actual field checkout sheet forms to be used by factory or field technicians.
- C. CxA will request specific information needed about each piece of commissioned equipment or system. Information requested includes, but is not limited to:
  - 1. Full details of Owner-contracted tests, if any.
  - 2. Full factory testing reports, if any.
- D. CxA may request additional documentation necessary for commissioning process. Requests by CxA may precede, be concurrent with, or follow normal submittals.
- E. Contractor's responsibility for deviations in submittals from requirements of Contract Documents is not relieved by CxA's review.

## 1.12 ARCHITECT'S ACTION

- A. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Architect will review each submittal, mark to indicate action taken, and return promptly.
  - 1. Compliance with specified characteristics is the Contractor's responsibility.

- B. Action Stamp: The Architect will stamp each submittal with a uniform, selfexplanatory action stamp. The stamp will be appropriately marked, to indicate the action taken:
  - 1. Final Unrestricted Release: Where submittals are marked "Approved," that part of the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents; final acceptance will depend upon that compliance.
  - 2. Final-But-Restricted Release: When submittals are marked "Approved as Corrected," that part of the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents; final acceptance will depend on that compliance.
  - 3. Returned for Resubmittal: When submittal is marked "Not Approved, Revise and Resubmit," do not proceed with that part of the Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.
    - a. Do not permit submittals marked "Not Approved, Revise and Resubmit" to be used at the Project site, or elsewhere where Work is in progress.
  - 4. Other Action: Where a submittal is primarily for information or record purposes, special processing or other activity, the submittal will be returned, marked "Action Not Required".

# PART 2 - PRODUCTS

## 2.1 <u>SUBSTITUTIONS</u>

- A. Conditions: The Contractor's substitution request will be received and considered by the Architect when one or more of the following conditions are satisfied, as determined by the Architect; otherwise requests will be returned without action except to record noncompliance with these requirements.
  - 1. Extensive revisions to Contract Documents are not required.
  - 2. Proposed changes are in keeping with the general intent of Contract Documents.
  - 3. The request is timely, fully documented and properly submitted.
  - 4. The request is directly related to an "or equal" clause or similar language in the Contract Documents.
  - 5. The specified product or method of construction cannot be provided within the Contract Time. The request will not be considered if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
  - 6. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.

- 7. A substantial advantage is offered the owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. Additional responsibilities for the Owner may include additional compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner or separate Contractors, and similar considerations.
- 8. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.
- 9. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.
- 10. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provide the required warranty.
- B. The Contractor's submittal and Architect's acceptance of Shop Drawings, Product Data or Samples that relate to construction activities not complying with the Contract Documents do not constitute an acceptable or valid request for substitution, nor does it constitute approval.

# PART 3 - EXECUTION (Not Applicable).

END OF SECTION 01 33 00

## SECTION 01 40 00 - QUALITY CONTROL SERVICES

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for quality control services.
- B. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include contract enforcement activities performed by the Architect or Owner's Project Manager.
- C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.
- D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.
  - 1. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.
  - 2. Inspections, test and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.
  - 3. Requirements for the Contractor to provide quality control services required by the Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

#### 1.3 <u>RESPONSIBILITIES</u>

- A. Retesting: The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.
  - 1. Costs of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests, performed on original construction, do not indicate compliance with Contract Documents.

- B. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency and Owner's OPM sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:
  - 1. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
  - 2. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
  - 3. Providing facilities for storage and curing of test samples.
  - 4. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
  - 5. Security and protection of samples and test equipment at the Project site.
- C. Owner Responsibilities: The Owner will provide inspections, tests and similar quality control services specified to be performed by independent agencies and not by the Contractor, except where they are specifically indicated as the Contractor's responsibility or are provided by another identified entity. Costs for these services are not included in the Contract Sum.
  - 1. The Owner will employ and pay for the services of an independent agency, testing laboratory or other qualified firm to perform services which are the owner's responsibility.
  - 2. The Contractor that is responsible for the material(s) to be tested agrees to engage and pay for the quality control services specified as the installing Contractor's responsibility, including retesting, from the independent agency engaged by the Owner.
- D. Duties of the Testing Agency and Special Inspector: The independent testing Agency and the Special Inspector, engaged to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections, shall cooperate with the Architect and Contractor in performance of their duties, and shall provide qualified personnel to perform required inspections and tests.
  - 1. The Agency or the Special Inspector shall notify the Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  - 2. Neither the Agency nor the Special Inspector is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.
  - 3. Neither the Agency nor the Special Inspector shall not perform any duties of the Contractor.
- E. Coordination: The Contractor and each Agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition, the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

# PART 2 - PRODUCTS (Not Applicable).

## PART 3 - EXECUTION

#### 3.1 <u>REPAIR AND PROTECTION</u>

- A. General: Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes.
- B. Protect construction exposed by or for quality control service activities, and protect repaired construction.
- C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 01 40 00

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## SECTION 01 41 04 - SPECIAL INSPECTIONS AND STRUCTURAL TESTING

#### PART 1 - GENERAL

#### 1.1 GENERAL REQUIREMENTS

- A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.
- B. Special Inspections and Structural Testing shall be in accordance with Section 1704 of the Massachusetts State Building Code.

#### 1.2 **QUALIFICATIONS**

- A. The Special Inspector shall be a Professional Engineer licensed in the State of Massachusetts who is approved by the Structural Engineer of Record (SER) and Building Official.
- B. The testing laboratory shall be NVLAP accredited and approved by the Structural Engineer of Record (SER) and Building Official.
- C. The testing laboratory shall maintain a full time Professional Engineer licensed in the State of Massachusetts on staff who shall stamp and sign all test reports. The Professional Engineer shall be responsible for the training of the testing technicians and shall be in responsible charge of the field and laboratory testing operations.
- D. Special Inspections shall be performed by inspectors who are either Professional Engineers (P.E.) or Engineers-in-Training (EIT) with an education and background in structural engineering except as indicated below.
  - 1. Special Inspections of soils and foundations may be performed by inspectors who are either Professional Engineers (P.E.) or Engineers-in-Training (EIT) with an education and background in geotechnical engineering.
  - 2. Technicians performing tests of concrete shall be ACI certified Concrete Field Testing Technicians Grade 1.
  - 3. Inspectors performing inspections of concrete work may be ACI certified Concrete Construction Inspectors in lieu of being a P.E. or EIT.
  - 4. Technicians performing tests or inspections of welds shall be AWS Certified Welding Inspectors. Technicians performing ultrasonic testing shall also be certified as an ASNT-TC Level II or Level III technician.
  - 5. Technicians performing standard tests described by specific ASTM Standards shall

have training in the performance of such tests and must be able to demonstrate either by oral or written examination competence for the test to be conducted. They shall be under the supervision of a Professional Engineer and shall not be permitted to independently evaluate test results.

# 1.3 <u>SUBMITTALS</u>

- A. The Special Inspector and Testing Laboratory shall submit to SER and Building Official for review a copy of their qualifications which shall include the names and qualifications of each of the individual inspectors and technicians who will be performing inspections or tests.
- B. The Special Inspector and Testing Laboratory shall disclose any past or present business relationship or potential conflict of interest with the Contractor or any of the Subcontractors whose work will be inspected or tested.

# 1.4 PAYMENT

- A. The Owner shall engage and pay for the services of the Special Inspector and Testing Laboratory.
- B. If any materials which require Special Inspections are fabricated in a plant which is not located in Massachusetts, the Contractor shall be responsible for the travel expenses of the Special Inspector or Testing Laboratory.
- C. The Contractor shall be responsible for the cost of any retesting or reinspection of work which fails to comply with the requirements of the Contract Documents.

# 1.5 <u>CONTRACTOR RESPONSIBILITIES</u>

- A. The Contractor shall cooperate with the Special Inspector and his agents so that the Special Inspections and testing may be performed without hindrance.
- B. The Contractor shall notify the Special Inspector or Testing Laboratory at least twenty-four (24) hours in advance of a required inspection or test.
- C. The Contractor shall provide incidental labor and facilities to provide access to the work to be inspected or tested, to obtain and handle samples at the site or at source of products to be tested, to facilitate tests and inspections, storage and curing of test samples.
- D. The Contractor shall keep at the project site the latest set of construction drawings, field sketches, approved shop drawings, and specifications for use by the inspectors and testing technicians.
- E. The Special Inspection program shall in no way relieve the Contractor of this obligation to perform work in accordance with the requirements of the Contract Documents or

from implementing an effective Quality Control program.

F. The Contractor shall be solely responsible for construction site safety.

# 1.6 LIMITS ON AUTHORITY

- A. The Special Inspector or Testing Laboratory may not release, revoke, alter, or enlarge on the requirements of the Contract Documents.
- B. The Special Inspector or Testing Laboratory will not have control over the Contractor's means and methods of construction.
- C. The Special Inspector or Testing Laboratory shall not be responsible for construction site safety.
- D. The Special Inspector or Testing Laboratory has no authority to stop the work.

# 1.7 STATEMENT OF SPECIAL INSPECTIONS

- A. The Statement of Special Inspections will be prepared by the Structural Engineer of Record (SER).
- B. CEPP/SEC Form 101 2004 shall be used for the Statement of Special Inspections.
- C. The Statement of Special Inspections shall be submitted with the application for Building Permit.

# 1.8 <u>RECORDS AND REPORTS</u>

- A. Detailed reports shall be prepared for each inspection or test. Reports shall include:
  - 1. Date of test or inspection
  - 2. Name of inspector or technician
  - 3. Location of specific areas tested or inspected
  - 4. Description of test or inspection and results
  - 5. Applicable ASTM standard
  - 6. Weather conditions
  - 7. Professional Engineer's stamp and signature
- B. Interim reports shall be submitted at the end of each week which include reports for all inspections and tests performed that week.
- C. Reports shall be addressed to the Building Official with copies sent to the SER, Architect, and Contractor.
- D. Any discrepancies from the Contract Documents found during a Special Inspection shall be immediately reported to the Contractor. If the discrepancies are not corrected,

the Special Inspector shall notify the SER and Building Official.

- E. The Test Laboratory shall immediately notify the SER by telephone or fax of any test results which fail to comply with the requirements of the Contract Documents.
- F. Reports shall be submitted within seven (7) days of the inspection or test. Hand written reports may be submitted if final typed copies are not available.
- G. At the completion of the work requiring Special Inspections, each inspection agency and testing laboratory shall provide a statement to the Special Inspector that all work was completed in substantial conformance with the Contract Documents and that all appropriate inspections and tests were performed.

# 1.9 FINAL REPORT OF SPECIAL INSPECTIONS

- A. The Final Report of Special Inspections shall be completed by the Special Inspector and submitted to the SER and Building Official prior to the issuance of a Certificate of Use and Occupancy.
- B. CEPP/SEC Form 102 2001 shall be used for the Final Report of Special Inspections.
- C. The Final Report of Special Inspections will certify that all required inspections have been performed and will itemize any discrepancies which were not corrected or resolved.

## 1.10 SCHEDULE OF INSPECTIONS AND TESTS

A. Required inspections and tests are described in the Schedule of Special Inspections and in the individual Specification Sections for the items to be inspected or tested.

END OF SECTION 01 41 04

# SECTION 01 42 00 - REFERENCES

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section specifies applicability of industry standards to products specified, administrative and procedural requirements governing the Contractor's selection of products for use in the Project.
- B. Submittals and administrative procedures for handling requests for substitutions made after award of the Contract are included under Section 01 33 00, "Submittals Procedures."

#### 1.3 <u>DEFINITIONS</u>

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. Indicated: The term indicated refers to graphic representations, notes, or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as shown, noted, scheduled, and specified are used to help the reader locate the reference. There is no limitation on location.
- C. Directed: Terms such as directed, requested, authorized, selected, approved, required, and permitted mean directed by the Architect, requested by the Architect, and similar phrases.
- D. Approved: The term approved, when used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.
- E. Regulations: The term regulations includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. Furnish: The term furnish means supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

- G. Install: The term install describes operations at the Project site including the actual unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. Provide: The term provide means to furnish and install, complete and ready for the intended use.
- I. Installer: An Installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
  - 1. The term experienced, when used with the term Installer, means having a minimum of five previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of the authority having jurisdiction.
  - 2. Trades: Using terms such as carpentry is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as carpenter. It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.
  - 3. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no choice or option. However, the ultimate responsibility for fulfilling Contract requirements remains with the Contractor.
    - a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.
- J. Project site is the space available to the Contractor for performing construction activities either exclusively or in conjunction with others performing other work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.
- K. Testing Agencies: A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.
- L. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms such are self-explanatory and have well recognized meanings in the construction industry.
- 1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - a. "Named Products" are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as the date of the Contract Documents.
- 2. "Materials" are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
- 3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

# 1.4 SPECIFICATION FORMAT AND CONTENT EXPLANATION

- A. These Specifications with the accompanying Drawings are intended to describe and illustrate all material, labor, and equipment necessary to complete respective Bid Packages for the **New Police Facility for the Carver Police Department**, **Carver, MA.**
- B. Specification Format: These Specifications are organized into Divisions and Sections based on the MASTERSPEC numbering system, 2014 edition.
- C. Specification Content: This Specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:
  - 1. Abbreviated Language: Language used in Specifications and other Contract Documents is abbreviated. words and meanings shall be interpreted as appropriate. Words that are implied, but not stated, shall be interpolated as the sense requires. Singular words will be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.
  - 2. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.
    - a. The words "shall be" are implied wherever a colon (:) is used within a sentence or phrase.
- D. In general, the Specifications will describe the "quality" of the work and the Drawings, the "extent" of the work. The Drawings and Specifications are cooperative and supplementary, however, and each item of the work is not

necessarily mentioned in both the Drawings and the Specifications. All work necessary to complete the project, so described, is to be included in this Contract.

- E. In case of disagreement between Drawings and Specifications, or within either document itself, the better quality or greater quantity of work for decision and/or adjustment. Any work done by the Contractor without consulting the Architect, when the same requires a decision, shall be done at the Contractor's risk.
- F. Omissions or Errors: If any omissions or errors are noted or instructions at variance with the obvious intent of the documents, it is the responsibility of the Contractor to call them to the Architect's attention before signing the Contract.

# 1.5 <u>SUBMITTALS</u>

A. Comply with requirements contained in Section 01 30 0, "Submittal Procedures".

## 1.6 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.
- B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.
- C. Responsibility to furnish material: Listing or mention of materials is sufficient indication to make it the Contractor's responsibility to furnish said materials in accordance with the grades or standards indicate d, free from defects impairing strength, durability or appearance, and in sufficient quantity for the proper and complete execution of the work, unless specifically stated otherwise.
- D. Responsibility for or methods: The listing or mention of any method of installation, erection, fabrication or workmanship shall not operate to make the contractor an agent, but shall be for the sole purpose of setting a standard of quality for the finished work. Contractor is free to use any alternate method, provided only that, prior to the start of the work, such alternate method is approved in writing by the Architect, as <u>resulting in quality equal to, or better</u>, <u>than that intended by these documents</u>. Unless an alternate method is approved, all work shall be in strict accordance with all methods of installation, erection, fabrication and workmanship listed or mentioned herein.

# 1.7 INDUSTRY STANDARDS

A. Compliance: Furnish all materials and accomplish all work in accordance with the grades or standards of materials ' standards of workmanship, and manufacturer's literature, as referenced in these documents.

- B. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- C. Publication Dates: Comply with the standards in effect as of the date of the Contract Documents.
- D. Conflicting Requirements: Where compliance with two or more standards is specified and where the standards may establish different or conflicting requirements for minimum quantities or quality levels, refer requirements that are different, but apparently equal, and uncertainties to the Architect for a decision before proceeding.
  - Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.
- E. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
  - 1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.
- F. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authority having jurisdiction, or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations," published by Gale Research Co., available in most libraries.

# 1.8 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle products in accordance with the Architect's and manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft.
  - 1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.

CARVER POLICE CARVER, MA	REFERENCES	<u>01 42 00-6</u>
2.	Coordinate delivery with installation time to ensure minimutime for items that are flammable, hazardous, easily damag to deterioration, theft and other losses.	um holding ed, or sensitive
3.	Deliver products to the site in the manufacturer's original se or other packaging system, complete with labels and instruc- handling, storing, unpacking, protecting and installing.	ealed container ctions for
4.	Inspect products upon delivery to ensure compliance with t Documents, and to ensure that products are undamaged and protected.	he Contract l properly
5.	Store products at the site in a manner that will facilitate insp measurement of quantity or counting of units.	pection and
6.	Store heavy materials away from the Project structure in a r will not endanger the supporting construction.	manner that
7.	Store products subject to damage by the elements above gro cover in a weathertight enclosure, with ventilation adequate condensation. Maintain temperature and humidity within ra- by manufacturer's instructions	ound, under to prevent ange required
8.	Packages, materials and equipment showing evidence of da rejected by the Architect.	mage may be
9.	Store rigid insulation board away from the building.	
PART 2 - PRODUCT	<u>`S</u>	
2.1 <u>PRODUCT S</u>	ELECTION	
A. Genera Docum time of	al Product Requirements: Provide products that comply with nents, that are undamaged and, unless otherwise indicated, us f installation.	the Contract nused at the
1.	Provide products complete with all accessories, trim, finish and other devices and details needed for a complete installa intended use and effect.	, safety guards ation and for the
2.	Standard Products: Where available, provide standard products that have been produced and used successfully in similar si other projects.	ucts of types tuations on
B. Produc Docum Proceed	et Selection Procedures: Product selection is governed by the nents and governing regulations, not by previous Project explores governing product selection include the following:	e Contract perience.
1.	Proprietary Specification Requirements: Where only a sing manufacturer is named, provide the product indicated, or ec described	gle product or qual to that
2.	Semi proprietary Specification Requirements: Where three products or manufacturers are named, provide one of the pr indicated. No substitutions will be permitted.	or more coducts

a. Where products or manufacturers are specified by name, accompanied by the term "or equal," or "or approved equal" comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.

- 3. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
- 4. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.
  - a. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.
- 5. Compliance with Standards, Codes and Regulations: Where the Specifications only requires compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.
- 6. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.
  - a. Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category, or for noncompliance with specified requirements.
- 7. Visual Selection: Where specified product requirements include the phrase "… as selected from manufacturer's standard colors, patterns, textures ……" or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern and texture from the product line selected.

# PART 3 - EXECUTION

# 3.1 INSTALLATION OF PRODUCTS:

- A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.
  - 1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

# END OF SECTION 01 42 00

# 01 42 16 – STANDARD SITEWORK REFERENCES AND DEFINITIONS

### <u> PART 1 - GENERAL</u>

### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

#### 1.01 <u>SUMMARY</u>

A. This Section includes the general standard abbreviations, acronyms, definitions and references for sitework used throughout this Specification.

### 1.02 <u>RELATED SECTIONS</u>

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specifications Sections that directly relate to Work of this Section include, but are not limited to:
  - 1. Division 00, all Sections.
  - 2. Division 01, all Sections.
  - 3. Division 02, all Sections.
  - 4. Division 10, all Sections.
  - 5. Division 31, all Sections.
  - 6. Division 32, all Sections.
  - 7. Division 33, all Sections.
- B. Provide all facilities, labor, materials, equipment, transportation, supervision, and related work necessary to complete the work in this Specification, and as shown on the Drawings.
- C. All work shall be performed in accordance with applicable codes, permits and regulations, and the requirements of all local, state, and federal agencies having jurisdiction over the work.

#### 1.03 <u>REFERENCES</u>

A. Reference herein to any technical society, organization, group or body is made in accordance with the following abbreviations. Unless otherwise noted or specified, all work in this Specification shall conform to the latest edition, as applicable.

# CARVER POLICE CARVER, MA

- 1. AASHTO: American Association of State Highway Transportation Officials.
- 2. ACI: American Concrete Institute.
- 3. ADA: United States Department of Justice, Americans with Disabilities Act, Standards for Accessible Design.
- 4. AI: Asphalt Institute publications as referenced.
- 5. ANSI: Refers to standard specifications, as amended, issued by the American National Standards Institute.
- 6. AWS: American Welding Society.
- 7. ASTM: Refers to standard specifications and testing methods issued by the American Society of Testing and Materials Reference as amended.
- 8. Building Code: Commonwealth of Massachusetts Building Code.
- 9. CMR: Code of Massachusetts Regulations.
- 10. CRSI: Concrete Reinforcing Steel Institute.
- 11. EPA: United States Environmental Protection Agency.
- 12. MASSDEP: Massachusetts Department of Environmental Protection and its various Divisions.
- 13. MASSDEP Guidelines: Refers to the 2002 Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban .
- 14. MASSDOT Standards: Refers to the Commonwealth of Massachusetts, Massachusetts Highway Department, Standard Specifications For Highways and Bridges, 1988, and all supplements and revisions, with the exception of provisions for measurements and payments.
- 15. NPCA: National Precast Concrete Association.
- 16. NRMCA: National Ready Mix Concrete Association.
- 17. OSHA: Occupational Safety and Health Administration
- Tree Pruning Standard: Comply with ANSI A300 (Part 1), "Tree, Shrub, and Other Woody Plant Maintenance--Standard Practices (Pruning)."
- 19. UFAS: Uniform Federal Accessibility Standards for the design, construction and alteration of buildings and facilities
- 20. U.S.D.A.: United States Department of Agriculture.

## 1.04 <u>DEFINITIONS</u>

- A. The following terms are used throughout this Specification and are hereby defined in greater detail, as follows:
  - 1. "Architect" shall refer to the lead design professional of record for the project.
  - 2. "Architect" may also refer to the Landscape Architect of record for the project for certain specific sections directly related to the scope of work shown on the "L-series" drawings.
  - 3. "Bituminous Concrete Pavement" is synonymous with "Hot Mix Asphalt Paving" as defined in the Section 400 and Section M3 of the MASSDOT Standards.
  - 4. "Bituminous Concrete Pavement" terminology: Refer to ASTM D 8 for definitions of terms.
  - 5. "Concrete" (for site flatwork) is synonymous with "Cement Concrete" as defined in the Section 700 and Section M4 of the MASSDOT Standards.
  - 6. "Construction Area" refers to the area within the "Contract Limit Line" as shown on the drawings including any area outside such limit that is damaged or otherwise disturbed by construction-related activities. This may include, but not be limited to, construction access routes, off-site storage or stockpile areas, utility work or other off-site improvements that may not be shown in the contract drawings.
  - 7. "Contractor" shall mean the General Contractor responsible for all work of this contract including the work of his subcontractors.

PART 2- PRODUCTS (Not Applicable to this Section)

PART 3 - EXECUTION (Not Applicable to this Section)

END OF SECTION 01 42 16

## 01 43 00 – SITEWORK QUALITY ASSURANCE

#### <u> PART 1 - GENERAL</u>

#### 1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

### 1.2 SUMMARY

A. This Section includes quality control, testing, contractor qualifications and similar requirements for Quality Assurance for sitework.

### 1.3 <u>RELATED SECTIONS</u>

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specifications Sections that directly relate to Work of this Section include, but are not limited to:
  - 1. Division 02, all Sitework related Sections.
  - 2. Division 10, all Sitework related Sections.
  - 3. Division 31, all Sitework related Sections.
  - 4. Division 32, all sitework related Sections.
  - 5. Division 33, all Sitework related Sections.
- B. Additional requirements for quality assurance, workmanship, tolerances and other measures may be included in other sections of this Specification.

### 1.4 <u>REFERENCES AND DEFINITIONS</u>

A. Refer to Division 01, Section 01 42 16 Standard Sitework References & Definitions for definition of specific referenced standards as may be abbreviated in the Specification.

#### 1.5 <u>TESTING</u>

A. Testing Agency Services: Owner will engage an independent laboratory to conduct tests and perform other services as required for quality control during construction. Contractor shall coordinate scheduling of required testing directly with Owner's selected testing agency.

B. Additional special testing requirements for certain materials and/or their installation may be noted in other sections of this Specification.

## 1.6 <u>SUBMITTALS</u>

- A. Provide manufacturer, supplier, fabricator and/or installer's qualifications and certifications for the type of work required as noted in the Specification.
- B. Licenses or professional certifications for individual contractors, suppliers and/or manufacturers as noted above or elsewhere in this Specification.
- C. Provide field samples and/or mock-ups as required in other sections of this Specification.

## 1.7 <u>MATERIALS (GENERAL)</u>

A. Source of Materials: Obtain materials of each type from the same source for the entire project unless requested in writing and approved by the Architect.

### 1.8 PAVEMENT BASE COURSES

- A. Subbase and Base Course Layers shall be tested in-place and results submitted to and approved by the Architect before construction of any further work thereon. Tests noted shall be paid for by the Owner. Test shall be taken as follows.
- 1. Each layer being placed beneath pavements shall meet the 95 percent minimum compaction standard for the material being placed.
  - 2. Perform one (1) field density test in accordance with ASTM D2922 on each lift of base course material placed as follows:
    - a. Every 1,000 sq. ft. below bituminous concrete pavement areas but not less than 3 tests.
    - b. Every 750 sq. ft. below concrete pavement areas but not less than 3 tests.
- B. It shall be the Contractor's responsibility to notify Testing Laboratory and Architect when each layer of fill is to be in place and ready for testing. The Contractor shall allow ample time for testing. If any fill is placed in excess of 8 inches without testing it shall be subject to removal.
  - 1. If testing indicates that the subgrade or backfill are found to be below the specified density or do not meet material specifications, additional compaction and proper materials shall be provided and at no additional expense to the owner. All required recompaction and retesting of non-conforming materials shall be at the Contractor's expense.

2. The Contractor is responsible for all testing fees due to miscoordination or poor scheduling with the testing laboratory.

### 1.9 **BITUMINOUS MATERIALS**

- A. Manufacturer Qualifications:
  - 1. Manufacturer shall be a paving-mix manufacturer registered with the Commonwealth of Massachusetts Department of Transportation.
- B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated, as documented according to ASTM E 548.
- C. Regulatory Requirements: Comply with MASSDOT for hot mix asphalt paving work.
- D. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.
- E. Pre-installation Conference: Conduct conference at Project site to review methods and procedures related to bituminous concrete pavement including, but not limited to, the following:
  - 1. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
  - 2. Review condition of subgrade and preparatory work.
  - 3. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
  - 4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment and facilities needed to make progress and avoid delays.
- F. Field Quality Control:
  - 1. Thickness: In-place compacted thickness of bituminous concrete courses will be determined according to ASTM D 3549.
  - 2. Surface Smoothness: Finished surface of final bituminous concrete course will be tested for compliance with smoothness tolerances.
  - 3. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement according to MASSDOT Standards.
  - 4. Remove and replace or install additional bituminous concrete where test results or measurements indicate that it does not comply with specified requirements.

# 1.10 SITE CONCRETE

- A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
  - 1. Testing Frequency: Obtain at least 1 composite sample for each 5000 sq. ft. (465 sq. m) or fraction thereof of each concrete mix placed each day.
  - 2. When frequency of testing will provide fewer than five compressivestrength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
  - 3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
  - 4. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
  - Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
  - 6. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
  - 7. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
  - 8. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi(3.4 MPa).
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain project identification name and number, date of concrete placement, name of concrete testing and

inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7and 28-day tests.

- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

# 1.11 <u>TOPSOIL</u>

- A. Topsoil, whether on-site material or imported from other sources shall be tested by the Contractor as follows:
  - 1. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
  - 2. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
    - a. Report suitability of topsoil for plant growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce topsoil or planting mix suitable for the intended use as specified herein.

# 1.12 <u>LANDSCAPE MATERIALS - TREES, PLANTS, GROUNDCOVERS AND</u> <u>LAWN AREAS</u>

- A. Existing Conditions: Landscape Installer shall inspect and accept the condition of work performed by others, including testing reports, before proceeding with work of this section. Commencement of this work shall be considered acceptance of previous work.
- B. Pre-installation Conference: Conduct a meeting with Owner, Architect, General Contractor, Site and Landscape Subcontractors at the project site to review requirements and conditions prior to the start of work. Architect shall be given ample opportunity to inspect finished topsoil grades and conditions prior to any planting activities. Any planting or

seeding done prior to this conference is subject to rejection and removal at the Contractor's expense.

- C. Provide quality, size, genus, species, and variety of exterior plants indicated, complying with applicable requirements in ANSI Z60.1, "American Standard for Nursery Stock."
- D. Source of Materials: Notify Architect 30 days in advance of expected delivery of plant materials to the site. Architect may elect to observe trees and shrubs either at place of growth or at site before planting for compliance with requirements for genus, species, variety, size, and quality. Architect also retains the right to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from project site and replace with compliant materials at no additional cost.
- E. Tree Pruning Standard: Comply with ANSI A300 (Part 1), "Tree, Shrub, and Other Woody Plant Maintenance--Standard Practices (Pruning)."

# 1.13 PAVEMENT INSTALLATION CONTRACTORS

- A. Installer's Qualifications: Contractor(s) or subcontractor(s) shall be experienced and in continuous operation in their field for a minimum of the past five (5) consecutive years.
- B. All installation contractors or subcontractors shall maintain current licenses and certifications standard in their industry and in compliance with all current local, state and federal regulations.
- C. Installers shall maintain full-time experienced supervisor on site at all times while their work is in progress. Failure to provide such supervision shall be deemed a reason for the Architect and/or Owner to halt work with no recourse for claim for delay by the contractor or any subcontractor(s).
- D. Installers shall obtain all necessary and required permits, or receive proof that such exists, prior to the start of any work related to their trade.

# 1.14 LANDSCAPE INSTALLATION CONTRACTORS

- A. Landscape Contractor(s) performing planting of trees, shrubs, groundcovers and lawn areas shall meet the following:
  - 1. Tree Service Firm Qualifications: An experienced tree service firm that has successfully completed tree protection and trimming work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of tree protection and trimming.
  - 2. Arborist Qualifications: An arborist certified by ISA or licensed in the state of Connecticut.

- 3. Installer Qualifications: A commercial landscape installation contractor shall be experienced and in continuous operation in their field for a minimum of the past five (5) consecutive years.
  - a. References, portfolio of work, locations of similar projects may be required for verification of qualifications.
  - b. Field Supervision: Maintain an experienced, full-time supervisor on Project site when planting is in progress.
  - c. Contractor or subcontractors shall maintain current licenses and certifications standard in their industry and in compliance with all current local, state and federal regulations.

PART 2- PRODUCTS (Not Applicable to this Section.)

PART 3- EXECUTION (Not Applicable to this Section.)

END OF SECTION 01 43 00

## SECTION 01 50 00 - TEMPORARY FACILITIES

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.
- B. Temporary utilities required include but are not limited to:
  - 1. Water service and distribution.
  - 2. Temporary electric power and light.
  - 3. Telephone service.
- C. Temporary construction and support facilities required include but are not limited to:
  - 1. Temporary heat (as required for construction).
  - 2. Field offices and storage sheds for both Contractor's use and Owner's OPM Services.
  - 3. Temporary roads and paving.
  - 4. Sanitary facilities, including drinking water.
  - 5. Dewatering facilities and drains.
  - 6. Temporary enclosures.
  - 7. Temporary Project identification signs and bulletin boards.
  - 8. Waste disposal services.
  - 9. Construction aids and miscellaneous services and facilities.
- D. Security and protection facilities required include but are not limited to:
  - 1. Temporary fire protection.
  - 2. Barricades, warning signs, lights.
  - 3. Enclosure fence for the site.
  - 4. Environmental protection.

#### 1.3 <u>QUALITY ASSURANCE</u>

- A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:
  - 1. Building Code requirements.
  - 2. Health and safety regulations.
  - 3. Utility company regulations.

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- 4. Police and Fire Department rules.
- 5. Environmental protection regulations.
- B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-ALO Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities."
  - 1. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", prepared jointly by AGC and ASC, for industry recommendations.
  - 2. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).
- C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

# 1.4 **PROJECT CONDITIONS**

- A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility within 15 days of the date established for commencement of the Work. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of the permanent service.
- B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.

## PART 2 - PRODUCTS

## 2.1 <u>MATERIALS</u>

- A. General: Provide new materials; if acceptable to the Architect, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.
- B. Lumber and Plywood: Comply with requirements in Division 6 Section "Rough Carpentry."
  - 1. For signs and directory boards, provide exterior type, Grade B-B High Density Concrete Form Overlay Plywood conforming to PS-1, of sizes and thickness indicated.
  - 2. For fences, barriers, sidewalk bridges and similar uses, provide minimum 5/8 inch thick exterior plywood.

- C. Gypsum Wallboard: Provide gypsum wallboard complying with requirements of ASTM C 36 on interior walls of temporary partitions.
- D. Paint: Comply with requirements of Division 9 Section "Finish Painting."
  - 1. For sign panels and applying graphics, provide exterior grade alkyd gloss enamel over exterior primer.
  - 2. For interior temporary partitions, provide two coats interior latex flat wall paint.
- E. Tarpaulins: Provide waterproof, fire-resistant, UL labeled tarpaulins with flamespread rating of 15 or less. For temporary enclosures provide translucent nylon reinforced laminated polyethylene or polyvinyl chloride fire retardant tarpaulins.
- F Water: General Trades Contractor to provide temporary water service to the Trade Contractors for the purposes of construction activity. Permanent water service will be available for Contractor's use upon approval of the Awarding Authority.
- G. Open-Mesh Fencing: Provide 11-gage, galvanized 2-inch, chain link fabric fencing 6-feet high with galvanized steel pad based posts.

## 2.2 <u>EQUIPMENT</u>

- A. General: Provide new equipment; if acceptable to the Architect, undamaged, previously used equipment in serviceable condition may be used. Provide equipment suitable for use intended.
- B. Water Hoses: Provide <sup>3</sup>/<sub>4</sub> inch heavy-duty, abrasion-resistant, flexible rubber hose 100 ft. long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shut-off nozzles at hose discharge.
- C. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.
- D. Electrical Power Cords: Provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.
- E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

- F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM or another recognized trade association related to the type of fuel being consumed.
- G. Temporary Offices: Provide prefabricated or mobile units or similar job-built construction with lockable entrances, operable windows and serviceable finishes.
   Provide heated and air- conditioned units on foundations adequate for normal loading.
- H. Temporary Toilet Units: Provide self-contained single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material.
- I. First Aid Supplies: Comply with governing regulations.
- J. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "All fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.
  - 1. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.
- K. The General Trades Contractor shall provide all management personnel with radios with cellular and walkie-talkie features. All major trades shall also be so equipped. Provide a list of names and numbers for all personnel to the Owner and Architect.

## PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required, at no additional cost to the Owner.
- B. Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed, or are replaced by authorized use of completed permanent facilities.

## 3.2 <u>TEMPORARY UTILITY INSTALLATION</u>

A. General: Where required, engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide the remainder with matching, compatible materials and equipment; comply with the company's recommendations.

- 1. Arrange with the company and existing users for a time when service can be interrupted, where necessary, to make connections for temporary services.
- 2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.
- B. Water Service: <u>The General Trades Contractor</u> to make temporary water service available to the property for the purposes of construction activity. The <u>General Trades Contractor</u> shall be responsible for all costs associated with temporary water service consumption until Substantial Completion is granted by the Awarding Authority. The <u>Owner</u> shall pay for all costs incurred by the local utility company as backcharges related to the installation of water lines or fire service lines to the existing building.
- C. Temporary Electric Power Service: Provide weatherproof, grounded electric power connections and distribution system of sufficient size, capacity, and power characteristics during construction period. Include transformers, overload protected disconnects, automatic ground-fault interrupters and main distribution switch gear. The <u>Electrical Contractor</u> shall be responsible for all costs associated with temporary electric service installation and removal when Substantial Completion is granted by the Awarding Authority. The <u>General Trades Contractor</u> shall be responsible for all costs associated with temporary and permanent electric service consumption until Substantial Completion is granted by the Awarding Authority. The <u>Owner</u> shall pay for all costs incurred by the local utility company as backcharges related to the installation of temporary electric power service for the purposes of construction.
  - 1. Power Distribution System: Install wiring overhead, and rise vertically where least exposed to damage. Where permitted, wiring circuits not exceeding 125 Volts, AC 20 ampere rating, and lighting circuits may be nonmetallic sheathed cable where overhead and exposed for surveillance.
  - 2. Furnish light bulbs and extensions cords as may be essential to the execution of the respective trades, and for extensions of lines to sheds or to power tools and remote areas which cannot be reached with extension cords.
- D. Temporary Lighting: Whenever overhead floor or roof deck has been installed, provide temporary lighting with local switching.
  - 1. Install and operate temporary lighting that will fulfill security and protection requirements, without operating the entire system, and will provide adequate illumination for construction operations and traffic conditions.
- E. Temporary Telephones: <u>General Trades Contractor</u> to provide all telephones required for General Trades Contractor's use during the extent of construction and pay all costs for installation, use, and removal. Telephones required by separate contractors shall be installed, removed, and paid for by that contractor.

1. At General Trades Contractor's telephone, post a list of important telephone numbers.

### 3.3 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION

- A. Locate field offices, storage sheds, sanitary facilities and other temporary construction and support facilities for easy access.
  - 1. Confine apparatus, storage materials, equipment, supplies and operations to the areas bounded by the Contract and on-site limits as shown on the drawings.
  - Maintain temporary construction and support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.
- B. Provide incombustible construction for offices, shops and sheds located within the construction area, or within 30 feet of building lines. Comply with requirements of NFPA 241.
- C. Owner's Field Office (FOR USE BY OWNER'S OPM SERVICES): <u>General</u> <u>Trades Contractor</u> to procure, furnish, maintain, and install the following:
  - a. Provide a 31' x 10' office space trailer to accommodate the needs of the Owner, Owner's Project Manager, and Architect for the duration of the project, or until approved by the Owner to remove from the site. The <u>General Trades Contractor</u> shall furnish and equip office as follows;
  - b. Furniture required for Project-site operations and documents including file cabinets, plan tables, plan racks, and bookcases as follows;
    - 1. One (1) 30 x 60-inch desk, pedestal style, two-drawer letter size file pedestal on one side, three-drawer pedestal on the other, pencil drawer center, and 18 x 42" return at same level as desktop. Provide locking drawers, plastic laminate top, and steel frame.
    - 2. One high-back simulated leather rolling adjustable office chair.
    - 3. Keurig Coffee machine, K-cups, and supplies.
    - 4. Conference table capable of fitting 12-15 people, with 12-15 folding padded chairs.
    - 5. Three (3) four-drawer, fire-rated, letter size, lockable metal file cabinets, including hanging file holders and folders.
    - 6. One (1) plan review table, 36 x 72 inch, with sloped surface, raised lip at low edge, at height as directed by Owner's Project Manager. Include on swivel-type, height adjustable drafting stool, with cushioned seat and back, foot rest, and five-caster base.
    - 7. One (1) portable 30 inch hanging plan rack unit complete with casters and (12) 3-knob stick.
    - 8. One (1) standard waste basket, 30-gallon size, with supply of waste-basket liners for the duration of the Project.
    - 9. One (1) wall-mounted coat rack with six coat hooks and top shelf.

- Shelving or bookcases capable of holding a minimum of fifty (5)
   3-inch, 3-ring binders.
- 11. Two (2) wall-mounted bulletin boards, 4 x 6', including tacks.
- 12. One (1) wall-mounted marker board, 4 x 6', includes dry-erase marker set.
- One (1) lap-top computer with docking station equal to Dell 13. Latitude D520+. CPU/Processor shall be i7Intel Pentium M/Core, Centrino based processor of AMD Turion64 mobile processor with minimum 1.5Ghz; memory; 1GB PC3200 (DDR-400); video card shall be 128MB ATI or NVIDIA based; screen shall be WXGA or SXGA 15"+; CD/DVD Drive shall be capable of reading and writing DVD+/-R, RW and DL; DVD shall be 16x, CD-R & RW @ 52x, CD-ROM, DVD-ROM.; hard drive shall be SATA 500GB+ largest size available with computer provided; provide internal wireless A/B/G networking; internal 10/100 Mbps; Ethernet; operating system shall be Windows Office 10 Professional with Microsoft Office Professional software & Adobe Acrobat Pro, scheduling and submittal tracking software compatible with software used by Contractor. Include one color laser printer and UPS backup system. Computer, Printer and Backup to be turned over to OPM at end of project.
- 14. One (1) digital camera equal to Nikon COOLPIX L24 with 4320 x 3240 minimum resolution, 3.6X optical zoom, built in flash, auto exposure, auto focus, carrying case, batteries including extra batteries, carrying case, and (2) 64GB Memory Disks.
- 15. One (1) large format combination color copier, printer; scanner equal to a Savin MP C4503, with operating manual and service contract. Include all supplies (paper, toner, parts) for the duration of the Project, plus 60 days. Include automatic document feeder, automatic sorter, stapler, reduction and enlargement feature, paper trays for 11x17, letter and legal-size paper. Include cabinet stand with casters.
- 16. One (1) mercury thermometer, mounted outside trailer adjacent to a window, with clear view from the interior.
- 17. Office supplies for the duration of the Project, including but not limited to pens, paper, folders, staplers, scissors, heavy-duty 3-hole punch, paper clips and binders, and 3-inch 3-ring binders.
- 18. One (1) DSL, ISDN, cable modem or other high-speed data line (i.e. T1 speed) capable of addressable IP addresses and associated router and/or hard cables and all connectors. Contractor shall pay for installation and monthly charges.
- c. The <u>Electrical Trade Contractor</u> shall provide all utility connections to, utility removals from all trailers. The <u>General Trades Contractor</u> shall pay all costs of energy consumption. Utility company backcharges invoiced by the electric utility company will be paid for by the <u>Owner</u>.
- d. The <u>General Trades Contractor</u> shall provide cleaning service and trash removal on a weekly basis for the duration of the Project.

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6	e. The <u>General Trades Contractor</u> shall provide 2 desktop ca wall calendar.	lendars & 1
1	The <u>General Trades Contractor</u> shall provide (1) 1.1 cubic counterton Microwave Oven	foot
٤	<ul> <li>g. The <u>General Trades Contractor</u> shall provide (1) 3.1 cubic</li> <li>Door Refrigerator</li> </ul>	foot Double
1	n. The <u>General Trades Contractor</u> shall provide (1) Chilled v dispenser.	vater
D. T	The <u>General Trades Contractor</u> shall furnish and pay for all new temporary heat to prevent injury to work or to material through or cold. At all times when there is concrete or other masonry not the he shall maintain a temperature of at least 40 degrees F in areas whe is located. For two (2) days previous to placement or application of work, resilient tile, paint or similar finish, a temperature of at least 6 shall be maintained in those portions of building in which this work	cessary n dampness oroughly set, ere such work any interior 00 degrees F occurs.
E. 1 I t	If temporary heat is required for protection of work or to hasten dryin process of construction before permanent heating apparatus is available the General Trades Contractor shall provide suitable approved heating adequate proper fuel and maintain fires as required at his expense.	ng out ible for use, ng, apparatus,
F. t t t t t t t t t t t t t t t t t t t	All temporary heating apparatus shall be installed and operated in such at finished work will not be damaged thereby. Until the permanent system is available, the General Trades Contractor is responsible for and costs of continuous heat in all areas being constructed as part of after finish has been delivered or erected.	ich a manner it heating maintenance the building
G.	The <u>Electrical Contractor</u> , shall provide temporary connections equipment requiring electrical power in order to provide tempor The Electrical Contractor shall remove such temporary connections equipment when the need for same is concluded.	<b>to all</b> rary heat. and
H.	<ul> <li>With the cooperation of all trades and separate Contractors involved Trades Contractor may utilize the permanent heating and ventilating completely installed and operational, providing the following condit by the General Trades Contractor at no additional cost to the Owner</li> <li>The General Trades Contractor shall minimize interruption of water to areas of the building being utilized by the Owner an adequate precaution to prevent any damage from occurring d heat.</li> <li>The General Trades Contractor shall take all necessary preca prevent waste of heat due to excessive ventilation of careless openings in the building.</li> <li>The system shall be protected from freezing. Any frost dama repaired at the General Trades Contractor's cost.</li> <li>Arrangements shall be made to monitor the system operation over weekends and holidays by the General Trades Contractor</li> </ul>	, the General system when ions are met : of heat and hot d shall take lue to lack of autions to soperation of age shall be n at night and or.

- 5. All safety controls shall be installed and operating.
- 6. All equipment shall be serviced and brought back to "as new" condition to the Architect's satisfaction before acceptance by the Owner.
- 7. All equipment warranties and guarantees shall be extended so that their full term is available to the Owner from the date of acceptance.
- 8. All permanent HVAC systems utilized for heat shall be cleaned throughout the system, including but not limited to the ductwork, cores, and coils of equipment, etc. Replacement of filters alone does not constitute a thorough cleaning.
- 9. All costs for power consumption and/or fuel shall be the responsibility of the <u>General Trades Contractor</u> until Substantial Completion if permanent systems are functioning and energy efficient measures are installed.
- I. Field Offices: Provide insulated, weathertight temporary offices of sufficient size to accommodate required office personnel.
- J. Storage and Fabrication Sheds: Install storage and fabrication sheds, sized, furnished and equipped to accommodate materials and equipment involved, including temporary utility service. Sheds may be open shelters or fully enclosed spaces on the site.
- K. Toilets: <u>General Trades Contractor</u> to install, maintain, and remove selfcontained toilet units. Shield toilets to ensure privacy. Use of pit-type privies will not be permitted. Maintain clean, sanitary conditions.
- L. Drinking Water Facilities: Provide containerized tap-dispenser bottled-water type drinking water units, including paper supply.
- M. The <u>General Trades Contractor</u>, if required, shall provide and maintain suitable pumps and drains to keep the excavated areas of the building (including concrete slab and footing bottoms, drainage, fill for concrete slabs, and excavations for all other in-ground installations and building work including pits and trenches) free from water and sufficiently dry at all times until site and building structures are in place. All costs associated with the requirements of this dewatering are to be <u>included</u> by the <u>General Trades Contractor</u> in his Bid.
- N. Temporary Enclosures: <u>General Trades Contractor</u> to provide temporary enclosure for protection of construction in progress and completed, from exposure, foul weather, other construction operations and similar activities.
  - 1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
  - 2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 square feet or less with plywood or similar materials.

- 3. Close openings through floor or roof decks and horizontal surfaces with load-bearing wood-framed construction.
- 4. Where temporary wood or plywood enclosure exceeds 100 square feet in area, use UL-labeled fire-retardant treated material for framing and main sheathing.
- O. Protection:
  - 1. Protect the building at all times from damages from rain water, spring water, ground water, backing up of drains and sewers and all other water. Provide all pumps, equipment and enclosures to insure this protection.
  - 2. Remove all snow and ice as may be required for proper protection and prosecution of the work.
  - 3. Provide all shoring, bracing and sheeting as required for safety and for proper execution of work.
  - 4. Protect all work from damage during cold weather. if low temperatures make it impossible to continue operations safely in spite of cold weather precautions, cease work and so notify Architect. Repair and/or replacement of all work damaged from frost, freezing or any elements of the weather are the responsibility of the **General Trades Contractor**.
  - 5. Protect the building and the site from damage, loss or liability due to theft or vandalism when the work is not in progress at night, weekends, or holidays.
  - 6. Exercise precaution for the protection of persons and property at all times. Observe the provisions of applicable laws and construction codes. Take additional safety and health measures, or cause such measures to be taken as reasonably necessary. Maintain guards on machinery, equipment and other hazards as set forth in the safety provisions of the Manual of Accident Prevention in Construction, published by the Associated General Trades Contractors of America, to the extent that such provisions are not in contravention of applicable laws.
  - 7. Protect and preserve in operating conditions all utilities traversing the work area. Repair all damages to any utility due to work performed under this Contract, to the satisfaction of the Architect at no additional cost to the Owner.
- P. Temporary Lifts and Hoists: Each Trade Contractor to provide facilities for hoisting materials, rubbish, and employees as required and customary for their trade. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- Q. Project Identification and Temporary Signs: <u>General Trades Contractor</u> to provide project identification and other signs of the size indicated; install signs where indicated to inform the public and persons seeking entrance to the Project. Support on posts or framing of preservative treated wood. Do not permit installation of unauthorized signs. Wording and layout to be provided by Architect.
  - 1. **Project Identification Sign**: Erect a 4 feet x 8 feet x <sup>3</sup>/<sub>4</sub> inches plywood sign. Frame with 2 x 4 center cross bracing, and two 4 x 4 x 12 feet long

posts in 12 inch diameter by 4 feet deep concrete piers. Mount sign to framing with four 3/8 inch diameter lug bolts and washers on each side of the sign.

- 2. Engage an experienced sign painter to apply graphics. Apply three coats to the sign face, and one coat to the sides and rear. Architect to provide project sign layout, colors, and lettering.
- 3. **Temporary Signs**: Prepare signs to provide directional information to construction personnel and visitors.
- R. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than 7 days during normal weather or 3 days when the temperature is expected to rise above 80 deg F (27 deg C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner. The <u>General Trades Contractor</u> shall furnish and maintain dumpster service on-site for the removal of all waste material and debris. It is the responsibility of each contractor utilized for the completion of this project to remove all associated waste material and debris from the job site on a daily basis and place into appropriate waste receptacle per the General Trades Contractor's Recycling Plan.
- S. Scaffolding Provisions: <u>General Trades Contractor</u> to provide, erect, maintain and dismantle all required interior and exterior scaffolding over 8'-0" high for the entire job for use by all trades. Hoisting and staging of trade specific materials shall be the responsibility of the specific trade. If the General Trades Contractor is to utilize rented scaffolding, they shall coordinate the rental schedule with each trade to complete all work requiring the use of scaffolding within the rental period. The Owner will not be responsible for any costs incurred to provide, erect, maintain, and dismantle interior and exterior scaffolding due to this lack of coordination between trade contractors.

## 3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer as requested by the Architect.
- B. Temporary Fire Protection: Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers," and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations.
  - 1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor.
  - 2. Store combustible materials in containers in fire-safe locations.

- 3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
- 4. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.
- 5. No gasoline may be stored in or close to the building at any time.
- C. Permanent Fire Protection: At the earliest feasible date in each area of the Project, complete installation of the permanent fire protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
- D. Barricades, Warning Signs and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.
- E. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft and similar violations of security.
  - 1. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.
- F. Environmental Protection: Provide protection, operate temporary facilities and, conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, waterways and subsoil might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

## 3.5 OPERATION, TERMINATION AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.
  - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities on a 24-hour day basis where required to achieve indicated results and to avoid possibility of damage.
  - 2. Protection: Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

- C. Termination and Removal: Unless the Architect requests that it be maintained longer, the contractor responsible for its installation shall remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.
  - 1. Materials and facilities that constitute temporary facilities are property of the Contractor. The Owner reserves the right to take possession of Project identification signs.
  - 2. Remove temporary paving that is not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that does not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances which might impair growth of plant materials or lawns. Repair or replace existing and new street paving, curbs and sidewalks and grassed areas at the temporary entrances, as required by the governing authority.
  - 3. At Substantial Completion, clean and renovate existing and new permanent facilities that have been used during the construction period, including but not limited to:
    - a. Replace air filters and clean inside of ductwork and housings.
    - b. Replace significantly worn parts and parts that have been subject to unusual operating conditions.
    - c. Replace lamps that are burned out or noticeably dimmed by substantial hours of use.

END OF SECTION 01 50 00

## 01 71 23 – FIELD ENGINEERING

#### <u>PART 1 - GENERAL</u>

#### 1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

### 1.2 <u>RELATED SECTIONS</u>

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specifications Sections that directly relate to Work of this Section include, but are not limited to:
  - 1. Division 00, all Sections.
  - 2. Division 01, all Sections.
  - 3. Division 31, all Sections.
  - 4. Division 32, all Sections.
  - 5. Division 33, all Sections.
- B. Provide all facilities, labor, materials, equipment, transportation, supervision, and related work necessary to complete the work in this Specification, and as shown on the Drawings.
- C. All work shall be performed in accordance with applicable codes, permits and regulations, and the requirements of all local, state, and federal agencies having jurisdiction over the work.

#### 1.3 EXISTING SURVEY

- A. As noted on the drawings and as provided in the contract documents, the existing site information used in the preparation of the contract documents was prepared by a Professional Surveyor licensed in the Commonwealth of Massachusetts.
- B. The final survey in stamped and sealed mylar form is on file with the Town of Carver.
- C. If electronic (AUTOCAD) files of existing survey and/or contract documents are provided, it is done so as a convenience to the Contractor to be utilized for this project only; the printed plans shall govern for contract scope.

## 1.4 SURVEYOR REQUIREMENTS

- A. The Contractor shall employ at his expense a competent professional surveyor licensed in the Commonwealth of Massachusetts to provide layout, both horizontal and vertical, for this project.
  - 1. Submit surveyor's name, registration number and certificate of insurance prior to start of any construction.

## 1.5 CONSTRUCTION LAYOUT

- A. Verify and confirm all existing site conditions prior to beginning work. Any variation from information shown on survey or contract plans shall immediately be brought to the attention of the Architect.
- B. Commencement of work shall be deemed as confirmation of the existing conditions, survey and contract plans.

### 1.6 <u>AS-BUILTS</u>

- A. Revisions, modifications, changes and adjustments made during the course of the project shall be accurately noted on a single set of plans to be submitted as the final record copy at project completion.
- B. Verification of the as-built finished grades, major layout of improvements, locations of buildings or structures and underground utilities is required to be submitted on mylar, stamped and signed, and in digital format.

PART 2 - MATERIALS (Not Applicable to this Section)

# PART 3 - EXECUTION

## 3.1 CONSTRUCTION LAYOUT

- A. Verify and confirm all existing site conditions prior to beginning work. Any variation from information shown on survey or contract plans shall immediately be brought to the attention of the Architect. Commencement of work shall be deemed as confirmation of the existing conditions, survey and contract plans.
- B. Existing utilities and equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning the work, investigate and verify the existence and location of underground utilities and other construction.
  - 1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer and storm sewer.

2. Close attention shall be required for any excavations within the vicinity of existing underground utilities.

# 3.2 PRESERVATION OF SURVEY POINTS

- A. The Contractor shall carefully protect from disturbance or damage, all land monuments or markers until an authorized agent has witnessed or otherwise referenced their locations, and shall not remove or destroy them without proper authorization from the Owner.
  - 1. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points, or requirements to relocate reference points because of necessary changes in grades or locations.
  - 2. Promptly replace lost or destroyed project control points. Base replacements on the original survey control points.
- C. Establish and maintain a minimum of two permanent benchmarks on the site, referenced to data established by survey control points.
  - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

# 3.3 PERFORMANCE

- A. Working from lines and levels established by the property survey, field measurements, establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to properly locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.
  - 1. Advise entities engaged in construction activities, of marked lines and levels provided for their use.
  - 2. As construction proceeds, check every major element for line, level and plumb.
- B. Surveyor's Log: Maintain a surveyor's log of control and other survey Work. Make this log available for reference.
  - 1. Record deviations from required lines and levels, and advise the Architect when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.
- C. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations by instrumentation and similar appropriate means.

- D. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels and control lines and levels required for mechanical and electrical Work.
- E. Existing Utilities: Furnish information necessary to adjust, move or relocate existing structures, utility poles, lines, services or other appurtenances located in, or affected by construction. Coordinate with local authorities having jurisdiction.

# 3.4 AS-BUILT DRAWINGS

- A. Organize and submit to the Architect and Owner a site as-built drawing in a form acceptable to the local authority having jurisdiction.
  - 1. Revisions, modifications, changes and adjustments made during the course of the project shall be accurately noted on a single set of plans to be submitted as the final record copy at project completion.
  - 2. Provide A-2 survey of final as-built conditions <u>including any zone</u> <u>change and lot line changes</u> at project completion.
  - 3. Verification of the final as-built conditions of major layout of improvements, locations of buildings or structures and underground utilities is required to be submitted on mylar, stamped and signed, and in digital format, including but not limited to the following:
    - a. In-place foundation walls
    - b. Site elevations / completed topography (T-2 survey)
    - c. Site improvements installed as part of project scope
    - d. Site landscaping (new and existing) within the project site
    - e. Elevations and inverts for all storm water, sanitary waste systems, underground structures, underground tanks, and connections to existing underground utilities.
  - 4. Submit final drawings in a reproducible format as determined by, and acceptable to, the local authority having jurisdiction and in a format that will comply with the Owner's requirements of a Final Certificate of Occupancy.

END OF SECTION 01 71 23

### SECTION 01 73 00 - EXECUTION

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201 - 2007, "The General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. General: This Section specifies administrative and procedural requirements for field engineering services, including, but not necessarily limited to, the following:
  - 1. Land survey Work
  - 2. Civil engineering services
  - 3. Dimensional layout of building elements and site improvements.
  - 4. Site as-built documentation

## 1.3 <u>SUBMITTALS</u>

- A. Certificates: Submit a certificate signed by the Land Surveyor or Professional Engineer certifying that the location and elevation of improvements comply with the Contract Documents.
- B. Project Record Documents: Submit a record of Work performed and record survey data as required under provisions of Sections "Submittals" and "Project Close-out".

### 1.4 **QUALITY ASSURANCE**

- A. Surveyor: The Site Contractor shall engage, at their expense, a Registered Land Surveyor registered in the Commonwealth of Massachusetts to perform land surveying services required, both horizontal and vertical, for this project.
- B. Submit surveyor's qualifications, registration, and certification for Architect's review and approval prior to proceeding with land surveying services.

#### 1.5 EXISTING SURVEY

A. As noted on the drawings and as provided in the contract documents, the existing site information used in the preparation of the contract documents was prepared by a Professional Surveyor licensed in the Commonwealth of Massachusetts.

B. If electronic (AUTOCAD) files of existing survey and/or contract documents are provided, it is done so as a convenience to the Contractor to be utilized for this project only; the printed plans shall govern for contract scope.

# PART 2 - PRODUCTS (Not Applicable)

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. The Owner will identify existing control points and property line corner stakes.
- B. Verify layout information shown on the Drawings, in relation to the property survey, and existing benchmarks before proceeding to layout the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.
  - 1. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points, or requirements to relocate reference points because of necessary changes in grades or locations.
  - 2. Promptly replace lost or destroyed project control points. Base replacements on the original survey control points.
- C. Establish and maintain a minimum of two permanent benchmarks on the site, referenced to data established by survey control points.
  - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
- D. Existing utilities and equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning the work, investigate and verify the existence and location of underground utilities and other construction.
  - 1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer and storm sewer.
  - 2. Close attention shall be required for any excavations within the vicinity of existing underground utilities.

## 3.2 <u>PERFORMANCE</u>

- A. Working from lines and levels established by the property survey, field measurements, establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to properly locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.
  - 1. Advise entities engaged in construction activities, of marked lines and levels provided for their use.
- 2. As construction proceeds, check every major element for line, level and plumb.
- B. Surveyor's Log: Maintain a surveyor's log of control and other survey Work. Make this log available for reference.
  - 1. Record deviations from required lines and levels, and advise the Architect when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.
- C. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations by instrumentation and similar appropriate means.
- D. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels and control lines and levels required for mechanical and electrical Work.
- E. Existing Utilities: Furnish information necessary to adjust, move or relocate existing structures, utility poles, lines, services or other appurtenances located in, or affected by construction. Coordinate with local authorities having jurisdiction.
- F. <u>Site As-Built Drawing</u>: Organize and submit to the Architect and Owner a site asbuilt drawing in a form acceptable to the local authority having jurisdiction.
  - 1. Revisions, modifications, changes and adjustments made during the course of the project shall be accurately noted on a single set of plans to be submitted as the final record copy at project completion.
  - 2. Provide A-2 survey of final as-built conditions at project completion.
  - 3. Drawing shall indicate all as-built conditions of the following:
    - a. in-place foundation walls,
    - b. site elevations / completed topography
    - c. site improvements installed as part of project scope
    - d. site landscaping (new and existing) within the project site
    - e. elevations and inverts for all storm water, sanitary waste systems, underground structures, underground tanks, and connections to existing underground utilities.
  - 4. Submit final drawings in a reproducible format as determined by, and acceptable to, the local authority having jurisdiction and in a format that will comply with the Owner's requirements of a Final Certificate of Occupancy.

END OF SECTION 01 73 00

#### SECTION 01 77 00 – CLOSEOUT PROCEDURES

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section specifies administrative and procedural requirements for project closeout by the General Trades Contractor and Trade Contractors, including but not limited to:
  - 1. Final inspection procedures.
  - 2. Record document submittals.
  - 3. Operating and maintenance manual submittal.
  - 4. Submittal of warranties.
  - 5. Final cleaning.
- B. Closeout requirements for specific construction activities are included in the appropriate sections of the specifications.
- C. Closeout requirements pertaining to final engineering are included in Section 01 73 00 "EXECUTION".
- D. Refer to Section 01 78 23 "Operation and Maintenance Data" for requirements for preparation, format, and submittal procedures for O&M Manuals and As-Built documentation.

#### 1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection by the Architect for certification of Substantial Completion, complete the following. List exceptions in the request.
  - 1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.
    - a. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.

- 2. Advise the Owner of pending insurance change-over requirements.
- 3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
- 4. Obtain and submit releases to the Architect enabling the Owner unrestricted use of the Work and access to services and utilities; include occupancy permits, operating certificates and similar releases.
- 5. Submit record drawings, maintenance manuals and similar final record information to the Architect.
- 6. Deliver tools, spare parts, extra stock, and similar items.
- 7. Remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
- 8. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.
- B. Final Inspection Procedures: Submit a request for final inspection, to the Architect. Following the Architect's final inspection, the Architect will either prepare the Certificate of Substantial Completion, or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.
  - 1. The Architect will repeat final inspection when requested by the General Trades Contractor and assured that the Work has been substantially completed.
  - 2. Results of the completed final inspection will form the basis of requirements for final acceptance.

## 1.4 FINAL ACCEPTANCE

- A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
  - 1. Submit the final payment request to the Architect with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
  - 2. Submit an updated final statement to the Architect, accounting for final additional changes to the Contract Sum.
  - 3. Submit a certified copy of the Architect's Final Inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the General Trades Contractor.
  - 4. Submit consent of surety to final payment.
  - 5. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
- B. Reinspection Procedure: The Architect will reinspect the work upon receipt of notice from the General Trades Contractor that the Work, including Final Inspection list items from earlier inspections, has been completed, except items

whose completion has been delayed because of circumstances acceptable to the Architect.

- 1. Upon completion of reinspection, the Architect will prepare a certificate of final acceptance, or advise the General Trades Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
- 2. If necessary, reinspection will be repeated one additional time at no additional expense. Any reinspections required beyond this limit will be charged to the General Trades Contractor at standard hourly rates.

### 1.5 <u>RECORD DOCUMENT SUBMITTALS</u>

- A. General: Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Architect's reference during normal working hours.
- B. Record Drawings: Maintain a clean, undamaged set of blue or black line whiteprints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
  - 1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.
  - 2. Mark new information that is important to the Owner, but was not shown on Contract Drawings or Shop Drawings.
  - 3. Note related Change Order numbers where applicable.
  - 4. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set. Submit to the Architect.
- C. Maintenance Manuals: See Section 01 78 23 "Operation and Maintenance Data" for O&M requirements.
- D. <u>Site As-Built Drawing</u>: The General Trades Contractor to organize through a certified land surveyor and submit to the Architect and Owner's Project Manager a site as-built drawing in a form acceptable to the local authority having jurisdiction. Refer to Section 01 73 00 "Execution" for minimum requirements of Site As-Built Drawings.

#### 1.6 WARRANTEE SUBMITTALS

A. Submit written warranties to the Architect prior to the date certified for Substantial Completion. If the Architect's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Architect.

- 1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Architect within fifteen (15) days of completion of that designated portion of the Work.
- B. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner through the Architect for approval prior to final execution.
- C. Form of Submittal: At Final Completion compile two (2) copies of each required warranty and bond properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the table of contents of the Project Manual.
- D. Schedule: Provide warranties on products and installations as indicated and specified in each Specification Section relating to each product.
- E. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

#### PART 2 - PRODUCTS (Not Applicable)

## PART 3 - EXECUTION

- 3.1 <u>FINAL CLEANING</u>
  - A. General: General cleaning during construction is required by the General Conditions and included in Section 01500 "Temporary Facilities".
  - B. Cleaning: The General Trades Contractor is to employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
    - 1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion.
      - a. Remove labels that are not permanent labels.
      - b. Clean transparent materials. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
      - c. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective

condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.

- d. Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth eventextured surface.
- C. Removal of Protection: Remove temporary protection and facilities installed for protection of the work during construction.
- D. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.
  - 1. Where extra materials of value remaining after completion of associated Work have become the Owner's property, arrange for disposition of these materials as directed.
- E. If the General Trades Contractor fails to demonstrate a commitment to accomplish the required cleaning in an orderly, timely fashion, the Owner reserves the right to employ a professional cleaning service, and to deduct any costs thereof from the Contract Amount.

#### 3.2 WARRANTY PROCEDURES

- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the owner has benefited from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as

limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

- 1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
- E. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.

END OF SECTION 01 77 00

#### SECTION 01 78 39 - OPERATION AND MAINTENANCE DATA

#### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory.
  - 2. Operation manuals for systems, subsystems, and equipment.
  - 3. Product maintenance manuals.
  - 4. Systems and equipment maintenance manuals.
- B. Related Sections:
  - 1. Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
  - 2. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

#### 1.3 **DEFINITIONS**

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

#### 1.4 <u>CLOSEOUT SUBMITTALS</u>

- A. Manual Content: Operations and maintenance manual content is specified in individual specification sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  - 1. Where applicable, clarify and update reviewed manual content to correspond to modifications and field conditions.

# CARVER POLICECARVER, MAOPERATION AND MAINTENANCE DATA01 78 39-2

- B. Format: Submit operations and maintenance manuals in the following format:
  - 1. **Two (2) paper copies and one (1) electronic copy**. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.
- C. Initial Manual Submittal: Submit draft copy of each manual at least four (4) weeks before commencing demonstration and training. Architect and Owner's Commissioning Agent will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least two (2) weeks before commencing demonstration and training.
  - 1. Correct or modify each manual to comply with Architect's and Owner's Commissioning Agent's comments. Submit copies of each corrected manual within ten (10) working days of receipt of Architect's and Owner's Commissioning Agent's comments and prior to commencing demonstration and training.

### PART 2 - PRODUCTS

### 2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
  - 1. List of documents.
  - 2. List of systems.
  - 3. List of equipment.
  - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

# CARVER POLICECARVER, MAOPERATION AND MAINTENANCE DATA

## 2.2 <u>REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE</u> <u>MANUALS</u>

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  - 1. Title page.
  - 2. Table of contents.
  - 3. Manual contents.

### B. Title Page: Include the following information:

- 1. Subject matter included in manual.
- 2. Name and address of Project.
- 3. Name and address of Owner.
- 4. Date of submittal.
- 5. Name and contact information for Contractor.
- 6. Name and contact information for Construction Manager.
- 7. Name and contact information for Architect.
- 8. Name and contact information for Commissioning Agent.
- 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
- 10. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
  - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- E. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
  - 1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if

necessary to provide essential information for proper operation or maintenance of equipment or system.

- b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
- 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
- 3. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
- 4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
  - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
  - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

## 2.3 **OPERATION MANUALS**

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
  - 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
  - 2. Performance and design criteria if Contractor is delegated design responsibility.
  - 3. Operating standards.
  - 4. Operating procedures.
  - 5. Operating logs.
  - 6. Wiring diagrams.
  - 7. Control diagrams.
  - 8. Piped system diagrams.
  - 9. Precautions against improper use.
  - 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
  - 1. Product name and model number. Use designations for products indicated on Contract Documents.
  - 2. Manufacturer's name.
  - 3. Equipment identification with serial number of each component.

# CARVER POLICECARVER, MAOPERATION AND MAINTENANCE DATA

- 4. Equipment function.
- 5. Operating characteristics.
- 6. Limiting conditions.
- 7. Performance curves.
- 8. Engineering data and tests.
- 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
  - 1. Startup procedures.
  - 2. Equipment or system break-in procedures.
  - 3. Routine and normal operating instructions.
  - 4. Regulation and control procedures.
  - 5. Instructions on stopping.
  - 6. Normal shutdown instructions.
  - 7. Seasonal and weekend operating instructions.
  - 8. Required sequences for electric or electronic systems.
  - 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

#### 2.4 **PRODUCT MAINTENANCE MANUALS**

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Product Information: Include the following, as applicable:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Color, pattern, and texture.
  - 4. Material and chemical composition.
  - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

## CARVER POLICECARVER, MAOPERATION AND MAINTENANCE DATA01 '

- 1. Inspection procedures.
- 2. Types of cleaning agents to be used and methods of cleaning.
- 3. List of cleaning agents and methods of cleaning detrimental to product.
- 4. Schedule for routine cleaning and maintenance.
- 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

#### 2.5 <u>SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS</u>

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
  - 1. Standard maintenance instructions and bulletins.
  - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  - 3. Identification and nomenclature of parts and components.
  - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
  - 1. Test and inspection instructions.
  - 2. Troubleshooting guide.
  - 3. Precautions against improper maintenance.
  - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - 5. Aligning, adjusting, and checking instructions.
  - 6. Demonstration and training video recording, if available.

- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
  - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

## PART 3 - EXECUTION

## 3.1 MANUAL PREPARATION

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
  - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- C. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
  - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- D. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
  - 1. Do not use original project record documents as part of operation and maintenance manuals.

E. Comply with Section 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 39

#### SECTION 01 79 00 - DEMONSTRATION AND TRAINING

#### PART 1 – GENERAL

#### 1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems, and equipment.
  - 2. Training in operation and maintenance of systems, subsystems, and equipment.
  - 3. Demonstration and training <u>videotapes</u>.
- B. Related Sections include the following:
  - 1. Section 01 31 00 "Project Management " for requirements for Pre-Instruction Conferences
  - 2. Section 01 91 13 "General Commissioning Requirements"
  - 3. Individual Sections for specific requirements for demonstration and training for products in those Sections.

#### 1.3 <u>SUBMITTALS</u>

- A. Instruction Program: Submit two (2) copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
  - 1. At completion of training, submit one (1) electronic copy of the complete training manual(s) for Owner's use.
  - 2. Format for electronic media to be DVD based with proper labeling permanently affixed to disks.
- B. Qualification Data: For facilitator.
- C. Attendance Record: For each training module, submit list of participants and length of instruction time.
- D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.
- E. Demonstration and Training Digital Video Disks (DVD's): Submit ONE (1) copy within seven (7) days of end of each training module.

- 1. Identification: On each copy, provide an applied label with the following information:
  - a. Name of Project.
  - b. Name and address of photographer / vidoegrapher
  - c. Name of Architect and Owner's Project Manager (OPM).
  - d. Name of Contractor.
  - e. Date material was recorded.
  - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
- 2. Transcript: Prepared on 8-1/2-by-11-inch paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding DVD. Include name of Project and date of video material on each page.

#### 1.4 **QUALITY ASSURANCE**

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures, videography, and training.
- C. Pre-Instruction Conference: Conduct conference at Project site. Review methods and procedures related to demonstration and training including, but not limited to, the following:
  - 1. Inspect and discuss locations and other facilities required for instruction.
  - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
  - 3. Review required content of instruction.
  - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

#### 1.5 <u>COORDINATION</u>

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

#### PART 2 - PRODUCTS

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#### 2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:
  - 1. Fire alarm systems
  - 2. Fire suppression systems
  - 3. Electronic security systems
  - 4. Heat generation, including boilers, feedwater equipment, pumps, distribution piping, and water distribution piping.
  - 5. Refrigeration systems, including chillers, condensers, pumps, all distribution piping.
  - 6. HVAC systems, including air-handling equipment, air distribution systems, and terminal equipment and devices.
  - 7. HV AC instrumentation and controls.
  - 8. Electrical service and distribution, including transformers, switchboards, panel boards, uninterruptible power supplies, and motor controls.
  - 9. Lighting equipment and controls.
  - 10. Communication systems, including intercommunication, voice and data, and television equipment.
  - 11. Plumbing systems and equipment, including hot water heaters, pumps and systems, booster pumps, treatment systems.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
  - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    - a. System, subsystem, and equipment descriptions.
    - b. Performance and design criteria if Contractor is delegated design responsibility.
    - c. Operating standards.
    - d. Regulatory requirements.
    - e. Equipment function.
    - f. Operating characteristics.
    - g. Limiting conditions.
    - h. Performance curves.
  - 2. Documentation: Review the following items in detail:
    - a. Emergency manuals.
    - b. Operations manuals.
    - c. Maintenance manuals.
    - d. Project Record Documents.
    - e. Identification systems.
    - f. Warranties and bonds.
    - g. Maintenance service agreements and similar continuing commitments.
  - 3. Emergencies: Include the following, as applicable:
    - a. Instructions on meaning of warnings, trouble indications, and error messages.
    - b. Instructions on stopping.

- c. Shutdown instructions for each type of emergency.
- d. Operating instructions for conditions outside of normal operating limits.
- e. Sequences for electric or electronic systems.
- f. Special operating instructions and procedures.
- 4. Operations: Include the following, as applicable:
  - a. Startup procedures.
  - b. Equipment or system break-in procedures.
  - c. Routine and normal operating instructions.
  - d. Regulation and control procedures.
  - e. Control sequences.
  - f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - 1. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
  - a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
  - a. Diagnostic instructions.
  - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
  - a. Inspection procedures.
  - b. Types of cleaning agents to be used and methods of cleaning.
  - c. List of cleaning agents and methods of cleaning detrimental to product.
  - d. Procedures for routine cleaning
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
  - a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.

#### PART 3 - EXECUTION

#### 3.1 <u>PREPARATION</u>

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.
- B. Set up instructional equipment at instruction location.

#### 3.2 <u>INSTRUCTION</u>

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Provide manufacturer's instructors or instructors certified by manufacturer as being experienced in operation and maintenance procedures for each system, subsystem, or piece of equipment to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
  - 1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
  - 2. Owner will furnish an instructor to describe Owner's operational philosophy.
  - 3. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  - 1. Schedule training with Owner through Construction Manager and CxA with at least fourteen (14) days' advance notice.
  - 2. Schedule training to conform to personnel availability at Site and to conclude prior to start up of system.
- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral and/or a demonstration performance-based test.
- E. In addition to written technical descriptions, training shall detail training program to allow those who have completed training to provide training for new employees resulting in self-perpetuating training program.
- F. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

#### 3.3 <u>DEMONSTRATION AND TRAINING VIDEOTAPES</u>

A. General: Engage a qualified commercial photographer to record demonstration and training videos. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

- 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Video Format: Provide high-quality video on DVD.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
- D. Narration: Describe scenes on videotape by audio narration by microphone while video is recorded. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.
- E. As part of training, devote 1 lesson plan to reviewing of video to allow new employees to view tape at their own convenience and be able to comprehend system without need for instructor in attendance.

END OF SECTION 01 79 00

### **SECTION 01 91 13 – GENERAL COMMISSIONING REQUIREMENTS**

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

- A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.
- B. Project Commissioning Plan shall be developed as part of this process.
- C. Related Sections include the following:
  - 1. Division 22, Section 22 00 00 Plumbing
  - 2. Division 23, Section 23 00 00 HVAC
  - 3. Division 26, Section 26 00 00 Electrical

#### 1.2 <u>SUMMARY</u>

- A. An independent commissioning agent (CA) has been retained to implement and coordinate the commissioning process for this project. The objectives of the commissioning process are to:
  - 1. Achieve, verify and document that the performance of facilities, systems, and assemblies meet defined objectives and criteria.
  - 2. Verify that O&M documentation left on site is complete.
  - 3. Verify that the Owner's operating personnel are adequately trained.
  - 4. Coordinate all of the Commissioning efforts of the Commissioning Team
  - 5. Finalize the Commissioning Plan
  - 6. Verify that all Commissioning is completed successfully.
- B. The commissioning process includes specific tasks to be conducted during each phase in order to verify that design, construction, operation and occupancy meet the Owner's project requirements.
- C. This section defines the members of the commissioning team (CxT) and outlines the responsibilities of each member of the CxT. All CxT members work together to fulfill their contracted responsibilities and meet the objectives of the contract documents.
- D. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

E. Participating CxT entities shall each include the cost to complete their work of the commissioning process in their proposal.

#### 1.3 <u>COMMISSIONED SYSTEMS</u>

- A. See below for a list of the Systems to be Commissioned:
  - HVAC Systems
    - Variable Refrigerant Volume (VRV) Outdoor Units
    - Variable Refrigerant Volume (VRV) Indoor Units
    - Electric Duct Heaters
    - Electric Cabinet Heater
    - Gas Fire Unit Heaters
    - Energy Recovery Units, with energy recovery wheel
    - Exhaust Fans
    - Building Automation System
    - Integrated testing of life safety systems including systems which may span multiple trades
    - Testing, Adjusting and Balancing Verification (TAB)
  - Plumbing Systems
    - Hot water heater (Propane) with associated storage tanks, thermostatic mixing and recirculation pumps
    - Plumbing water systems, including flush valves, shower valves, and faucets
    - Emergency Shower / Eyewash Stations
  - Electrical Systems
    - Lighting controls including occupancy sensors, day lighting/photo sensors
    - Life safety system including fire alarm system (Type B)
    - Emergency Generator (Diesel) and pump controls / ATS
    - Security Systems (Type B)
- B. Note: Systems may change with final design. Type B systems which is tested by others witnessed by Commissioning Agent and documentation reviewed and commented on by Commissioning Agent.

## 1.4 **DEFINITIONS**

- A. Acceptance: A formal action, taken by a person with appropriate authority (which may or may not be contractually defined) to declare that some aspect of the project meets defined requirements, thus permitting subsequent activities to proceed.
- B. Checklists: Verification checklists that are developed and used during all phases of the commissioning process to verify that the Owner's Project requirements are

being achieved. This includes checklists for general verification, plus testing, training, and other specific requirements.

- C. Commissioning or Commissioning Process: A quality-focused process for enhancing the delivery of a Project. The process focuses on verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the Owner's Project requirements.
- D. Commissioning Process Activities: Components of the commissioning process.
- E. Commissioning Agent: The entity identified by the Owner who plans, schedules, and coordinates the commissioning team to implement the commissioning process.
- F. Commissioning Plan: A document that provides the organization, schedule, and coordination planning for the commissioning process.
- G. Commissioning Process Progress Report: A written document that details activities completed as part of the commissioning process and significant findings from those activities, which is continuously updated during the course of a Project.
- H. Commissioning Request for Information (RFI): Form used by the CA to request information from the design and construction team.
- I. Commissioning Team: The individuals who through coordinated actions are responsible for implementing the commissioning process.
- J. Coordination Drawings: Drawings showing the work of all trades to illustrate that equipment can be installed in the space allocated without compromising equipment function or access for maintenance and replacement. These drawings graphically illustrate and dimension manufacturers' recommended maintenance clearances.
- K. Deferred Performance Tests (DPTs): Performance tests that are performed, at the discretion of the CA, after Substantial Completion, due to partial occupancy, equipment, seasonal requirements, design, or other site conditions that do not allow the test to be performed.
- L. Deficiency: A condition in the installation or function of a component, piece of equipment, or system that is not in compliance with the contract documents.
- M. Document Request Log: A log maintained by the CA to list and track documents requested from the design and construction team.
- N. Factory Testing: Testing of equipment on-site or at the factory, by factory personnel, with or without an Owner's Representative present.

- O. Functional Performance Test: A written protocol that defines methods, personnel, and expectations, for tests conducted on components, equipment assemblies, systems, and interfaces among systems.
- P. Integrated System Testing: A written protocol that defines methods, personnel and expectations for tests conducted to verify proper interface and interaction between HVAC, building automation, electrical, security and fire systems. In addition to testing the response of these systems to a building power outage and restoration, HVAC equipment is tested to verify that modules of capacity are brought on automatically in response to added heat load.
- Q. Issues Log: A formal and ongoing record of problems or concerns and their resolution that have been raised by members of the commissioning team during the course of the commissioning process.
- R. Non-Compliance: See Deficiency.
- S. Non-Conformance: See Deficiency.
- T. Phased Commissioning: Commissioning that is completed in phases as required by the phasing plan as approved for the Project and other scheduling issues.
- U. Pre-Functional/Start-Up Checklist: A form used by the Contractor to verify that appropriate components are on-site, ready for installation, correctly installed, and functional.
- V. Seasonal Performance Tests: Performance tests that are deferred until the system(s) will experience conditions closer to their design conditions based on weather conditions.
- W. Commissioned Systems Resource Manual (CSRM): A system-focused document that refers to reference materials and their physical location and bound information within the CSRM that includes the operation manual, maintenance manual, and additional information of use to the Owner during the occupancy and operation phase.
- X. Training Plan: A written document that details the expectations, schedule, budget, and deliverables of commissioning process activities related to training of project operating and maintenance personnel, users, and occupants.
- Y. Verification: The process by which specific documents, components, equipment, assemblies, systems, and interfaces among systems are confirmed to comply with the criteria described in the Owner's Project requirements.

#### 1.5 SUBMITTALS

- A. The CA shall provide the Contractor with a specific request for the type of submittal documentation the CA requires facilitating the commissioning work. These requests shall be integrated into the normal submittal process and protocol of the construction project. All documentation requested by the CA shall be included by the Contractor in the O&M manual.
- B. The CA shall review submittals related to the commissioning of equipment for conformance to the contract documents as it relates to the commissioning process, to the performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of performance test procedures and only secondly to verify compliance with equipment specifications. The CA shall follow communications protocol to notify those required of items missing or areas that are not in conformance with contract documents and which require submission.
- C. CA shall receive submittals concurrent to Architect / Engineer. CA shall provide comments, when required, to Architect / Engineer for inclusion in their comments to contractors.
- D. Shop Drawings
  - 1. Include a complete bill of material of equipment used indicating quantity, manufacturer and model number and other relevant technical data.
  - 2. Include manufacturer's description and technical data, such as performance curves, performance test procedures, product specification sheets, schedules, settings and installation, operation and maintenance instructions, and detailed startup procedures.
  - 3. Submittals shall contain outline dimensions, layout details, operating and maintenance clearances and sufficient engineering data to indicate compliance with the specifications.
  - 4. Scale and Measurements: Make Shop Drawings accurately to a scale sufficiently large to show all pertinent aspects of the item and its method of connection to the work.
  - 5. Each piece of equipment shall be identified by the number shown in the schedules and specification article number pertaining to the item. Shop Drawings shall, at a minimum, be 1/4 inch equal 1'-0" scale, and shall be newly prepared by the Contractor and not reproduced from the Architect / Engineer's Drawings.
  - 6. When manufacturer's cut sheets apply to a product series rather than a specific product, the data specifically applicable to the Project shall be highlighted or clearly indicated by other means. General catalogs shall not be accepted as cut sheets to fulfill submittal requirements.
  - 7. Shop Drawings to be provided to the CA include all systems referenced above in section 1.03 Systems to be Commissioned.

- E. The CA may request additional submittals/information not listed above and design narrative from the Architect / Engineer, Contractor, and/or equipment suppliers, etc.
- F. Submittals to the CA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the Contractor, through the CA shall review and approve them.

## 1.6 COMMISSIONING TEAM

- A. Members appointed by Contractor: Individuals, each having expertise and authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CA.
- B. Members appointed by Owner:
  - 1. CA: An entity identified by the Owner who leads, plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner has engaged the CA under a separate contract.
  - 2. Representatives of the facility user and operation and maintenance personnel.
  - 3. Architect and engineering design professionals (A/E).
- C. Members of the Commissioning Team, at minimum, to include:
  - 1. Owner's Representative.
  - 2. Owner Operations Staff Representative.
  - 3. Architect / Engineer (A/E).
  - 4. General Contractor.
  - 5. Mechanical Sub-contractor.
  - 6. Plumbing Sub-contractor.
  - 7. Fire Protection Sub-contractor.
  - 8. Major HVAC, Plumbing, and Fire Protection Equipment Suppliers.
  - 9. Electrical Sub-contractor.
  - 10. Lighting Controls Equipment Supplier.
  - 11. Major Electrical Systems Suppliers (generator, switchgear, ATS, etc.).
  - 12. Instrumentation and Controls Sub-contractor.
  - 13. Instrumentation and Controls Supplier.
  - 14. Security System Sub-contractor.
  - 15. Security System Supplier.
  - 16. Test and Balance Sub-contractor.
  - 17. Commissioning Agent.

#### 1.6 <u>RESPONSIBILITIES</u>

- A. All CxT Members:
  - 1. Follow the commissioning plan.
  - 2. Attend preconstruction commissioning meeting and additional commissioning meetings as necessary.
  - 3. Cooperate with all CxT members to carry out commissioning process.
  - 4. Include the price of commissioning responsibilities/tasks in each CxT member's proposal.
- B. Commissioning Agent (CA):
  - 1. Develops a commissioning plan outlining the organization, schedule, allocation of resources, and documentation requirements of the commissioning process. CA oversees implementation of commissioning plan.
  - 2. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, updated timelines and schedules and technical expertise.
  - 3. The CA shall develop specific commissioning documentation. This commissioning documentation shall be kept in three ring binders. All pages shall be numbered, and a table of contents page(s) shall be provided. The CA developed commissioning documentation shall include, but not be limited to, the following:
    - a. Commissioning plan.
    - b. Commissioning schedule.
    - c. Commissioning RFIs.
    - d. Issues log.
    - e. Functional performance test procedures.
    - f. Commissioning team meeting minutes.
    - g. Final commissioning report.
  - 4. Additional documentation required of the commissioning process that the CA shall verify is in place and review (when contracted to do so), includes the following:
    - a. Shop Drawing submittals.
    - b. Installation, operation and maintenance (O&M) manuals
    - c. Training materials, agenda and training schedules for Owner's operating personnel.
    - d. Warranties for equipment, systems and Project.
    - e. Test and balance reports.

- 5. Provides Contractor training with regards to testing process, forms used, approval process, and scheduling.
- 6. The CA may assist with problem solving, non-conformance or deficiencies, but ultimately that responsibility resides with the Contractor and the Architect / Engineer.
- 7. The CA is not responsible for the design concept, design criteria, compliance with codes, review or approval of change orders, design or construction scheduling or cost estimating.
- 8. The CA coordinates the commissioning work and, with the Contractor, ensures that commissioning activities are being incorporated into the construction schedule maintained by the Contractor.
- 9. Makes revisions to the commissioning plan as required.
- 10. Plans and conducts a pre-construction commissioning meeting and other commissioning meetings.
  - a. Prepares meeting agendas, meeting minutes and distributes to the commissioning team.
- 11. Requests and reviews additional information required to perform commissioning tasks, including O&M materials and Contractor prefunctional/startup checkout procedures.
- 12. Reviews normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the Architect / Engineer's reviews.
- 13. Develops a startup, checkout, Contractor directed test; CA witnessed test and integrated system test plan with Contractor.
- 14. Attends selected planning and job-site meetings to obtain information on construction progress. Reviews construction meeting minutes for revisions/substitutions relating to the commissioning process. Assists in resolving any discrepancies.
- 15. Conducts periodic construction observations, as contracted, to verify that systems and equipment are installed consistently with contract documents.
- 16. Documents deficiencies in the issues log and distributes to the CxT. (Note: The CA is responsible for identifying deficiencies but is not responsible for ensuring that deficiencies are corrected. Also note that CA observations are not intended to take the place of design team observations.)
- 17. With necessary assistance and review from the Architect / Engineer and Contractor, writes the functional test procedures and integrated systems test procedures for equipment and systems.
- 18. Reviews the control sequences and interlocks and works with Contractor and Architect / Engineer until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
- 19. Reviews and approves completed Contractor directed functional performance test forms.
- 20. Directs functional performance tests (CA witnessed) <u>after</u> "Contractor directed" functional testing has been completed and Contractor directed

functional performance test forms have been filled out, submitted to and approved by CA.

- 21. Coordinates retesting as necessary until satisfactory performance is achieved.
- 22. Analyzes any performance trend logs and monitoring data to verify performance.
- 23. Reviews test and balance execution plan (if owned within the design team's project specification section for Testing and Balancing).
- 24. Reviews test and balance reports along with Architect / Engineer.
- 25. Directs and witnesses integrated systems testing conducted by Contractor.
- 26. Maintains a master issues log and a separate testing record. Provides the Owner, Architect / Engineer, and Contractor with written progress reports and test results with recommended actions.
- 27. Verifies the training of the Owner's operating personnel has been completed.
- 28. Reviews equipment warranties to ensure that the Owner's responsibilities are clearly defined.
- 29. Compiles and maintains commissioning documents.
- 30. Coordinates and supervises required seasonal or deferred testing and deficiency corrections.
- 31. Returns to the site at 10 months into the 12 month warranty period and reviews with facility staff the current building operation and the condition of outstanding issues related to the original and seasonal commissioning. Also interviews facility staff and identifies problems or concerns they have operating the building as originally intended. Makes suggestions for improvements and for recording these changes in the O&M manuals. Identifies areas that may come under warranty or under the original construction contract. Assists facility staff in developing reports, documents and requests for services to remedy outstanding problems.

## C. Owner:

- 1. Manages the contract of the Architect / Engineer (A/E) and Contractor.
- 2. Facilitates the coordination of the commissioning work by the CA, and, with the Contractor and CA, ensures that commissioning activities are being scheduled into the construction schedule.
- 3. Assigns operations and maintenance personnel and arranges for them to participate in the various meetings and observations/inspections as follows:
  - a. Design/construction phase coordination meetings.
  - b. Procedure meetings for testing systems.
  - c. Pre-functional/startup checkouts.
  - d. Functional testing.
  - e. Integrated systems testing.
  - f. Systems testing.

- 4. Assists with gathering of documents requested of CxT members.
- 5. Provides the basis of design documents, approved by Owner, to the CA and Contractor.
- 6. Reviews, comments and approves the commissioning plan.
- 7. Reviews, comments and approves the construction documents.
- 8. Performs review of Contractor submittals.
- 9. Coordinates site visits and meetings with the CA.
- 10. Attends commissioning meetings, pre-functional/startup procedures, and functional testing.
- 11. Reviews, comments and approves the CA's functional test reports.
- 12. Provides access to areas of the facility in a timely manner for commissioning team to perform its work.
- 13. Reviews commissioning progress reports and issues log.
- 14. Coordinates the resolution of non-compliance and design deficiencies identified in all phases of commissioning.
- 15. Develops final punchlist for the construction project.
- 16. Reviews and accepts the CA's final commissioning report and provides final approval for the completion of the commissioning work.
- 17. Ensures that any seasonal or deferred testing and any deficiency issues are addressed.
- 18. Participates in warranty review activities 10 months into 12 month warranty period with other members of the CxT.
- D. Architect / Engineer (A/E):
  - 1. Provides documentation of design intent/basis of design based on Owner's Project requirements.
  - 2. Prepares construction contract documents.
  - 3. Specifies and verifies adequate maintenance access for each piece of equipment in design, Shop Drawings, and actual installation.
  - 4. Provides system design parameters to Owner and obtains approval.
  - 5. Provides any design narrative documentation requested by the CA. This includes clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
  - 6. Notifies the CA of substantive changes to the contract documents.
  - 7. Reviews and comments on pre-functional/startup checklists, functional performance test procedures and integrated systems test procedures submitted by the CA.
  - 8. Reviews and approves submittals.
  - 9. Provides periodic site observations as contracted.
  - 10. Witnesses testing of selected equipment and systems.
  - 11. Reviews and comments on CA's commissioning progress reports and issues logs.
  - 12. Reviews and approves O&M data and training plan.
  - 13. Reviews and/or prepares as-built documents from Contractor record documents as contracted.

- 14. Prepares punchlists.
- 15. Prepares final basis of design document.
- 16. Reviews and approves test and balance plan and reports.
- 17. Provides designer's intent training for Owner's operating personnel, if included in Architect / Engineer contract.
- 18. Coordinates the resolution of system deficiencies identified during commissioning.
- 19. Coordinates resolution of design non-conformance and deficiencies identified during warranty period commissioning.
- 20. Recommends final acceptance of the systems to the Owner.
- 21. Reviews and comments on the final commissioning report.
- E. Contractor:
  - 1. The Contractor is responsible for his commissioning activities and coordinating all commissioning activities of his sub-contractors and equipment suppliers.
  - 2. Facilitates the coordination of commissioning work by the CA and ensures that the Contractor, his sub-contractors, and all other CxT member commissioning tasks/activities are incorporated into the construction schedule.
  - 3. Furnishes a copy of all construction documents, addenda, change orders, requests for information, and approved submittals and Shop Drawings related to commissioned equipment/systems to CA.
  - 4. Includes requirements for submittal data, O&M data, commissioning tasks and training in each purchase order or subcontract written.
  - 5. Performs review of submittals.
  - 6. Ensures that all sub-contractors execute their commissioning responsibilities according to the contract documents and schedule.
  - 7. Attends Contractor training conducted by CA concerning commissioning process, forms to be used, testing requirements, commissioning process deliverables and scheduling.
  - 8. Attends CxT meetings.
  - 9. Provides functional and seasonal testing plan in accordance with procedures supplied in this Section.
  - 10. Responds to (in writing) and addresses items documented in the issues log.
  - 11. Notifies the CA six weeks in advance of all equipment startup, Contractor directed testing, and tests required by contract documents.
  - 12. Contractor to certify that equipment/systems have been installed per manufacturer's instructions.
  - 13. Reviews and makes comment on the pre-functional/startup checklists and functional performance test procedures developed by CA.
  - 14. Submits test results for tests required by the contract documents, including (but not limited to) duct leakage tests, plumbing system disinfection certification, fire alarm tests, etc.
  - 15. Completes pre-functional/startup checkout forms to CA for review and approval.

- 16. Completes Contractor directed functional performance testing. This testing mandates the participation of Contractor and all sub-contractors involved with systems integration, such as, mechanical, electrical, and controls sub-contractors. Submits completed Contractor directed functional test forms to CA for review and approval.
- 17. Notifies the CA when systems and assemblies are ready for CA witnessed testing.
- 18. Remedies any deficiencies identified in the pre-functional/startup checklists and Contractor directed functional performance testing and notifies CA (in writing) that deficiencies have been addressed.
- 19. Coordinates and facilitates the resolution of non-compliance, deficiencies and discrepancies identified in all phases of commissioning.
- 20. Notifies the CA four weeks in advance when test and balancing activities are to start and when their activities have been completed.
- 21. Provides qualified personnel for performing all test procedures, including functional performance testing witnessed by CA.
- 22. Performs functional performance testing of assemblies and systems witnessed by the CA.
- 23. Performs integrated test procedures directed and witnessed by the CA. This testing mandates the participation of Contractor and all subcontractors involved with systems integration, such as mechanical, electrical and building automation system sub-contractors.
- 24. Coordinates training of Owner personnel. Develops training agenda, training materials, conducts training sessions. Schedules sub-contractors, equipment suppliers, etc. to participate in training the Owner's personnel. Coordinates with Owner schedule for training Owner operating personnel.
- 25. Provides training agenda, materials and schedules to CA for review and comment.
- 26. Prepares O&M manuals, according to the contract documents, including clarifying and updating the original sequences of operation to as-built conditions. Submits O&M manuals to CA for review prior to Owner operating personnel training. O&M manuals are to be used in training sessions.
- 27. Submits complete set of as-built records to CA for review.
- 28. Ensures that Contractor and sub-contractors execute seasonal and deferred functional performance testing, witnessed by the CA, according to the specifications.
- 29. Ensures that Contractor and sub-contractors correct deficiencies and make necessary adjustments to O&M manuals and as-built records for applicable issues identified in any seasonal or deferred testing.
- 30. Participates in warranty review activities coordinated by CA 10 months into 12 month warranty period.
- F. Equipment Suppliers:

- 1. Provides all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
- 2. Assists in equipment testing per agreements with Contractor.
- 3. Includes all special tools and instruments (only available from equipment supplier, specific to a piece of equipment) required for testing equipment according to these contract documents.
- 4. Analyzes specified products and verifies that the Architect / Engineer has specified the newest, most updated equipment reasonable for this Project's scope.
- 5. Provides information requested by CA regarding equipment sequence of operation and testing procedures.
- 6. Reviews and approves test procedures for equipment installed by factory representatives.
- 7. Provides personnel, services, documents, tools, etc. for those responsibilities listed under Contractor that are applicable to equipment suppliers.

## 1.7 <u>COORDINATION</u>

- A. The CA shall receive a copy of all construction documents, addenda, change orders, and appropriate approved submittals and Shop Drawings related to commissioned system/equipment directly from the Contractor.
- B. The CA shall disseminate written information and documents to all responsible parties relative to the nature and extent of the communication.
- C. The CA is primarily responsible to the Owner and, as such, shall regularly apprise the Contractor and the Owner of progress, pending problems and/or disputes, and shall provide regular status reports on progress with each system. Any potential change in the contractual and/or financial obligations of the Owner (credits, change orders, schedule changes, etc.) shall be identified and quantified as soon as possible.
- D. The CA shall coordinate the schedule of commissioning activities with the construction schedule. It is possible that some procedures shall be completed before the entire system is completed.

## 1.8 <u>SCHEDULE</u>

A. Contractor schedules and scheduling is the responsibility of the Contractor. The CA shall provide commissioning scheduling information to the Contractor for review and planning activities. CA developed commissioning activities to be integrated into the construction schedule by the Contractor.

- B. The schedule shall incorporate sufficient time for the following commissioning process steps:
  - 1. Equipment/systems shall be installed per manufacturer's instructions.
  - 2. Pre-functional/startup checklists shall be completed by the field personnel implementing the startup procedure, field personnel to sign the completed form, and submit signed checklist to CA for review and approval.
  - 3. Contractor Directed Functional Testing: The Contractor shall perform functional performance testing of systems/equipment once prefunctional/startup checklists have been approved by CA. Personnel actually carrying out Contractor directed functional performance testing are to fill out test forms during the "Contractor Directed" testing and the appropriate contracting team personnel shall sign the completed forms. Submit signed, completed forms to CA for review and approval.
  - 4. CA Witnessed Functional Testing: The Contractor shall perform functional performance testing to be witnessed by the CA after step 3 above has been completed. The CA shall complete and sign functional performance test forms for those tests completed in this step 4.
- C. The Contractor shall integrate all commissioning activities into the overall construction schedule. All parties shall address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.
- D. Problems observed shall be addressed immediately, responsible parties notified, and actions taken to correct deficiencies coordinated in a timely manner.

## PART 2 - PRODUCTS

#### 2.01 <u>TEST EQUIPMENT</u>

- A. All industry standard test equipment, special tools, ladder/lifts, two way radios and equipment required for performing the specified tests shall be provided by the Contractor and shall be approved by the CA. The Owner shall furnish necessary utilities for the commissioning process.
- B. Any portable or hand-held setup/calibration devices required to initialize the control system shall be provided by the control system sub-contractor and equipment supplier for testing.
- C. The instrumentation used in the commissioning process shall meet the following standards:
  - 1. Be sufficient quality and accuracy to test and/or measure system performance within the tolerances required.

- 2. Be calibrated at the manufacturer's recommended intervals with calibration tags permanently affixed to the instrument.
- 3. Be maintained in good repair and operating condition throughout the duration of use on this project.
- 4. Be immediately recalibrated or repaired if dropped and/or damaged in any way during use on this project.

## 2.02 <u>TEST EQUIPMENT – PROPRIETARY</u>

A. Proprietary test equipment and software required by any equipment manufacturer for programming and/or startup, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the commissioning process as needed. Proprietary test equipment (and software) shall become the property of the Owner upon completion of the commissioning process.

### PART 3 - EXECUTION

#### 3.01 COMMISSIONING PLAN

- A. The CA shall develop a commissioning plan detailing the following information, at minimum, for the project:
  - 1. Contact directory of key commissioning team personnel
  - 2. Communications protocol for project
  - 3. Listing of equipment/systems to be commissioned
  - 4. Sampling strategy to be used for equipment and systems for applicable commissioning process.
  - 5. Responsibilities for each party involved with the commissioning process
  - 6. Commissioning milestone and schedule
  - 7. Listing of key deliverables associated with the commissioning process
  - 8. Note that the commissioning plan shall be incorporated into the commissioning report so that one document shall be used throughout the commissioning process and when the process is completed this documents shall be called the final commissioning report.
  - 9. Listing of exhibits to the commissioning plan/report.

#### 3.02 <u>MEETINGS</u>

- A. The CA shall schedule, plan and conduct an initial commissioning meeting with the Contractor. The Contractor and its responsible parties are required to attend.
- B. The CA has been scoped to coordinate (6) six commissioning based meetings during the construction and acceptance phase. Additional meetings will result in
requests for additional fees. The CA will alert the OPM as we reach (5) five meetings and will determine if additional meetings are required.

C. Other meetings shall be planned and conducted by the CA as construction progresses. The meetings shall cover coordination, deficiency resolution, and planning issues. These meetings shall be held at least monthly, until the final three months of construction, when they may be held as frequently as one per week.

# 3.03 CONSTRUCTION OBSERVATION

A. CA construction observation is an additional and separate activity from that provided by the design team. Construction observation is required as part of the commissioning and coordination process to be provided by the CA.

# 3.04 TEST AND BALANCE (TAB)

- A. Air and water test and balance shall be accomplished by a test and balance firm as specified by the Architect / Engineer.
- B. The CA will review the TAB report to verify all water and air systems have been set within the specified tolerances as called out in the Testing, Adjusting and balancing section of the project specification.
- C. All individual diffusers, water coils, terminal units, fans, etc. that fall outside of the specified tolerance will be noted within a TAB review form. This will be sent to the design team (architect and engineer) and the design team will ultimately be responsible for accepting or rejecting the TAB report.

# 3.05 CONTRACTOR DIRECTED FUNCTIONAL PERFORMANCE TESTING

- A. Functional performance testing shall demonstrate that each system is operating according to the documented Owner's project requirements and basis of design and contract documents. Functional performance testing facilitates bringing the systems from a state of individual substantial completion to full dynamic operation.
- B. Functional performance test forms (FPTFs) shall be developed by the CA. The basis of the FPTFs shall be the control sequence of operation for the equipment/system.
- C. Control sequences of operation specified by the Architect / Engineer and provided by the Contractor shall include all operating modes, interlocks, control responses, and specific responses to abnormal or emergency conditions.

- D. Before test procedures are finalized, the Contractor shall provide to the Architect / Engineer and the CA all requested documentation and a current list of changes affecting equipment or systems, including an updated points list, program code, control sequences, and testing parameters. Using the testing parameters and requirements in the technical specifications, the CA shall update/develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Contractor and his sub-contractors and equipments suppliers, as appropriate, shall provide assistance to the CA in developing the final procedures. Prior to finalization, the Owner and Architect / Engineer shall review and concur with the test procedure.
- E. Sample functional performance test procedure forms are made part of the project specifications and are found in an appendix of this specification section.
- F. Execution of Contractor Directed Functional Performance Testing
  - 1. Contractor directed FPT cannot proceed until pre-functional/startup checklist process is completed and checklists have been approved by the CA.
  - 2. Air and water system balance shall be completed before performance testing of air or water-related equipment or systems.
  - 3. Contractor shall coordinate with Owner, Architect / Engineer and CA the start of Contractor directed functional performance testing on the commissioning equipment/systems. Contractor directed testing shall occur no sooner than 48 hours from approval from CA of pre-functional/startup checklists.
  - 4. The Owner and Architect / Engineer, as necessary, shall observe the execution of Contractor directed functional performance testing.
  - 5. The CA will not be present for Contractor directed functional performance testing.
  - 6. The contracting team carrying out Contractor directed testing shall include trades necessary to functionally test the equipment/system and its interaction with other equipment/systems. This generally includes mechanical, electrical, temperature control personnel and may also include equipment suppliers and test balance personnel.
  - 7. The Contractor shall coordinate so that all personnel required to carry out Contractor directed functional performance testing are present and are working together to complete the task.
  - 8. Contractor directed functional performance testing shall include the following, at minimum:
    - a. Set the system equipment (i.e. chiller, pumps, fan, RTUs, etc.) into the operating mode to be tested (i.e. normal shut-down, normal auto position, normal manual position, unoccupied cycle, emergency power and alarm conditions, etc.)
    - b. Repeat test for each operating cycle that applies to the system being tested.

- c. Perform operating checks of all safety cutouts, alarms, and interlocks with smoke control and life safety systems during all modes of operation of the mechanical/electrical systems.
- d. Perform functional testing of the Fire Suppression Systems to ensure systems meet Sequence of Operations Matrix as provided by the A&E.
- 9. The Contractor shall inspect and verify the position of each device and interlock identified in the test procedures. Each item shall be signed off as acceptable (yes) or failed (no).
- 10. Contractor directed functional performance testing shall be completed on 100% of the equipment/systems included in the commissioning process. Contractor directed functional testing is the contracting team's trouble-shooting phase of the testing process.
- 11. During Contractor directed functional performance testing, the contracting team completing the testing procedures is to fix problems as they appear and is required to fill out and sign the Contractor directed test procedure forms. Note that the test procedure forms are identical to that used during the CA witnessed testing.
- 12. Once Contractor directed functional testing is complete, problems fixed and forms filled out and signed by the appropriate personnel, submit the forms to CA for review and approval.
- 13. Only individuals of the Contractor (technicians, engineers, tradesmen, equipment suppliers, etc.) who have direct knowledge and witnessed that a line item task on the functional test procedure was actually performed shall check off that line item. It is not acceptable for witnessing supervisors to fill out these forms.
- 14. Upon CA approval of the Contractor directed functional performance test forms, the equipment/system is ready for CA witnessed testing.
- G. Contractor directed functional performance test forms filled out by the appropriate personnel, signed and approved by the CA shall be included in the final commissioning report.

# 3.06 CA WITNESSED FUNCTIONAL PERFORMANCE TESTING

- A. The identical test procedures and forms that the contracting team used for Contractor directed functional performance testing shall be used for CA witnessed testing.
- B. The same contracting team that executed Contractor directed functional testing shall again be onsite and execute functional performance testing to be witnessed by the CA.
- C. Execution of CA Witnessed Functional Performance Testing:

- 1. CA witnessed functional performance testing shall not proceed until Contractor directed functional testing has been completed, forms completed and signed by the appropriate personnel and CA has reviewed and approved the test forms.
- 2. CA shall coordinate with Owner and Architect / Engineer that Contractor directed testing has been approved by CA.
- 3. Contractor shall notify contracting team the CA witness testing can proceed and that scheduling of CA witnessed testing should occur.
- 4. CA witnessed testing shall occur no sooner than 48 hours from approval of CA approval of Contractor directed functional performance testing.
- 5. In some cases, multiple identical piece of equipment shall be witness tested by CA using a sampling strategy. Significant application differences and significant sequence of operation differences in otherwise identical equipment invalidates the common identity. A small size or capacity difference alone does not constitute a difference.
- 6. CA witnessed testing shall occur when enough equipment/systems have met CA approval of Contractor directed functional performance testing and can be grouped together to be efficient for CA to be onsite.
- 7. During CA witnessed testing the contracting team executing/performing the mechanical/integrated automations systems test shall execute the functional performance test which includes, at minimum:
  - a. Set the system equipment (i.e. chiller, boiler, pumps, fan, etc.) into the operating mode to be tested (i.e. normal shut-down, normal auto position, normal manual position, unoccupied cycle, emergency power and alarm conditions etc.)
  - b. Repeat test for each operating cycle that applies to the system being tested.
  - c. Perform operating checks of all safety cutouts, alarms, and interlocks with smoke control and life safety systems during all modes of operation of the mechanical/electrical systems.
- 8. During CA witnessed testing, the contractor team executing/performing the Fire Suppression Systems test shall execute the functional performance test which includes, at minimum:
  - a. Set the zone into the test mode (i.e. each Clean Agent system is fully disarmed, preaction sprinkler valve is closed, etc.)
  - b. Perform a functional test of devices (Manual Release Stations, Abort Stations, Smoke Detectors, Keyed Maintenance Switch, etc.) and compare each result against the Sequence of Operations Matrix as supplied by the Architect / Engineer.
  - c. Repeat test for each zone that applies.

- d. Perform operating checks of all signals sent to monitoring facilities and interlocks with smoke control and HVAC systems during all modes of operation of the Fire Suppression Systems.
- 9. The CA shall inspect and verify the position of each device and interlock identified in the test procedure. Each item shall be sign off as acceptable (yes) or failed (no).
- 10. During CA witnessed functional testing, the CA shall document results of the test on the functional performance test forms.
- 11. If during the test an operating deficiency is observed, appropriate comments shall be added to the test procedure form and the issue log.
- 12. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CA. In such cases the deficiency and resolution shall be documented on the procedure form or an attached sheet.
- D. Non-Conformance:
  - 1. As tests progress and a deficiency is identified, the CA shall discuss the issue with the commissioning team and the contractor.
  - 2. When there is no dispute on the deficiency and the Contractor accepts responsibility to correct it:
    - a. The CA shall document the deficiency and the Contractor's response and intentions. The CA shall submit the noncompliance reports to the Owner. The Contractor corrects the deficiency, signs the statement of correction at the bottom of the non-compliance form certifying that the equipment is ready to be retested and sends it back to the CA.
    - b. The Contractor shall reschedule the test; and the test is repeated.
  - 3. If there is a dispute about a deficiency, regarding whether or not it is a deficiency:
    - a. The dispute shall be documented on the non-compliance form with the Contractor's response.
    - b. Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with Architect / Engineer. Final acceptance authority is with the Owner.
    - c. The CA documents the resolution process.
    - d. Once the interpretation and resolution have been decided, the Contractor corrects the deficiency, signs the statement of correction on the non-compliance form and provides it to the CA. The Contractor shall reschedule the test and the test is repeated until satisfactory performance is achieved.
  - 4. Cost of retesting a performance test shall be paid by the Contractor.

- 5. The Contractor shall submit in writing to the Owner and CA at least as often as commissioning meetings are being scheduled, the status of each outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreement and proposals for their resolutions.
  - a. The CA retains the original non-conformance forms until the end of the project.
  - b. Retesting shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.
- E. Failure Due to Manufacturing Defect: If 10% (or three, whichever is greater) of identical pieces of equipment fail to perform to the contract documents (mechanically or substantively) due to a manufacturing defect, not allowing it to meet its submitted performance specification, all identical units may be considered unacceptable by the Architect / Engineer or CA. In such case, the Contractor shall provide the Owner with the following:
  - 1. Within one week of notification from the Owner, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the Owner within two weeks of the original notice.
  - 2. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc., and all proposed solutions. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
  - 3. The Architect / Engineer shall determine whether a replacement of all identical units or a repair is acceptable.
  - 4. Two examples, where applicable, of the proposed solution shall be installed by the Contractor and the Architect / Engineer shall be allowed to test the installations for up to one week, upon which the Architect / Engineer shall decide whether to accept the solution.
  - 5. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

# 3.07 CA WITNESSED INTEGRATED SYSTEMS TESTING

- A. Integrated systems testing consists of the following tests that shall be conducted by the Contractor as directed (and witnessed / supervised / coordinated) by the CA:
  - 1. An Electrical System Interruption Test shall be performed.
    - a. Electrical system interruption testing shall test and verify that electrical, mechanical and control systems return to normal

operation after an electrical power system interruption. Testing shall also involve the interruption of power to control systems to verify correct default "failsafe" operation of HVAC equipment and fire suppression systems.

- B. CA witnessed integrated systems testing shall not proceed until CA witnessed functional testing has been completed, forms completed and signed by the appropriate personnel.
- C. The CA shall inspect and verify the position of each device and interlock identified in the test procedure. Each item shall be signed off as acceptable (yes) or failed (no).
- D. During CA witnessed integrated systems testing, the CA shall document results of the test on integrated systems test forms.
- E. If during a test an operating deficiency is observed, appropriate comments shall be added to the test procedure form and the issues log.
- F. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CA. In such cases the deficiency and resolution shall be documented on the procedure form or an attached sheet.
- G. Non-Conformance:
  - 1. As tests progress and a deficiency is identified, the CA shall discuss the issue with the commissioning team, and the Contractor.
  - 2. When there is no dispute on the deficiency and the Contractor accepts responsibility to correct it:
    - a. The CA shall document the deficiency and the Contractor's response and intentions. The CA shall submit the non-compliance reports to the Owner. The Contractor corrects the deficiency, signs the statement of correction at the bottom of the non-compliance form certifying that the equipment is ready to be retested and sends it back to the CA.
    - b. The Contractor shall reschedule the test; and the test shall be repeated.
  - 3. If there is a dispute about a deficiency, regarding whether or not it is a deficiency:
    - a. The dispute shall be documented on the non-compliance form with the Contractor's response.
    - b. Resolutions are made at the lowest management level possible. Other parties are brought into the discussion as needed. Final interpretive authority is with the Owner.
    - c. The CA documents the resolution process.

- d. Once the interpretation and resolution have been decided, the Contractor corrects the deficiency, signs the statement of correction on the non-compliance form and provided it to the CA. The Contractor shall reschedule the test and the test repeated until satisfactory performance is achieved.
- 4. Cost of retesting a performance test shall be paid by the Contractor.
- 5. The Contractor shall submit in writing to the Owner and CA at least as often as commissioning meetings are being scheduled, the status of each outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreement and proposals for their resolutions.
  - a. The CA retains the original non-conformance forms until the end of the project.
  - b. Retesting shall not be considered a justified reason for a claim of delay or for a time extension by the Contractor.
- H. Failure Due to Manufacturing Defects: If 10% (or three, whichever is greater) of identical pieces of equipment fail to perform to the contract documents (mechanically or substantively) due to manufacturing defect, not allowing it to meet its submitted performance specification, all identical units may be considered unacceptable by the Architect / Engineer or CA. In such case, the Contractor shall provide the Owner with the following:
  - 1. Within one week of notification from the Owner, the Contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the Owner within two weeks of the original notice.
  - 2. Within two weeks of the original notification, the Contractor or manufacturer shall provide a signed and dated, written explanation of the problem, cause of failures, etc., and all the proposed solutions. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
  - 3. The Architect / Engineer shall determine whether a replacement of all identical units or a repair is acceptable.
  - 4. Two examples, where applicable, of the proposed solution shall be installed by the Contractor and the Architect / Engineer shall be allowed to test the installations for up to one week, upon which the Architect / Engineer shall decide whether to accept the solution.
  - 5. Upon acceptance, the Contractor and/or manufacturer shall replace or repair all identical items, at their expense. The replacement/repair work shall proceed with reasonable speed beginning within one week from when the parts can be obtained.

#### 3.08 DEFERRED TESTING

- A. Unforeseen Deferred Tests: If any check or test cannot be completed due to the project completion level, required occupancy condition or other reason execution of checklists and performance testing may be delayed upon approval of the Owner and CA. These tests shall be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.
- B. Seasonal Testing: During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract. The CA shall coordinate this activity through the Owner. Tests shall be executed by the contracting team and shall follow the steps of pre-functional/startup checklists, Contractor directed functional testing, and CA witnessed testing. Any final adjustments to the O&M manuals and as-built drawings due to testing shall be made by the Contractor.

## 3.09 OPERATING AND MAINTENANCE DATA

- A. Operations and maintenance data shall cover all systems, equipment, devices, materials and finishes described within these specifications and provided by Contractor under this Project.
- B. The CA shall review the draft form of the O&M manuals provided by the Division 22, 23 and 26 Contractors. The review process shall verify that O&M instructions meet specifications and are included for all commissioned equipment/systems provided by the Contractor, and that the information, instructions, and wiring diagrams are specific (edited where necessary) to the actual equipment provided for this Project.
- C. The O&M manual review and coordination efforts shall be completed prior to Owner training sessions, as these documents are to be utilized in the training sessions.
- D. The CA's review does not replace the Architect / Engineer's review of O&M manuals according to the Architect / Engineer's contract.
- E. O&M Data Format:
  - 1. O&M data shall be provided in neatly indexed, heavy duty, vinyl, 3-ring binders of manageable size. Binders shall be indexed by specification Section, with additional dividers provided under each specification section if multiple types of equipment and/or systems are defined within a single specification Section. Dividers shall be heavy paper with plastic covered tabs.
  - 2. Fold all oversized sheets to neatly fit within binder. For sheets greater than 11" x 17" provide inserts for storage in binder.

- 3. Provide a table of contents in each binder. If more than one binder is used, clearly identify in the table of contents which information is contained in each binder.
- 4. Clearly label each manual with the title "OPERATION AND MAINTENANCE MANUAL VOLUME \_ OF \_" and the Project name.
- F. O&M Data Content:
  - 1. For the BMS/DDC system include the following in the O&M manuals:
    - a. General/Hardware:
      - 1) Description of the system including definitions, size, architecture and functionality of each component of the system.
      - 2) As-built drawings for the system; control diagrams, wiring diagrams, system schematics, etc.
      - 3) Hardware component manufacturer's specifications, installation instructions, operating and servicing instructions.
      - 4) Design data for sensors and control components external to digital controllers. Include manufacturer's specifications, installation, maintenance and calibration procedures.
      - 5) Output hardware data. Include manufacturer's installation, maintenance and operations procedures.
      - 6) Step-by-step instructions to set controllers from installation to a point they can accept control programs from a computer. Include shop drawings showing cable connections, equipment settings for the operation of each controller.
      - 7) Interconnection wiring diagrams with system components and device identification.
      - 8) Step-by-step procedure for diagnosing and installing controller.
      - 9) Drawings: Project as-built drawings shall be included in O&M manuals. Reduce to 11x17 format, provide with reinforced punch binder tab. Bind with text; fold drawings to size of text pages. (Larger drawing will be allowed if 11x17 is unreadable.
      - 10) Include all submittals, product data and shop drawings updated to as-built conditions.
      - 11) Spare parts lists for each type of control device.
      - 12) Inspection period, cleaning methods, recommended cleaning materials and calibration tolerances.
    - b. Software:

- 1) Include step-by-step procedures for uploading and downloading of software programs from and to each controller and the operator station computer.
- 2) Include documentation for software setup of every physical and virtual point. Include point name, location, type, and any other characteristic to define point.
- 3) Include step-by-step procedure for making set point and equipment scheduling changes.
- 4) Include documentation describing running and analyzing controller diagnostics.
- 5) List alarms and messages programmed into each controller.
- 6) Provide PID Loop turning procedures for the control system.
- 7) Include step-by-step procedure for loading operator station software and accessing the control system.
- 8) Documentation for creating, editing and using graphics.
- 9) Sequences of operation in English narrative and graphic chart format. Sequences to include normal, emergency and failsafe modes of operation.
- 10) Include all software documentation updated to as-built conditions.
- c. Provide two (2) copies of all job software on electronic format which can be directly loaded by the Owner.

# 3.10 TRAINING OF OWNER'S OPERATING PERSONNEL

- A. The Contractor shall provide training coordination, scheduling of subcontractors, and ensure that training is completed. All training shall be coordinated through the Owner and with the CA.
- B. Also refer to specification section for Demonstration and Training.
- C. The Contractor shall ensure that each sub-contractor and equipment supplier (mechanical, plumbing, fire, electrical, specialty, etc) shall have the following responsibilities:
  - 1. Provide to the CA a training plan sixty days before the planned training covering the following elements:
    - a. Equipment
    - b. Intended audience
    - c. Location of training
    - d. Objectives
    - e. Subjects covered (description, duration of discussion, special methods, etc)
    - f. Duration of training on each subject

- g. Instructor for each subject
- h. Methods (classroom lecture, manufacturer's quality video, site walk-through, actual operational demonstrations, written handouts, etc).
- 2. Provide designated Owner personnel with comprehensive orientation and training in the understanding of the systems and the operation and maintenance of each piece of equipment that makes up the system.
- 3. Training shall normally start with classroom sessions followed by handson demonstration/training on each piece of equipment.
- 4. During any demonstration, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system shall be repaired or adjusted as necessary and the demonstration repeated at another scheduled time, if necessary.
- 5. The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the training.
- 6. The controls sub-contractor shall attend sessions other than the controls training, as specified, to discuss the interaction of the controls system as it relates to the equipment being discussed.
- 7. The training sessions shall follow the outline in the table of contents of the O&M manual and illustrate whenever possible the use of the O&M manuals for reference.
- 8. Training shall include:
  - a. Use of the printed installation, operation and maintenance instruction material included in the O&M manual.
  - b. A review of the written O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include startup, operation in all modes possible, shutdown, seasonal changeover and any emergency procedures.
  - c. Discussion of relevant health and safety issues and concerns.
  - d. Discussion of warranties and guarantees.
  - e. Common troubleshooting problems and solutions.
  - f. Explanatory information included in the O&M manuals.
  - g. Discussion of any peculiarities of equipment installation or operation.
  - h. Classroom sessions shall include the use of overhead projections, slides, video/audio-taped material as might be appropriate.
  - i. Hands-on training shall include startup, operation in all modes possible, including manual, shut-down, alarms, power failure and any emergency procedures, and preventative maintenance for all pieces of equipment.

- 9. The Contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls not controlled by the central control system.
- D. At the discretion of the CA, training may occur before performance testing is complete if required by the facility operators to assist the CA in the performance testing.
- E. Videotaping of the training sessions shall be provided by the Contractor and added to the O&M manuals. In addition, factory training videos identifying key troubleshooting, repair, service and/or replacement techniques shall be provided and reviewed with the Owner.

## 3.11 <u>RECORD DOCUMENTS</u>

- A. Also refer to specification Section 01 78 39 for Project Record Documents.
- B. The Contractor shall maintain at the site one record copy of all drawings, specifications, addenda, approved Shop Drawings, change orders, and other modifications, in good order and marked to record all changes applicable to the work made during construction. All changes from design made during construction shall be recorded by the Contractor. Contractor shall be responsible for sufficient detail and accuracy of all changes made.
- C. Contractor record documents shall be periodically reviewed and verified during construction by the CA. Discrepancies in the record documents shall be documented in site visit reports and the Contractor shall be responsible to verify and correct the record documents against the installed system for specified and all similar problems noted.
- D. Contractor shall supply draft copy of complete record documents to the Architect / Engineer and Owner prior to initial training session.

# 3.12 WARRANTIES

- A. Also refer to specification sections referring to Closeout Procedures and Warranties.
- B. Contractor shall supply a complete copy of all warranties applicable to the Project, the terms of maintenance for each warranty, and the inception and expiration dates for each warranty. This information shall become part of the O&M data.
- C. Within ten (10) months of Substantial Completion, the CA shall conduct a review of the operations and condition of the facility with Owner operating personnel with respect to warranty related issues. CA shall supply Contractor,

Architect / Engineer and Owner with a detailed report listing the issues identified. This report shall include at a minimum the following:

- 1. Description of issue identified, including photographs as applicable.
- 2. Recommended course of action.
- 3. Supplementary information relative to previous maintenance or repairs attempted for resolution of issue.
- D. Contractor shall plan to attend a warranty review meeting with CA at site with Owner.
- E. Architect / Engineer shall issue a formal course of action to Contractor for resolution of issues identified.
- F. Contractor shall employ services and materials necessary for compliance to action statement from Architect / Engineer. All repairs and actions taken by Contractor shall be coordinated with Owner, with a formal log of work completed provided to Owner, Architect / Engineer and CA at completion of all warranty work.

# 3.13 EXCLUSIONS

- A. Responsibility for Construction Means and Methods: The Commissioning Agent is not responsible for construction means, methods, job safety, or any construction management functions on the job site.
- B. Hands-On Work by the Commissioning Agent: The Contractor shall provide all services requiring tools or the use of tools to start-up, test, adjust, or otherwise bring equipment and systems into a fully operational state. The CA shall coordinate and observe these procedures (and may make minor adjustments), but shall not perform construction or technician services other than verification of testing, adjusting, balancing, and control functions.

END OF SECTION 01 91 13

## 02 41 13 – SELECTIVE SITE DEMOLITION

#### <u> PART 1 - GENERAL</u>

#### 1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Protection of Property.
  - 2. Preservation of Survey Points.
  - 3. Demolition and Removal of Existing Site Improvements.
  - 4. Clearing and Grubbing.
  - 5. Removal of Materials From The Site.
  - 6. Ownership of Removed Materials.
- B. Provide all facilities, labor, materials, equipment, transportation, supervision, and related work necessary to complete the work in this Specification, and as shown on the Drawings.
- C. All work shall be performed in accordance with applicable codes, permits and regulations, and the requirements of all local, state, and federal agencies having jurisdiction over the work.

#### 1.3 <u>RELATED SECTIONS</u>

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specifications Sections that directly relate to Work of this Section include, but are not limited to:
  - 1. Division 01, all Sections relating to sitework.
  - 2. Division 02, all Sections relating to sitework.
  - 3. Division 31, all Sections relating to sitework.
  - 4. Division 31, all Sections relating to sitework.
  - 5. Division 32, all Sections relating to sitework.
  - 7. Division 33, all Sections relating to sitework.

## CARVER POLICE CARVER, MA

02 41 13-2

#### 1.4 <u>REFERENCES AND DEFINITIONS</u>

A. Refer to Division 01, Section 01 42 16 Standard Sitework References & Definitions for definition of specific referenced standards as may be abbreviated in this section.

## 1.5 QUALITY ASSURANCE

A. Refer to Division 01, Section 01 43 00 Quality Assurance quality control, testing, contractor qualifications and similar requirements for sitework defined elsewhere in this Specification.

## 1.6 <u>PROTECTION OF PROPERTY</u>

- A. The work under this Contract shall be executed in such a manner that no damage or injury will occur to the public, to all properties and structures off or on the site which may be in any way affected by the operations under the Contract, to streets, paving, gas, water, electrical or any other pipes, mains, conduits, overhead utility wires, and to all other property.
- B. Should any damage or injury be caused by the Contractor, his subcontractors or any employees, or by the work under this Contract, the Contractor shall, at his own expense, make good such damage and assume all responsibility for such without cost to the Owner or contract.
- C. The Contractor shall develop a Site Usage Plan showing work / staging areas and perimeter construction fencing depicting his use of the site, as generally shown on the plans.
- D. Contractor's plan shall include public access to certain portions of the building as required by the Owner. Emergency access shall be maintained at all times to the building and the work site. Revise and/or reposition fencing as may be directed by the Fire Marshall.
- E. See additional specification section(s) for additional requirements for protections.

## 1.7 PRESERVATION OF SURVEY POINTS

A. The Contractor shall carefully protect from disturbance or damage, all land monuments or markers until an authorized agent has witnessed or otherwise referenced their locations, and shall not remove or destroy them without proper authorization from the Owner.

## 1.8 <u>DEMOLITION AND REMOVAL OF EXISTING SITE IMPROVEMENTS</u>

A. Prior to any demolition, removal or earthwork activities, have all utilities marked on the ground as specified elsewhere.

- B. Demolish and remove from the site all existing pavements, curbs, plants, utilities and other site improvements as shown on drawings and as may interfere with the work of this contract.
  - 1. Utility demolition is specified elsewhere.
- C. If shown or noted on the drawings that removal of pavements includes the stone base, remove base aggregates and dispose of off-site in a legal manner.
  - 1. Pavement base aggregate may be used as general site fill at the discretion of the Architect.
- D. Depressions in the soil resulting from removal of existing site improvements shall be filled and compacted as specified in Section 31 20 00 Site Earthwork.

## 1.9 CLEARING AND GRUBBING

- A. Before any removals of plant materials, conduct a meeting at the site with the Architect, General Contractor and his applicable subcontractor(s) to review extent of clearing, grubbing, trimming and pruning requirements, including if necessary, marking of specific plants.
- B. Contractor shall remove any trees, shrubs, brush or other plant materials that are within the Contract Limit Line and shown to be removed or which may be in the line of the work of this contract.
  - 1. Removal shall include grubbing of the roots for all plant materials.
  - 2. All cleared and trimmed materials shall be removed from the site. Burning on-site is not allowed.
  - 3. Chipping of tree branches and trunks, but not brush or shrubs, may be allowed at the direction of the Architect for use as mulch in select locations.
- C. Grubbing shall consist of the removal of plant roots larger than 2 inches in diameter and all stumps to the following depths below adjacent ground levels:
  - 1. In open lawn or plant bed areas, to a minimum depth of 12 inches below the proposed finished grade.
  - 2. In areas to receive pavement or permanent surfaces, to a minimum depth of 24 inches below the proposed finished grade.

## 1.10 REMOVAL OF MATERIALS FROM THE SITE

A. Materials shown to be removed and not scheduled for re-use shall be disposed of off-site in a legal manner. This includes any excess or unsuitable soil and rock materials.

- B. The Contractor shall not bury any construction debris, demolished pavement, organic materials or other material on site.
- C. Remove and dispose of any devices used for tree protection and materials used for erosion and sedimentation controls in a legal manner, off-site only after receiving authorization for their removal from the Architect at the end of the project.

PART 2 - PRODUCTS (Not Applicable to this Section)

PART 3 - EXECUTION (Not Applicable to this Section)

END OF SECTION 02 41 13

CARVER POLICE CARVER, MA

#### SECTION 03 10 04 - CONCRETE FORMWORK

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

- A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.
- B. The General Provisions of the Contract, including the General and Supplementary Conditions, apply to the work specified in this Section.

#### 1.2 DESCRIPTION OF WORK

- A. Furnish all labor, supervision, materials, tools and equipment necessary for, or incidental to the completion of the formwork for cast-in-place concrete as shown on the Contract Drawings and/or as specified.
- B. Built-In Inserts
  - 1. Install built-in anchors, anchor bolts, inserts, sleeves, angles, bolts, etc, as required under other Divisions shall be furnished by such trades.

#### 1.3 <u>RELATED WORK</u>

- A. Section 03 20 04 Concrete Reinforcement
- B. Section 03 30 04 Cast-in-Place Concrete

#### 1.4 **QUALITY ASSURANCE**

- A. Design Criteria
  - 1. Design of formwork shall conform to ACI 318 Chapter 6 and ACI 347, Chapter 2. The design and engineering of the formwork, as well as the construction, shall be the responsibility of the Contractor. Formwork shall be designed to support gravity and wind loads as specified by the State Building Code. Allowable stresses shall meet applicable requirements of the State Building Code.
  - 2. Formwork shall be mortar tight, sufficiently rigid and strong to prevent sagging or springing between supports and to maintain true position and shape during and after placing of concrete, without waves, bulges, or other defects in finished concrete surfaces.
  - 3. Erection and removal of formwork shall conform to the requirements of ACI 301, Section 2, except as modified herein.

- B. Allowable Tolerances
  - 1. Erect and maintain concrete forms so as to insure completed work within the tolerance limits of ACI-117, unless otherwise noted in the Contract Documents.

## 1.5 <u>SUBMITTALS</u>

- A. Contractor shall submit shop drawing to the Engineer for review of temporary shoring locations and locations of any construction, control or expansion joints to be used in all walls and slabs, as outlined in Section 03 20 04 Concrete Reinforcement.
- B. The Contractor shall submit fully detailed shop drawings for all permanent metal forms to the Engineer for review. Shop drawings shall include form thicknesses, physical dimensions, accessories, coatings and method of attachment to supporting structure.

## PART 2 - PRODUCTS

## 2.1 MATERIALS

- A. Conform with ACI 347, Chapter 3.
- B. Unexposed surfaces may be formed with dressed matched lumber, free from loose knots or major defects.
- C. Exposed concrete surfaces shall be formed with three-quarter (3/4") inch thick sound plywood without patches, A.P.A. Plyform Ext. B-B, using a minimum of pieces and placed symmetrically.
- D. Chamfer strips shall be new half-inch (1/2") 45 degree wood strips, nailed six (6") inches on center, and installed in inside corners of forms.
- E. Form releasing agent shall be a clear, non-staining material the approved equal of Nox-Crete.

## PART 3 - EXECUTION

#### 3.1 **INSPECTION**

A. The Contractor shall notify the Engineer twenty-four (24) hours prior to placing foundation forms for examination of soil bearing material.

## 3.2 PREPARATION OF WOOD FORM SURFACES

- A. All forms shall be coated with a non-staining form release agent compound before the reinforcement is placed.
- B. Forms shall be thoroughly cleaned and recoated with form release agent before re-use.

## CARVER POLICE CARVER, MA

#### 3.3 INSTALLATION OF TEMPORARY FORMS

- A. Construct forms to shape, grade and dimensions shown, sufficiently tight to prevent leakage. Joints shall be placed on true vertical and horizontal axis.
- B. Side forms shall be used for footings and grade beams.
- C. Erect formwork and adequately support, brace and maintain so as to safely support construction loads and to remain in correct position during and after placing concrete without displacement.
- D. Forms for external corners of exposed members shall be accurately fitted and securely fastened. Install beveled chamfer strips nailed at six (6") inches on center, in corners of all exposed members to provide a three-quarter (3/4") inch chamfer, measured at the diagonal face.
- E. Forms shall be recessed to receive anchor bolts and bearing plates.
- F. Formwork shall be pitched as required to meet finished slab elevations as shown on the Contract Drawings, to maintain the depth of any slab or beam. Camber formwork as shown on Contract Drawings to meet tolerances.
- G. Attach to formwork as required items such as preformed reglets, and any other anchors, inserts, bolts, or sleeves. Coordinate with requirements of all other Divisions' work for proper lines and spacing.
- H. Provide cleanout panels at bottom of walls and columns for cleaning and inspection.
- I. Keys shown shall be two (2) inches deep by one-third (1/3) the total thickness, and beveled unless otherwise noted.

#### 3.4 WALL CONSTRUCTION JOINTS

- A. Unless otherwise shown on the Drawings, foundation walls shall have vertical construction joints located no more than sixty-five (65') feet apart. No vertical construction joint shall be within four feet zero inches (4'-0") of any column pier, corner or footing joint.
- B. See Section 03 30 04 for Slab Construction Joint Requirements.

## 3.5 <u>TIES</u>

- A. Where vertical surfaces are exposed in either exterior or interior areas, use wood cone snap ties with one and one-half  $(1 \ 1/2")$  inch break back.
- B. Locate form ties for exposed concrete in horizontal rows and vertical tiers. Drill forms to suit ties used. Do not splinter forms by driving ties through improperly prepared holes.

# CARVER POLICE CARVER, MA

#### 3.6 SHORING OF METAL FORMS

A. Shore metal deck forms at all locations as recommended by metal form supplier and in accordance to the Steel Deck Institute recommendation. Shores shall be supported on the same structural members which support the metal deck and not from the floor below, and shall be designed so that deflection of shore at any point is not more than 1/360th of the deck span being shored. Note: Metal deck forms will generally not require shoring; however, some areas with long spans and/or thicker concrete slabs may require shoring.

## 3.7 REMOVAL OF FORMWORK

- A. The Contractor shall be solely responsible for construction during and after form removal.
- B. Formwork for footings may be removed twenty-four (24) hours after placing of concrete.
- C. Formwork not supporting the weight of concrete, such as sides of beams, walls, columns and similar parts of the work, may not be removed in less than seventy-two (72) hours after placing the concrete, and provided that curing and protection operations are maintained.
- D. Formwork supporting the weight of concrete, such as beam soffits, joists, slabs and other structural elements of work, may not be removed in less than fourteen (14) days or until the concrete has attained a minimum strength to carry its own weight and any approved superimposed load, which at no time shall exceed the design live load of that floor.
- E. No construction loads exceeding the dead load plus live load shall be supported on any unshored portion of the structure under construction. No construction loads shall be supported on, nor any shoring removed from, any part of the structure under construction except when that portion of the structure in combination with the remaining forming and shoring system has sufficient strength to support safely its weight and the loads placed thereon.
- F. Exercise care in form removal to prevent chipping of corners or other damage to concrete. Any damage to concrete shall be patched as per Section 03 30 04 Cast-in-Place Concrete.

END OF SECTION 03 10 04

### SECTION 03 20 04 - CONCRETE REINFORCEMENT

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

- A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.
- B. The General Provisions of the Contract, including the General and Supplementary Conditions, apply to the work specified in this Section.

#### 1.2 DESCRIPTION OF WORK

A. Furnish all labor, supervision, materials, tools and equipment necessary for, or incidental to completion of the concrete reinforcement for cast-in-place concrete as shown on the Contract Drawings and/or specified.

#### 1.3 <u>RELATED WORK</u>

- A. Section 03 10 04 Concrete Formwork
- B. Section 03 30 04 Cast-in-Place Concrete

## 1.4 **QUALITY ASSURANCE**

A. Allowable tolerances: Fabricating and placing tolerances as outlined in ACI 301, Section 3, except as modified by these specifications.

#### 1.5 <u>SUBMITTALS</u>

- A. Shop Drawings
  - 1. The Contractor shall submit detailed drawings which clearly show location, splicing, cover, sizes, and spacing of all reinforcing and wire fabric. Schedules and diagrams shall indicate bends, sizes, and lengths of reinforcing members. All reinforcement in concrete walls and grade beams shall be shown in elevation one eighth inch equals one foot zero inch (1/8" = 1'-0") scale. All construction joints, as required on the Contract Drawings or requested by the Contractor, shall be shown with any additional reinforcement required. Show and locate all concrete openings, including those required for other Divisions. Any drawings submitted without showing construction joints and openings will be rejected and will not be reviewed.
- B. No reinforcing shall be cut, fabricated, shipped on the job site or placed before shop drawings are reviewed. Only shop drawings bearing the Engineer's stamp marked "Furnish as Submitted" or "Furnish as Corrected" shall be used in the field.

## C. Certificate

1. The manufacturer shall submit to the Engineer certified test results stating that the reinforcing steel and welded wire fabric conform to the chemical composition and tensile and bending requirements as outlined in ASTM A615 and ASTM A185.

#### 1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver reinforcement to the project site in bundles, marked with metal tags indicating bar size, grade and length.
- B. Store reinforcing on skids or other supports above ground and protect from any damage or surface contamination, which would impair its bonding qualities.

#### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. All reinforcing bars shall conform to the requirements of ASTM A615, Grade 60.
- B. Welded wire fabric shall conform to the requirements of ASTM A185.
- C. Metal Accessories
  - 1. Provide all spacers, chairs, ties, clips and other devices required for proper placement.
- D. Epoxy adhesive shall be HIT HY 200 as furnished by Hilti, Inc., Tulsa, Oklahoma.

#### 2.2 FABRICATION

- A. Bar reinforcing shall be fabricated cold to dimensions given on the Contract Drawings. Conform to ACI standards 318 and 315 for forming hooks and bends and for detailing, fabricating, and erecting reinforcement.
- B. Reinforcing shall be accurately formed to dimensions on drawings, details and schedules within the following tolerances:

Sheared Length ......  $\pm 1$  inch Stirrups, Ties and Spirals ......  $\pm 1/2$  inch All Other Bends .......  $\pm 1/2$  inch

C. Reinforcing shall be bent cold and shall not be straightened or bent in a manner that will injure the materials.

## PART 3 - EXECUTION

#### 3.1 **INSPECTION**

A. The Contractor shall notify the Engineer twenty-four (24) hours prior to placing concrete to inspect secured reinforcing. No concrete shall be placed until reinforcing has been inspected.

## 3.2 INSTALLATION

#### A. Placement

- 1. Reinforcement shall be free of paint, dirt, oil, or excessive scale or rust that might reduce its bond strength with concrete.
- 2. Reinforcement shall be accurately placed and secured against displacement before and during the placing of concrete. Provide metal chairs, supports, and spacers to secure steel in correct horizontal and vertical position. Conform to "Recommended Practice for Placing Reinforcing Bars" (CRSI) in spacing of bolsters for slab and beam bottom reinforcing and in spacing of support bars on continuous high chairs for top slab reinforcement. The use of individual high chairs is prohibited.
- 3. No welding of bars will be allowed.
- 4. For exposed concrete in soffits or ceilings, bar supports shall be stainless steel, plastic, or have plastic ends of an approved type in contact with forms.
- 5. Reinforcement shall stop at expansion joints and continue through construction joints.
- 6. All reinforcing bars shall be supported and wired together to prevent displacement by construction loads or the placing of concrete beyond the tolerances specified below. On ground, solid concrete blocks, made of 3000 psi concrete, shall be used to support any reinforcing bars in slabs. Surfaces of blocks shall be sufficiently rough to insure proper bond with cast-in-place concrete. Reinforcement shall be secured against displacement with annealed iron wire ties or suitable clips at all intersections, except reinforcing for footings may be wired at alternate intersections.

## B. Cast-in-Place Concrete Reinforcing Cover

1.	Footing and grade beams cast against and permanently exposed to earth	3"
2.	Walls, #6 bars and larger	2"
3.	Piers, #5 bars, 5/8 in., wire and smaller	2"

4. Structural Slabs:

a.	Not exposed to weather	or in contact with the ground	
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- b. Exposed to weather or in contact with the ground......1"
- 5. Beams, girders, columns: Principal reinforcement, ties, stirrups or spirals......1 1/2"
- C. Reinforcing Placing Tolerances
  - 1. Place reinforcing as shown on drawings and schedules within the following tolerances:

Cast-in-Place Concrete Cover to Formed Surfaces ....+ 1/4 inch

Depth to Steel Reinforcing of: 24" or Less .....+ 1/4 inch More than 24" .....+ 1/2 inch

Longitudinal Location of Bends and Ends of Bars, Except at Ends of Members ......+ 2 inches

- D. Splicing
  - 1. Lap splices tie securely with wire to prevent displacement during placement of concrete.
  - 2. Splice bars only at the locations and to the lengths shown on the Contract Drawings or as accepted on the Shop Drawings.
- E. Welded Wire Fabric
  - 1. Fabric shall be shipped in flat sheets.
  - 2. Wire fabric end and side laps shall be even multiple of wiring spacing and shall be not less than six (6") inches.
  - 3. Wire fabric reinforcement for structural slabs shall be supported on continuous high chairs at all slab support member locations.
  - 4. Wire fabric reinforcement for slabs on grade shall be placed in the upper third of slab depth.
  - 5. Wire fabric for slabs on grade shall be supported on masonry blocks or other suitable supports at a spacing not to exceed four feet zero inch (4'-0") on center.

6. All exterior slabs on grade shall contain welded wire fabric unless otherwise noted.

END OF SECTION 03 20 04

### SECTION 03 30 04 - CAST-IN-PLACE CONCRETE

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

- A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.
- B. The General Provisions of the Contract, including the General and Supplementary Conditions, apply to the work specified in this Section.

#### 1.2 DESCRIPTION OF WORK

- A. Furnish all labor, supervision, materials, tools and equipment necessary for or reasonably incidental to completion of all cast-in-place concrete as shown on the Contract Drawings and/or specified herein.
- B. Work shall include all footings, piers, walls, slabs on grade, retaining walls, grade beams, structural slabs, concrete stairs and platforms and beams shown on the Contract Drawings.
- C. Pads and miscellaneous concrete as required for Mechanical and Electrical Divisions.
- D. Set anchor bolts and leveling plates specified in Division 5, Structural Steel.
- E. Place all anchors, inserts, dovetail slots, hangers, sleeves, and etc. which must be encased in concrete for other Divisions.

#### 1.3 <u>RELATED WORK</u>

- A. Section 03 10 04 Concrete Formwork
- B. Section 03 20 04 Concrete Reinforcement

#### 1.4 **QUALITY ASSURANCE**

#### A. Standards

- 1. Concrete work shall conform to all requirements of ACI-301 "Specifications for Structural Concrete" latest edition.
- 2. Design of concrete shall conform to all requirements of ACI-318 "Building Code Requirements for Structural Concrete" latest edition.

- B. Testing Agency
  - 1. The Owner will engage and pay for an independent commercial testing laboratory to test concrete used on this project.
  - 2. Testing required under Section 2.02, Proportions, shall be by an independent commercial laboratory as approved by the Engineer, and at the Contractor's expense.
- C. Quality Control
  - 1. Compression Tests
    - a. Tests shall be made in conformance with ASTM C39. Each test shall consist of four (4) cylinders made and tested by the laboratory during the progress of the project, testing as follows:
      - i. One (1) after curing seven (7) days in the field.
      - ii. Three (3) after curing twenty-eight (28) days in the laboratory.
    - b. At least one (1) test shall be made every one hundred (100 cy) cubic yards of concrete or fraction thereof, placed in any one concreting operation on any given day.
    - c. Concrete for each set of cylinders shall be from any one (1) sample, representative of the entire batch.
    - d. Specimens shall be made, cured and tested in accordance with ASTM C31.
    - e. When concrete is pumped, test cylinders shall be made from concrete taken at the discharge end of the pumping train.
  - 2. Additional tests as follows shall be made from the concrete taken to mold the cylinders.
    - a. Slump test: in accordance with ASM C143.
    - b. Air-entrainment test: in accordance with ASTM C173 or ASTM C231.
  - 3. The Contractor shall notify the Engineer and the testing laboratory twenty-four (24) hours before concrete placement and shall cooperate in making of cylinders by the testing laboratory.

## 1.5 STORAGE AND HANDLING

A. Store materials protected from exposure to harmful weather conditions and at a temperature above 40°Fahrenheit.

# CARVER POLICE CARVER, MA

### 1.6 WARRANTY FOR SLAB WATERPROOFING ADMIXTURE

- A. Project warranty: Refer to Conditions of the Contract for project warranty provisions.
- B. The manufacturer's standard warrantee document executed by an authorized company official. The manufacturer's warrantee is in addition to, and not a limitation of, other rights the owner may have under provisions of the Contract Documents.
  - 1. Warrantee Period: Five years commencing on the date of acceptance of the property by the Owner or Notice of Completion.
  - 2. Warrantee terms: Terms in include moisture related failures, including all finish floor materials and labor.

#### 1.7 <u>SUBMITTALS</u>

#### A. Test Reports

- 1. Report of tests shall be submitted to the Engineer and shall include: name of job, date and location of placement, class of concrete, mix data, and slump, air content, compressive strength, age and condition of test cylinders, weight of each cylinder tested for 7 day break, type of fracture, and method of curing.
- 2. One (1) copy of all test reports shall be promptly forwarded by the testing laboratory to the Engineer, plus one (1) copy each to the Architect, Contractor and Concrete Supplier.
- B. Test Results
  - 1. The average of the tests for any portion of the structure shall equal or exceed the specified twenty-eight (28) day compressive strength (fc).
  - 2. No single strength test shall have a value less than 90% of the specified compressive strength (fc).
  - 3. Where the concrete does not comply with these requirements, the Engineer may require other tests, such as cored cylinders (in conformance with ASTM C42) or load tests, all at the Contractor's expense. Should the concrete fail to pass such tests, it shall be removed and replaced at no additional cost to the Owner. In addition, the Contractor may be required to remove and replace sound portions of structure as necessary to insure safety, appearance, and durability of the structure. Additional load tests strengthening or removal and replacement of parts of structure and any costs associated with delay of projects shall be at Contractor's expense.
- C. Concrete Proportions
  - 1. See Section 2.02A thru 2.02J for additional requirements.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

- A. Cement: domestic portland cement conforming to ASTM C150, Type I or Type II.
- B. Fine aggregate: natural sand conforming to ASTM C33.
- C. Coarse aggregate: crushed stone or crushed washed gravel conforming to ASTM C33.
- D. Water: clean, potable.
- E. Admixtures: Each admixture shall be approved by the Engineer. No admixtures containing calcium chloride or other water soluble chlorides will be allowed. Each manufacturer shall submit a written notarized statement to the Engineer of the chloride content of each admixture. Formulate admixtures to avoid an increase in water-cement ratio or loss of strength.
  - 1. Air entraining agent: ASTM C-260.
  - 2. Retarder Densifier: ASTM C-494, Type D.
  - 3. Accelerator: ASTM C-494 Type C.
  - 4. Water-reducing agent: ASTM C-494, Type A.
  - 5. Slab vapor reducing admixture: Concrete moisture proofing admixture for interior slab construction shall be one of the following products:
    - a. Barrier 1 Inc., 1901 Tumblewater Blvd., Ocoee, Florida 34761
    - Moxie 1800 Super-Admix by Moxie International, 3352 Swetzer Road, Loomis, CA 95650
    - c. Vapor Lock 20/20 by the Specialty Products Group, Inc., 6254 Skyway Road, Smithville, Ontario Canada
- F. Non-shrink non-metallic grout: CE CRD C-621.
- G. Curing and sealing compound: Fed. Spec. TT-C-800A Type I, ASTM C-309.
- H. Polyethylene film: white opaque, reinforced six (6) mils thick.
- I. Vapor barrier below slabs on grade. Vapor barrier shall meet the requirements of ASTM E1745-97(2004) Class A, with a permeance of 0.01 US perms or less.
  - 1. Install all vapor barriers according to ASTM E 1643-98(2005) guidelines.
- J. Curing paper shall be the approved equal of Sisalkraft Paper "Orange Label" that

conforms with ASTM C171, Type I.

- K. Premolded joint filler shall be a preformed bituminous expansion type that conforms to ASTM D-994. Joint material thickness shall be one-half (1/2") inch thick, except as otherwise indicated on the drawings.
- L. Damproofing specified on concrete walls below grade shall be the approved equal of Sonneborn Building Products' Hydrocide 700B that complies to ASTM D-1227, Type I.
- M. Waterstop shall be bentonite waterstop Rx101, one inch by three-quarter (1"x3/4") inch as manufactured by Colloid Environmental Technologies Company or approved equal.

#### 2.2 **PROPORTIONS**

- A. Concrete mix proportions shall be selected to produce an average compressive strength exceeding the required twenty-eight (28) day compressive strength (fc) in accordance with ACI 318 Chapter 5.3, proportioning on basis of field experience, or trial mixtures, or both. The Contractor shall submit to the Engineer the concrete strength to which the materials were proportioned, and copies of any records that the concrete supplier may have showing standard deviations in previous mixes.
- B. Mix proportions shall be as outlined in ACI 301 Section 4 by the testing laboratory.
- C. Where a concrete production facility has a record, based on at least thirty (30) consecutive strength tests that represent similar materials and conditions to those expected, required average compressive strength used as the basis for selecting concrete proportions shall exceed required fc at designated test age by at least:
  - 400 psi if standard deviation is less than 300 psi 550 psi if standard deviation is 300 to 400 psi 700 psi if standard deviation is 400 to 500 psi 900 psi if standard deviation is 500 to 600 psi
  - 1. If standard deviation exceeds 600 psi, concrete proportions shall be selected to produce an average strength at least 1200 psi greater than required fc.
- D. Strength test data for determining standard deviation shall be considered to comply with Section 2.02C, if data represents either a group of at least thirty (30) consecutive tests or a statistical average for two (2) groups totaling thirty (30) or more tests.
- E. Strength tests used to establish standard deviation shall represent concrete produced to meet a specified strength or strengths within 1000 psi of that specified for the proposed work.
- F. Changes in materials and proportions within the population of background tests used to establish standard deviation shall not have been more closely restricted than for the proposed work.

- G. After sufficient experience and test data become available from the job, using ACI 211 methods of evaluation, the standard deviation may be reduced when the probable frequency of tests more than 500 psi below required compressive strength will not exceed one in one hundred (1 in 100), and that probable frequency of an average of three (3) consecutive tests below required compressive strength will not exceed one in one hundred (1 in 100).
- H. If it is intended to place any concrete by pumping, a corresponding mix shall be designed for such placement and so designated.
- I. No concrete shall be placed until tests of design mixes show a twenty-eight (28) day average compressive strength at least equal to the specified design compressive strength or until the concrete design mix proportions have been accepted by the Engineer.
- J. Contractor shall submit the following data:
  - 1. Fine aggregate organic content, sieve analysis, fineness modulus and specific gravity.
  - 2. Coarse aggregate sieve analysis and average weight loss in accordance with ASTM C-33.
  - 3. Mix design, including cement brand, proportions of aggregate by weight, slump, water-cement ratio, percentage of air.
  - 4. Thirty (30) twenty-eight (28) day compressive test results on proposed mix that comply with Section 2.02C.
  - 5. Admixture-types, brand and quantity.

## 2.3 SPECIFIC REQUIREMENTS

A. Unless otherwise noted, concrete for all the parts of the work shall be 3,000 psi at twentyeight (28) days and meet the values shown in the following Table:

Min. compressive strength @ 28 days (psi)	3,000
Slump (inches)	. 2 1/2 - 4
Max. size coarse aggregate (inches)	1 1/2
Max. size coarse aggregate for suspended slabs and pumped concrete (inches).	
Max. size coarse aggregate for minimum 5 inch thick slab on grade (inches)	1 1/2
Min. cement factor (sacks per cy)	5 1/2

- 1. Water content shall include surface water in aggregates.
- B. Concrete for exterior retaining walls and foundation walls at the building perimeter shall also conform to the following requirements:

Min.	compressive strength @	28 days (psi)	
Max.	water cement ratio shall	be	

1. Exception: For concrete for building foundation walls which are protected by insulation or other products which prevent water and soil moisture from contacting the concrete, the requirements of 2.3B may be modified to:

Min. compressive strength @ 28 days (psi)	
Max. water cement ratio shall be	0.50

C. Concrete for Interior Slabs shall also conform to the following requirements:

Min. compressive strength @ 28 days (psi)	
Max. water cement ratio shall be	0.48
Min. cement factor (sacks per C.Y.)	

- 1. Mix shall include a mid-range water reducer such as Polyheed 997 as manufactured by Master Builders, Inc. or equivalent.
- 2. Mix shall be proportioned to provide a maximum 5" slump at point of discharge.
- 3. Interior concrete slabs-on-grade shall not be air entrained.
- 4. Water to cement ratio shall be compatible with all requirements of Barrier One.
- 5. Add Slab Vapor Reducing Admixture in strict accordance with manufacturer's recommendations.
- D. Concrete for exterior flatwork, retaining walls adjacent to pedestrian paths and/or vehicle access, and concrete piers outside of the building shall be 5,000 psi at twenty-eight (28) days and meet the values shown in the following Table:

Min. compressive strength @ 28 days (psi)	5,000
Slump (inches)	21/2 - 4
Max. water cement ratio	0.40
Max. size coarse aggregate (inches)	1 1/2
Max. size coarse aggregate for suspended slabs and pumped concrete (inches).	1
Max. size coarse aggregate for minimum 5 inch thick slab on grade (inches)	1 1/2
Min. cement factor (sacks per cy)	6 1/2

- 1. Water content shall include surface water in aggregates.
- E. All concrete exposed to the weather, including site work and all foundations, shall be air-entrained as follows:

Air Content

% by Volume
5.5 - 8.5
6 – 9

F. Variations of proportions may be permitted to produce more workable materials on approval by the Engineer.

#### PART 3 - EXECUTION

## 3.1 PRIOR TO PLACING CONCRETE

- A. Soil bottoms for footings and slabs shall be accepted by the Engineer before placing concrete. The subgrade shall be free of frost before concrete placing begins.
- B. All debris, sawdust, ice, etc., is to be cleaned from place of deposit before concrete is placed.
- C. All water is to be removed from place of deposit before concrete is placed. Provide drainage or pumping as required to maintain dry excavation until concrete has taken initial set.
- D. All conduits and piping are to be dug into subgrade sufficiently so as to provide uniform slab thickness.
- E. Prior to placing any concrete, the Contractor shall notify the Engineer twenty-four (24) hours in advance so that formwork and reinforcing may be inspected. Do not place concrete until inspection has been made or waived.
- F. All dowels, anchor bolts, sleeves, inserts and other embedded items shall be set with the aid of templates and shall be securely positioned in place prior to the placement of concrete.

#### 3.2 <u>MIXING</u>

- A. Concrete shall be ready-mixed in conformance with the requirements of ASTM C94 for measurement of materials, batching, mixing and delivery, and shall be discharged within one and one-half (1 1/2) hours after water is first added to the mix, except that in unusually hot weather, this maximum time may be reduced.
- B. Mixing and conveying equipment shall be thoroughly clean and free from hardened concrete and foreign materials before concrete operation is started.
- C. All materials including water shall be added to ready-mixed concrete at the batching

plant. Water shall not be added to the mix on the project site. Mixing shall be continued for at least one and one-half  $(1 \ 1/2)$  minutes prior to its use.

- D. Mixer shall produce thoroughly mixed, uniform mass, and discharge mixture without segregation. Entire batch shall be discharged before mixer is recharged.
- E. Partially hardened concrete shall not be retempered or used.
- F. Delivery Tickets
  - 1. One (1) copy of all concrete delivery tickets shall be furnished to the Engineer on request. Contractor shall note on tickets location of placement. Delivery tickets shall provide the following information:
    - a. Date and truck number
    - b. Name of ready-mix batch plant
    - c. Contractor and job location
    - d. Cement brand, type mix number and weight in pounds
    - e. Fine aggregate weight in pounds
    - f. Maximum size of aggregate
    - g. Coarse aggregate weight in pounds
    - h. Water in gallons
    - i. Admixture, name and amount in concrete, if any
    - j. Amount of concrete in cubic yards
    - k. Time mix left plant

# 3.3 DEPOSITING CONCRETE

- A. Depositing of all concrete shall be in accordance with ACI 304.
- B. Concreting shall conform to the requirements of ACI 305 or ACI 306 in hot or cold weather as required. See Section 3.10.
- C. All Contractors whose work is related to the concrete or must be supported by it shall be given ample notice and opportunity to introduce and/or furnish embedded items before the concrete is placed.
- D. Unless adequate protection is provided, and approved by the Engineer, concrete shall not be placed during rain, sleet, or snow.
- E. Concrete shall be conveyed from the mixer to the place of final deposit in a practically continuous flow by methods which will prevent the separation or loss of the ingredients. It shall be placed in the forms or on grade as nearly as practicable to its final position and shall be thoroughly vibrated around all reinforcing bars and mesh to assure complete absence of voids. Under no circumstances shall partially hardened concrete be placed in the work. Concrete shall be prohibited from free-falling in excess of four (4) feet.
- F. Concrete may be pumped. Use of aluminum alloys in the pumping train is prohibited.
- G. Concrete shall be thoroughly compacted and worked into the forms and around the reinforcing by means of suitable mechanical vibrators. Sufficient vibrators shall be on hand to allow for breakdowns. Vibrators shall be run deep into the concrete and shall remain in one position until the concrete is thoroughly compacted, but not long enough to cause segregation of the aggregates.
- H. Vertical lifts shall not exceed eighteen (18") inches. Vibrate through successive lifts to avoid pour lines. Vibrate first lift thoroughly until top of lift glistens to avoid stone pockets, honeycomb, and segregation.
- I. Concrete shall be deposited continuously, and in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause formation of seams and planes of weakness within section. If section cannot be placed continuously between planned construction joints, as specified, field joint and additional reinforcement shall be introduced so as to preserve structural continuity. Engineer shall be notified in any such case.
- J. Unless otherwise permitted, the work shall be so executed that a section begun on any day shall be completed in daylight on the same day.
- K. Cold joints, particularly in exposed concrete, including "honeycomb", are unacceptable. If they occur in concrete surfaces exposed to view, Engineer may require that entire section in which blemish occurs be removed and replaced with new materials at Contractor's expense.

# 3.4 INTERIOR SLABS

- A. Add slab vapor reducing admixture in strict accordance with manufacturer's recommendations.
  - 1. A representative of the slab vapor reducing admixture must be present at the jobsite during mixing and placement of the first batch of treated concrete. The Contractor must not proceed without the Representative being present for the certification of the mix and placement process. Please provide 10 days notice of the placement of the first batch of treated concrete.
  - 2. The addition of non-chlorinated admixture is permitted, subject to the limitations of the vapor reducing admixture's recommendations.
  - 3. All concrete mix designs which include a vapor reducing admixture shall be approved by the admixture manufacturer prior to placing concrete.

# 3.5 <u>CONSTRUCTION AND CONTROL JOINTS</u>

- A. Walls, Columns, Beams, and Slab on Grade, and Structural Slab
  - 1. No additional construction joints, except those shown on the Contract Drawings, accepted on the shop drawings, or accepted by the Engineer will be allowed.

- 2. The surface of the concrete at all joints shall be hard and thoroughly cleaned prior to placing adjoining concrete.
- 3. The cured or partially cured concrete of construction joints, except at locations noted below, shall be dampened (but not saturated) immediately prior to the placing of fresh concrete.
- 4. The face of hardened concrete joints in exposed work and joints in the middle of beams, girders and slabs shall be dampened (but not saturated) and then thoroughly covered with a coat of neat cement grout of similar proportions to the mortar in the concrete. The grout shall be as thick as possible on vertical surfaces and at least one-quarter (1/4") inch thick on horizontal surfaces. The fresh concrete shall be placed before the grout has attained its initial set.
- 5. Construction joints shall be constructed with reinforcing continuous through joint unless otherwise shown. All key bulkhead joints shall be constructed with a key depth of one-third (1/3) the total thickness unless otherwise shown.
- 6. Sawcut control joints in slabs shall be saw cut within twenty-four (24) hours of concrete placement. Control joint shall be sawed to depth of one-quarter (1/4) of the slab thickness.
- Unless otherwise shown on the Drawings, slabs on grade shall be broken down into sections with control and/or construction joints that do not exceed six hundred fifty (650 sf) square feet area and whose dimensions do not exceed a one and one half to one (1 1/2 to 1) ratio.

# 3.6 FINISHED CONCRETE SURFACES

# A. Walls

- 1. It is the intent of this Specification that forming operations be performed in a manner which will produce sound concrete surfaces, free of bulges and offsets, with a minimum of fins, blemishes due to form defects and honeycomb areas.
- 2. Any exposed concrete which is not formed as shown on the Plans, or for any reason is out of alignment or level beyond tolerance specified, or shows a defective surface, shall be considered as not conforming with the intent of these Specifications; and shall be removed from the job by the Contractor, at his expense, unless the Engineer grants permission to patch the defective area.
- 3. Immediately after removing forms, all concrete surfaces shall be inspected and any pour joints, voids, pockets, or other surface defects shall be repaired at once, before the concrete is thoroughly dry.
- 4. Cut out surface defects which do not impair structural strength to one (1") inch depth and refill with fresh concrete. Thoroughly wet cuts immediately prior to filling with

stiff concrete of approximately the same mix as the adjoining work. After a partial set, compress and rub to produce a finish similar in texture and color to adjoining work.

- 5. Clean all exposed surfaces, concrete and adjoining work stained by the leakage of concrete.
- 6. Remove wood cones remaining after the rods are snapped off, and fill holes with a concrete mortar finished to the same color and texture of surrounding concrete.
- 7. All surfaces on both the interior and exterior, which are exposed or are within six (6") inches of being exposed in the completed building, shall have a "rubbed finish" (i.e., smooth rubbed finish, or grout cleaned finish). Parging will not be accepted. Finish all rubbed concrete surfaces in accordance with ACI 301, Section 5.3.3.4.
- 8. Do not clean, rub or patch in freezing temperatures, or when frost is on concrete surface.
- 9. Permission to patch does not imply waiver of Engineer's right to require complete removal and replacement of said work if, in Engineer's opinion, said patching does not satisfactorily restore quality and appearance of work.
- B. Slabs Finishing
  - 1. All interior concrete slabs shall be finished by screeding floating, floated finish, and steel troweled to a smooth even surface in accordance with ACI 301, Section 5.3.4, unless otherwise noted.
  - 2. All exterior steps and slabs and interior slab scheduled for toppings shall be finished by screed floating, floated finish and broom finish in accordance with ACI 301, Section 5.3.4.
  - 3. Any slab surface finish not specified shall be finished in accordance with ACI 301, Section 5.3.4.2.j.
  - 4. No dry cement or other materials shall be applied to surface of any concrete slab to absorb moisture prior to finishing.
  - 5. Provide a positive pitch to all floor drains as shown. Pitch exterior slabs away from the building as shown on the Drawings.
  - 6. Provide one-eighth (1/8") inch radius tooled edging at all exposed slabs and/or sidewalk edges.
  - 7. Provide proper depression in concrete to accept specified finish floor materials.

- C. Stairs
  - 1. Stair treads, landing slabs, and platforms shall be floated and given a troweled finish, as outlined above.

# 3.7 CONCRETE AND STEEL DECKING

A. Concrete cast on steel deck shall be finished to elevations indicated on Drawings and to specified tolerances, with consideration given to deflection of steel deck and beams. No additional payment will be made for concrete required to maintain these specified elevations.

# 3.8 <u>CURING</u>

- A. All concrete shall be kept constantly moist and protected against any drying action for not less than seven (7) days after placing of the concrete, and shall be accomplished in the following manner:
  - 1. Walls, Beams and Columns
    - a. Formwork shall not be removed for a minimum of three (3) days.
    - b. For the remainder of the curing period, the concrete shall be kept moist by the application of absorptive mats or other moisture retaining covering as accepted by the Engineer, kept continuously wet or curing compounds. Application of curing compound is to follow immediately behind form removal to prevent surface from drying out.
  - 2. All slabs, either slab on grade or suspended slabs, shall be cured using curing paper.
  - 3. Where concrete is cured by curing paper, cover surface immediately after finishing. Joints shall be lapped five (5") inches, and squeegee curing paper to remove wrinkles. Repair all rips and tears until end of curing period.
  - 4. The use of curing compounds on exterior slab on grade construction (sidewalks) is not permitted.

#### 3.9 <u>CONCRETING PRECAUTION FOR WEATHER EXTREME</u>

- A. Cold weather: Precautions shall be taken when the temperature is at or below 40 degrees F, or at 45 degrees F and falling, in accordance with "Guide to Cold Weather Concreting", ACI 306.
  - 1. Set up a proper enclosure and heat to 50 degrees F for at least four (4) hours before starting any pour.
  - 2. Use a water-reducing admixture with an accelerated set, but do not use or rely upon any materials as an "antifreeze".

- 3. Use vented heaters with blowers so placed that they do not produce localized hot spots which may dry out the concrete.
- 4. Maintain the temperature of the concrete at not less than 50 degrees F for seventytwo (72) hours and at above freezing for an additional seven (7) days. The temperature shall then be allowed to drop gradually to the exterior air temperature before the enclosure is removed at the rate of not more than 5 degrees F per hour nor 50 degrees F in any twenty-four (24) hour period before discontinuing.
- 5. All frozen concrete shall be removed from the job and replaced.
- B. Hot weather: Precautions shall be taken when the temperature is at or above 75 degrees F, or at 70 degrees F and rising, in accordance with "Guide to Hot Weather Concreting", ACI 305. No concrete shall be placed when the air temperature is above 90 degrees F, unless the air is still and relative humidity is above eighty (80%) percent.
  - 1. Set up proper windbreakers for concrete surfaces wherever the relative humidity is less than 70% for slight air motion or 80% for light breezes.
  - 2. Provide shade for placements otherwise exposed to the sun.
  - 3. Concrete is to be at a temperature of 80 degrees F, or less when placed. If necessary, the batching plant shall cool the aggregate by spraying or by using chilled water or ice. All such water shall be accounted for as part of the mixing water.
  - 4. Use an admixture with a retarded set.
  - 5. All forms shall be thoroughly wetted at least daily, and more often when the relative humidity is low.
  - 6. For slabs, maintain the required materials for curing at hand so they may be placed immediately upon steel troweling. When the concrete temperature of any slab goes above 100 degrees F, place a layer of sand on it and keep it continuously wet until the temperature is below 90 degrees F.

# 3.10 CONCRETE MOUNTS FOR MECHANICAL EQUIPMENT

A. Furnish and place all concrete platforms, curbs, piers, etc., required for mechanical equipment as called for in the Mechanical Drawings. Set all anchor bolts, etc., as required.

# 3.11 BEAM POCKETS

A. Fill all recessed beam bearing pockets full height and flush to cast concrete walls with concrete.

# 3.12 <u>GROUTING</u>

- A. Install non-shrink grout under all structural steel column base plates, leveling plates and bearing plates.
- B. Non-shrink grout shall be mixed in accordance with the manufacturer's printed instructions. Bedding grout shall be placed solidly between the bearing surface and base or plate to ensure that no voids remain. Finish edges at 45 degree bevel and properly cure grout.

#### 3.13 SLAB FLATNESS\LEVELNESS TOLERANCES

- A. Finished surfaces shall be smooth, free from blemishes and trowel marks, with a maximum variation in finish elevation as defined by ACI FF/FL requirements.
- B. All floor slabs shall conform to the following ACI F-number requirements:
  - 1. Specified overall value......FF-35/FL-25
  - 2. Minimum local value .....FF-25/FL-20
- C. Floor slab flatness and levels tests on the slabs shall be conducted in accordance with the provisions set forth in ASTM E 1155. Floor tolerance measurement shall be made using a Dipstick Floor Profiler as manufactured by The Edward W. Face Company, Inc. of Norfolk, VA or approved alternate method.

#### 3.14 WATERSTOP INSTALLATION

- A. Provide continuous waterstop at all locations shown on the Plans.
- B. Apply adhesive primer to vertical surfaces prior to applying bentonite strip. Nail bentonite strip using concrete cut nails at one foot zero inch (1'-0") on center.
- C. Install waterstop in accordance with manufacturer's instructions with a minimum two and one-half (2 1/2) inch concrete cover.

END OF SECTION 03 30 04

#### SECTION 04 20 00 - UNIT MASONRY

#### (FILED SUB BID REQUIRED)

#### PART 1 - GENERAL

#### 1.1 TIME, MANNER AND REQUIREMENTS FOR FILING SUB-BIDS

- A. Sub-Bids shall be submitted in accordance with the provisions of General Laws, Chapter 149, Section 44A, inclusive, as amended.
- B. Sub-Bids for work under this Section shall be received electronically, until 2:00
  p.m. on Tuesday, October 29, 2019, at which time and place all Trade Contractor Bids shall be duly recorded.
- C. This project is being Electronically Bid (E-Bid). All bids shall be submitted online at <u>www.Projectdog.com</u>. Hard copy bids will not be accepted by the Awarding Authority. E-Bid tutorials and instructions are available within the specifications and online at <u>www.Projectdog.com</u>. For assistance, call Projectdog, Inc at (978)499-9014, M-F 8:30AM-5PM.
  - a. All required bid forms must be submitted in **PDF** format only. The bidder must complete all required signatures either digitally (using Adobe Acrobat) or manually (print, sign and scan as a PDF file).
  - b. Bid Bonds issued by a surety company shall be submitted on the E-Bid page. Bid bonds in the form of cash or check shall be completed and delivered as outlined on the Bid Bond Affidavit form.
  - c. The bidder must enter bid price on the E-Bid form as a whole dollar value only with no punctuation. Sums shall be expressed in both words and figures on the bid form. Note: The E-Bid form will automatically match the word value to the numeric figure entered by the bidder.
  - d. Bidders may save, submit or modify an E-Bid at any time prior to bid close. Once submitted, a bid cannot be edited. To modify a bid the bidder must retract the bid, make any necessary changes, and then submit the bid again. Upon submitting or retracting the bidder will receive a convenience email for informational purposes only. Bidders are encouraged to contact Projectdog, Inc at (978) 499-9014, M-F 8:30AM-5PM, if an email is not received.
  - e. If a bid is submitted prior to an Addendum being issued, the bidder will receive an automated email for informational purposes only. The bidder must review the addendum, retract the bid, acknowledge all addenda, and submit the bid again. If a bidder fails to acknowledge addenda their bid may be rejected by the Awarding Authority.

- f. Timely submission of an E-Bid shall be the full responsibility of the Bidder. The server clock is the time of record. It is the bidder's responsibility to review and confirm online that a bid has been submitted and/or retracted and that the bid is 100% true, complete and accurate. All bidders are required to review their submitted E-Bid via the "View My Bid Package" link.
- D. Sub-Bids filed with the Awarding Authority shall be accompanied by a Bid Deposit in the form of a certified check or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to the "**Town of Carver**". A bid bond shall be:
  - 1. In a form satisfactory to the Awarding Authority.
  - 2. With a surety company qualified to do business in the Commonwealth and satisfactory to the Awarding Authority.
  - 3. Conditioned upon the faithful performance by the principal of the agreements contained in the Bid. The amount of such bid deposit shall be five percent (5%) of the value of the Bid.
- E. Sub-Bids for work under this Section shall be for the complete work required as specified and as shown on the drawings.
- F. Sub-Bidders are directed to the Instructions to Bidders, and to the requirements that all bidders visit the site to determine the scope of work required under this Section.
- G. Sub-Bidders must comply with all provisions of Division 1, General Requirements, in the same manner as the General Contractor.

# 1.2 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

# 1.3 <u>SUMMARY</u>

- A. This Section includes furnishing and installing the following:
  - 1. Concrete unit masonry (cmu) for masonry Detention Area and Sally Port wall construction as indicated on the drawings
  - 2. Precast concrete watertable cap, including galvanized metal support angle and flashings.

- 3. Cultured stone veneer watertable and support system for cultured stone veneer at base of wall construction, including lath, scratch coat, mortar setting bed, and stone veneer.
- 4. Mortar and Grout
- 5. Reinforcing steel and joint reinforcement
- 6. Ties, anchors, and flashing related to masonry construction and as indicated on the drawings
- 7. Field mock-up utilizing all materials specified (4' x 4' min.)

# 1.4 <u>SYSTEM PERFORMANCE REQUIREMENTS</u>

- A. Provide unit masonry that develops the following installed compressive strengths (f'm):
  - 1. For concrete unit masonry: As follows:
    - a. f'm = 1900 psi.

# 1.5 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each different masonry unit, accessory, and other manufactured product indicated.
- C. Material certificates for the following signed by manufacturer and Contractor certifying that each material complies with requirements.
  - 1. Each different cement product required for mortar and grout including name of manufacturer, brand, type, and weight slips at time of delivery.
  - 2. Each material and grade indicated for reinforcing bars.
  - 3. Each type and size of joint reinforcement.
  - 4. Each type and size of anchors, ties, and metal accessories.
- D. Material test reports from a qualified independent testing laboratory employed and paid by Contractor indicating and interpreting test results relative to compliance of the following proposed masonry materials with requirements indicated:
  - 1. Mortar complying with property requirements of ASTM C 270.
  - 2. Grout mixes. Include description of type and proportions of grout ingredients.
  - 3. Masonry units.
- E. Precast Concrete: Submit for approval the following:
  - 1. Copies of shop drawings showing details of the stone to be provided including: profiles, cross-sections, reinforcement, exposed faces, arrangement of joints, anchoring methods, anchors, annotation of stone types and their location.
  - 2. Unless otherwise shown on contract drawings:

- a. Provide suitable wash on all exterior sills, coping, projecting courses and pieces with exposed top surfaces.
- b. Provide drips as needed.
- E. Cultured Stone: Submit for approval the following:
  - 1. Submit drawings depicting proper installation and flashing techniques. Coordinate locations with those found on the drawings.
  - 2. Manufacturer's data sheets on each product to be used including
    - a. Preparation instructions and recommendations
    - b. Storage and handling requirements and recommendations
    - c. Installation standards and methods.
  - 3. Selection samples: For each finish product specified, two (2) complete sets of color samples representing manufacturer's full range of available colors and textures.

# 1.6 QUALITY ASSURANCE

- A. Unit Masonry Standard: Comply with ACI 530.1/ASCE 6 "Specifications for Masonry Structures," except as otherwise indicated.
  - 1. Revise ACI 530.1/ASCE 6 to exclude Sections 1.4 and 1.7; Parts 2.1.2, 3.1.2, and 4.1.2; and Articles 1.5.1.2. 1.5.1.3, 2.1.1.1, 2.1.1.2, and 2.3.3.9 and to modify Article 2.1.1.4 by deleting requirement for installing vent pipes and conduits built into masonry.
- B. Comply with ACI 530/ASCE5 "Building Code Requirements for Masonry Structures, Section 9.5 Lateral Support for bracing requirements of partitions.
- C. Fire Performance Characteristics: Where indicated, provide materials and construction identical to those of assemblies whose fire resistance has been determined per ASTM E 119 by a testing and inspecting organization, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.
- D. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.
- E. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality from one manufacturer for each cementitious component and from one source and producer for each aggregate.

# 1.7 <u>QUALITY ASSURANCE – PRECAST CONCRETE</u>

A. Manufacturer Qualifications: A firm experienced in manufacturing precast concrete units similar to those indicated for this project and with a record of

successful in-service performance as well as sufficient production capacity to manufacture required units.

- B. Source Limitations for precast concrete: Obtain precast concrete units through one source from a single manufacturer.
- C. Reference Standards: Comply with applicable provisions and recommendation of the following, except as otherwise shown or specified.
  - 1. Cast Stone Institute Technical Manual 04720 (current edition).
  - 2. ASTM C 150 Specification for Portland Cement.
  - 3. ASTM C 73 Specification for Concrete Aggregates.
  - 4. ASTM C 979 Specification for Pigments for Integrally Pigmented Concrete.
  - 5. ASTM C 494 Specification for Chemical Admixtures for Concrete.
  - 7. ASTM A 613 Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
  - 8. ASTM C 1194 Test method for Compressive Strength of Architectural Cast Stone.
  - 9. ASTM C 666 Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
  - 10. ASTM C 1195 Test method for Absorption of Architectural Cast Stone.
  - 11. ASTM C 1364 Standard Specification for Architectural Cast Stone.
  - 12. ASTM C 1729 Practice of Visual Appraisal foe Colors and Color Differences of Diffusely Illuminated Opaque Materials.
  - 13. ASTM D 2244 Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
- D. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.
- E. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality from one manufacturer for each cementitious component and from one source and producer for each aggregate.

# 1.8 QUALITY ASSURANCE – CULTURED STONE

- A. Manufacturer Qualifications: Manufacturer who is a current member of Maonsry Veneer Manufacturer's Association (MVMA) with a minimum of five (5) years documented experience manufacturing and marketing all manufactured stone products of the type specified in this section.
- B. Source Limitations for precast concrete: Obtain cultured stone units through one source from a single manufacturer.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship. Do not proceed with remaining work until workmanship, color, texture, and pattern are approved by the Architect.

## 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry materials to project in undamaged condition.
- B. Store and handle masonry units off the ground, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not place until units are in an air-dried condition.
- C. Store cementitious materials off the ground, under cover and in dry location.
- D. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- E. Store masonry accessories including metal items to prevent corrosion and accumulation of dirt and oil.

## 1.10 PROJECT CONDITIONS

- A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
  - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
- B. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Remove immediately any grout, mortar, and soil that comes in contact with such masonry.
  - 1. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.
  - 2. Protect sills, ledges, and projections from mortar droppings.
  - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes from mortar droppings.
- C. Cold-weather Construction: Comply with referenced unit masonry standard for cold-weather construction and the following:
  - 1. Do not lay masonry units that are wet or frozen.
  - 2. Remove masonry damaged by freezing conditions.
  - 3. Refer to BIA Technical Note 1 for compliance with cold weather construction practices.
- D. Hot-Weather Construction: Comply with referenced unit masonry standard, BIA Technical Note 1.

# PART 2 - PRODUCTS

#### 2.1 MATERIALS, GENERAL

A. Comply with referenced unit masonry standard and other requirements specified in this Section applicable to each material indicated.

#### 2.2 CONCRETE MASONRY UNITS

- A. General: Comply with requirements indicated below applicable to each form of concrete masonry unit required.
  - 1. Size: Provide concrete masonry units complying with requirements indicated below for size that are manufactured to specified face dimensions within tolerances specified in the applicable referenced ASTM specification for concrete masonry units.
    - a. Concrete Masonry Units: Manufactured to specified dimensions of 3/8 inch less than nominal widths by nominal heights by nominal lengths indicated on drawings.
- B. Hollow and Solid Load-Bearing Concrete Masonry Units: ASTM C 90-90, C145, and Grade N and as follows:
  - 1. Unit Compressive Strength: Provide units with minimum average net area compressive strength indicated below:
    - a. 1900 psi.
  - 2. Weight Classification: Lightweight.
  - 3. Aggregates: Lightweight, expanded shale, clay or slate produced by the rotary kiln method complying with ASTM C-331, and shall be graded (#4-0 Gradation) to assume constant texture. The blending of screenings or any other deleterious substance which will impair the fire rating or insulation values is prohibited.
  - 4. Units made with pumice or burn-off aggregates will not be accepted.

# 2.3 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction.
- B. Masonry Cement: ASTM C 91.
- C. All mortar utilized on the exterior veneer, or concrete masonry units exposed to the weather, shall contain The Dry Block Integral Water Repellent System by W.R. Grace & Co.

#### 2.4 <u>REINFORCING STEEL</u>

- A. General: Provide reinforcing steel complying with requirements of referenced unit masonry standard and this article.
- B. Steel Reinforcing Bars: Material and grade as follows:1. Grade 60.
- C. Deformed Reinforcing Wire: ASTM A 496.

# 2.5 JOINT REINFORCEMENT

- A. General: Provide joint reinforcement complying with requirements of referenced unit masonry standard and this article, formed from the following:
  - 1. Galvanized carbon steel wire, ASTM-Al53, Class B-2, hot-dipped, 1.5 oz. galvanized coating.
- B. Description: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet, with prefabricated corner and tee units, and complying with requirements indicated below:
  - 1. Wire Diameter for Side Rods: 0.1875 inch.
  - 2. Wire Diameter for Cross Rods: 0.1483 inch (9 gage).
  - 3. For single-wythe masonry provide type as follows with single pair of side rods:
    - a. Truss design with continuous diagonal cross rods spaced not more than 16 inches o.c.
    - b. Subject to compliance with requirements, provide one of the following:
      - 1) "Truss Type, Extra Heavy Duty", by Dur-O-Wal, Inc.
      - 2) "Truss Tie-Wall, Heavy Class", by National Wire Products, Inc.
      - 3) "Standard Truss", Keywall.

# 2.6 <u>TIES AND ANCHORS, GENERAL</u>

- A. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and size of referenced unit masonry standard and of this article.
- B. Galvanized Carbon Steel Wire: ASTM A 82, ASTM-Al53, Class B-2, hot dipped, 1.5 oz. galvanized coating.
- C. Galvanized Steel Sheet: As follows:
  - a. Galvanized Steel Sheet: ASTM A 366 (commercial quality) cold-rolled carbon steel sheet, hot-dip galvanized after fabrication to comply with ASTM A 525, Class B2 (for unit lengths over 15 inches) and Class B3 (for unit lengths under 15 inches), for all sheet metal ties and anchors.

# 2.7 <u>ADJUSTABLE ANCHORS FOR CONNECTING MASONRY TO STRUCTURAL</u> <u>STEEL</u>

- A. General: Two-piece assemblies as described below allowing vertical or horizontal differential movement between wall and structural steel parallel to plane of wall, but resisting tension and compression forces perpendicular to it.
  - 1. Performance Characteristics: Capable of withstanding a 100 lb. force in either tension or compression without deforming over, or developing play in excess of, .05 inch.
- B. For anchorage of masonry inner wythes to the face of steel columns, and to the underside of structural steel members, furnish to the structural steel fabricator continuous channel slots formed from 16 ga. (mill) galvanized sheet steel.
  1. Provide channel slot anchors formed from 3/16 inch diameter wire.
- C. Products: Subject to compliance with requirements, provide the following:
  - 1. Channel Slots:
    - a. D/A 904, Dur-O-Wal, Inc.
  - 2. Triangle Tie Slot Anchors:
    - a. D/A 918-922, Dur-O-Wal, Inc.
- D. For the anchorage of masonry to the webs of steel beams at cavity wall conditions, furnish to the structural steel fabricator channel anchor slots formed from 16 gauge brite sheet steel, 8" long.
  - 1. Provide channel slot anchors formed from 16 gauge corrugated brite sheet metal, 3-1/2" long.
- E. Products: Subject to compliance with requirements, provide the following:
  - 1. Channel Slots:
    - a. D/A 901, Dur-O-Wal, Inc.
  - 2. Corrugated Channel Slot Anchors:
    - a. D/A 912, Dur-O-Wal, Inc.

# 2.8 <u>MISCELLANEOUS MASONRY ACCESSORIES</u>

- A. Nonmetallic Control Joint and Expansion Joint Strips: Premolded filler strips complying with ASTM D 1056, Type 2 (closed cell), Class A (cellular rubber and rubber-like materials with specific resistance to petroleum base oils), Grade 1 (compression-deflection range of 2-5 psi), compressible up to 35 percent, of width and thickness indicated, formulated from the following material:
  - 1. Neoprene.
- B. Products: Subject to compliance with requirements, provide one of the following:
  - 1. "Rapid Expansion Joint, D/A 2015", Dur-O-Wal, Inc.
  - 2. "NS Closed Cell Neoprene Sponge", Hohmann and Barnard, Inc.
  - 3. "032 Expansion Joint", National Wire Products Ind.

C. Bond Breaker Strips: Asphalt-saturated organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

#### 2.9 MORTAR AND GROUT MIXES

- A. General: Do not add admixtures including coloring pigments, air-entraining agents, accelerators, retarders, water repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
  - 1. Do not use calcium chloride in mortar or grout.
- Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification for B. job-mixed mortar and ASTM C 1142 for ready-mixed mortar, of types indicated below:
  - 1. For exterior, above-grade loadbearing and nonloadbearing walls and parapet walls, for reinforced masonry and where indicated, use type indicated below:
    - a. Type S.
  - 2. For interior loadbearing walls; for interior nonloadbearing partitions, and for other applications where another type is not indicated, use type indicated below: a. Type S.
- C. Grout for Unit Masonry: Comply with ASTM C 476 and referenced unit masonry standard.

#### PRECAST CONCRETE PRODUCTS 2.10

- A. Physical properties: Provide the following:
  - 1. Compressive Strength. ASTM C 1194: 5,000 psi min.
  - 2. Absorption. ASTM C 1195: 6% max.
  - 3. Rapid Freezing and Thawing. ASTM C 666: 5% max.
- B. Raw Materials:
  - Portland cement Type I or III, white, ASTM C 150 1.
  - 2. Coarse aggregates – Granite quartz or limestone, ASTM C 33
  - 3. Fine aggregates – Manufactured or natural sands, ASTM C 33
  - 4. Colors – Inorganic iron oxide pigments, ASTM C 979
  - Admixtures ASTM C 494 5.
  - Water potable 6.
  - 7. Reinforcement – ASTM A615
- C. Color and Finish:
  - Color: Crystal White, or approved equal utilizing Lehigh white cement. 1.
  - Texture: Smooth 2.
  - Exposed surfaces shall exhibit a fine-grained texture similar to natural 3. stone. No bugholes or air voids will be permitted.

# 4. Variation:

- a. Must match color and finish of approved sample when viewed in direct daylight at a 10-foot distance after subjecting to similar aging and weathering conditions.
- D. Reinforcing
  - 1. New billet steel reinforcing bars ASTM A 615
    - a. Reinforce units when necessary for safe handling and structural stress.
    - b. Reinforcement shall be galvanized or epoxy coated when covered with less than 1-1/2" of material.
    - c. Minimum cover shall be twice the diameter of the bars.
    - d. Area of reinforcement in panels greater than 12" wide shall be not less than <sup>1</sup>/<sub>4</sub> percent of the cross section area.
- E. Support Angle
  - 1. Galvanized metal support bracket (Simpson Strong Tie A-21), or other galvanized right angle bracket and fasteners with holding capacity minimum 5lbs/LF.
  - 2. Fasten with galvanized nails of screws penetrating studs 1" at a minimum at 16" o.c. spacing.
  - 3. Utilize a minimum of two (2) brackets per sill piece if blocking is present.
  - 4. Utilize construction adhesive to bond stone at bracket locations.

# 2.11 <u>CULTURED STONE PRODUCTS</u>

- A. Manufacturers
  - Acceptable Manufacturer: Cultured Stone® by Boral,® which is located at: 200 Mansell Court E. Suite 305; Roswell, GA 30076; Toll Free Tel: 800-255-1727; Email to request info:boralstoneanswers@boral.com; Web: www.culturedstone.com
  - 2. Requests for substitutions will be considered in accordance with provisions of Section 01 33 00 Submittal Requirements.
- B. Manufactured Stone Veneer General
  - 1. Manufactured Stone Veneer Performance Requirements: Conforming to ASTM C 1670 and as follows:
    - Compressive Strength: Not less than 1800 psi (12.4 MPa) average for 5 specimens and not less than 2100 psi (14.4 MPa) for individual specimen when tested in accordance with ASTM C 39 & ASTM C 192.
    - b. Bond Between Manufactured Masonry Unit, Mortar and Backing: Not less than 50 psi (345 kPa) when tested in accordance with ASTM C 482 using Type S mortar.
    - c. Thermal Resistance: R-value of not less than 0.355 per inch (25.4 mm) of thickness when tested in accordance with ASTM C 177.

- d. Freeze/Thaw: No disintegration and less than 3 percent weight loss when tested in accordance with ASTM C 67.
- e. Water Absorption: Tested in accordance with UBC 15-5 9-22% depending on density value.
- f. Unit Weight: Not more than 15 psf (73 kg/m2) saturated.
- g. Surface Burning Characteristics: Not more than the following when tested in accordance with UL 723:
  - 1. Flamespread: 25.
  - 2. Smoke Development: 450.
- h. UV Stable Mineral oxide pigments.
- C. Certifications:
  - 1. ICC ES AC 51 Acceptance Criteria for Manufactured Stone Veneer
  - 2. ICC Evaluation Service Evaluation Report ESR 1364 & ASTM C 1670.
  - 3. HUD Material Release Number 1316c
  - 4. UL Tested for Surface Burning Characteristics
  - 5. Texas Department of Insurance Product Evaluation EC-21
  - 6. Florida Product Approval Number FL15047
- D. Cultured Stone Veneer: Old Country Fieldstone
  - 1. Heights: Variable from 1 1/2 inches to 10 inches
  - 2. Lengths: Variable from 4 inches to 16 inches
  - 3. Color: Coastal Fog.

# PART 3 - EXECUTION

# 3.1 <u>EXAMINATION</u>

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other specific conditions, and other conditions affecting performance of unit masonry.
- B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.
- C. Notify Architect and do not proceed until unsatisfactory conditions have been corrected.

# 3.2 INSTALLATION, GENERAL

- A. Comply with referenced unit masonry standard and other requirements indicated applicable to each type of installation included in Project.
- B. Thickness: Build cavity and composite walls and other masonry construction to the full thickness shown. Build single-wythe walls to the actual thickness of the masonry units, using units of nominal thickness indicated.

- C. Build chases and recesses as shown or required to accommodate items specified in this and other Sections of the Specifications. Provide not less than 8 inches of masonry between chase or recess and jamb of openings and between adjacent chases and recesses.
- D. Leave openings for equipment to be installed before completion of masonry. After installation of equipment, complete masonry to match construction immediately adjacent to the opening.
- E. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting where possible.

# 3.3 <u>CONSTRUCTION TOLERANCES</u>

A. Comply with construction tolerances of referenced unit masonry standard.

# 3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.
- B. Lay up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.
- C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less that nominal 4-inch horizontal face dimensions at corners or jambs.
  - 1. Running bond with vertical joint in each course centered on units in courses above and below.
- D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- E. Stopping and Resuming Work: In each course, rake back 1/4-unit length for onehalf running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly (if required), and remove loose masonry units and mortar prior to laying fresh masonry.
- F. Built-In Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around all built-in items.

- 1. Fill space between door frames and masonry solidly with mortar, unless otherwise indicated.
- 2. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
- 3. Fill all cores in hollow concrete masonry units with grout.

# 3.5 MORTAR BEDDING AND JOINTING

- A. Lay solid masonry units with completely filled bed and head joint; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.
- B. Lay hollow concrete masonry units as follows:
  - 1. With full mortar coverage on horizontal and vertical face shells.
  - 2. Bed webs in mortar in starting course on footings and in all courses of piers, columns, and pilasters, and where adjacent to cells or cavities to be filled with grout.
  - 3. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.
- C. Cut joints flush for masonry walls to be concealed or to be covered by other materials.
- D. Tool joints for masonry walls to be exposed in compliance with referenced masonry standard.
- E. Tool joints in block veneer as directed by the Architect.

# 3.6 HORIZONTAL JOINT REINFORCEMENT

- A. General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8 inch on exterior side of walls, M inch elsewhere. Lap reinforcing a minimum of 6 inches.
- B. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

# 3.7 INSTALLATION OF REINFORCED UNIT MASONRY

A. General: Install reinforced unit masonry to comply with requirements of referenced unit masonry standard.

- B. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
- C. Install vertical reinforcing and secure with positioning ties <u>before</u> grout is placed.

## 3.8 TOLERANCES - PRECAST STONE PRODUCTS

- A. Comply with Cast Stone Institute Technical Manual 04720 (current edition).
- B. Variation from Plump: 1/8 inch in 10 feet or  $\frac{1}{4}$  inch in 20 feet
- C. Variation from Level: 1/8 inch in 10 feet or 1/4 inch in 20 feet or 3/8 inch maximum.
- D. Variation in Joint Width: Do not vary joint thickness more than 1/8 in 36 inches or 1/4 of normal joint width, whichever is less.
- E. Variation in Plane between Adjacent Surfaces. Do not exceed 1/10 inch difference between planes of adjacent surfaces indicated to be flush with units.

# 3.9 FIELD QUALITY CONTROL

- A. Testing Frequency: Tests and evaluations listed in this article will be performed during construction for each 5000 sq. ft. of wall area or portion thereof.
  - 1. Mortar properties will be tested per property specification of ASTM C 270.
  - 2. Mortar composition and properties will be evaluated per ASTM C 780.
  - 3. Grout compressive strength will be sampled and tested per ASTM C 1019.
- B. Evaluation of Quality Control Tests: In absence of other indications of noncompliance with requirements, masonry will be considered satisfactory if results from construction quality control tests comply with minimum requirements indicated.

#### 3.7 INSTALLATION OF CULTURED STONE

- A. Examination
  - 1. Do not begin installation until substrates have been properly prepared in conformance with ASTM C 1780 for the backup wall system indicated on the Drawings.
  - 2. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- B. Preparation
  - 1. Clean surfaces thoroughly prior to installation.
  - 2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

# C. Installation

- 1. Install in accordance with manufacturer's instructions.
- 2. Install manufactured stone masonry veneer in accordance with MVMA Installation Guide for Adhered Manufactured Stone Veneer, ASTM C 1780 and applicable Codes.
- 3. Install/Apply Related Materials in accordance with type of substrate and manufactured stone veneer manufacture's installation instructions.
- 4. General: Provide walls with Blended Color / Texture specified
- D. Mortar Joints:
  - 1. Style: Standard <sup>1</sup>/<sub>2</sub> inch joints, tooled
  - 2. Tool all grout joints
- E. Stone Direction:
  - 1. Random placement

END OF SECTION 04 20 00

## SECTION 05 12 04 - STRUCTURAL STEEL

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

- A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.
- B. The General Provisions of the Contract, including the General and Supplementary Conditions, apply to the work specified in this Section.

#### 1.2 SCOPE OF WORK

- A. The work under this Section consists of furnishing all labor, materials and equipment required to complete the structural steel as shown on the Drawings and/or as herein specified.
- B. Work Includes
  - 1. Beams, Girders, Angles and Columns
  - 2. Hangers, Bracing, and Girts
  - 3. Base Plates, Bearing Plates, and Leveling Plates
  - 4. Anchor Bolts
  - 5. Connections
  - 6. Masonry Anchors
  - 7. Roof Drain Angle Frames

#### 1.3 **QUALITY ASSURANCE**

- A. Standards
  - 1. Quality control, fabrication and erection shall be in accordance with the AISC 360-10 "Specification for Structural Steel Buildings" and the AISC 303-10 "Code of Standard Practice for Steel Buildings and Bridges", except as amended herein.
  - 2. Welding shall be in accordance with the AWS Structural Welding Code as modified by AISC Section 1.17 "Welds".
  - 3. Surface preparation for structural steel painting shall conform with "Steel Structures Paint Manual, Vol. 2, Systems and Specifications".
- B. Qualified Welders
  - 1. All welding, shop and field, shall be done by certified welders.

- C. Testing
  - 1. The Owner may retain and pay for an approved testing laboratory to inspect field welds, bolting, decking, and erection.
  - 2. The cost of retesting shall be paid by the Contractor.

# 1.4 COORDINATION AND MEASUREMENTS

- A. Prior to submitting Shop Drawings, the Contractor shall field verify all dimensions and elevations to assure proper fabrication and erection.
- B. The work of this Section shall be closely coordinated with work of other trades.

#### 1.5 <u>SUBMITTALS</u>

#### A. Shop Drawings

- 1. The Contractor shall submit two (2) prints and one (1) reproducible of Shop and Erection Drawings showing all structural steel members and connections including anchor bolts to the Engineer for review. Any work begun before drawings are reviewed by the Engineer will be at the Contractor's own risk.
- 2. Erection Drawings shall clearly show the following: sizes, locations and elevations of all members; grades of steel; standard connections per AISC Manual fully identified for all beam support points; details of non-standard and eccentric connections indicated on Structural Drawings; notes on connectors and fasteners; shop painting instruction, erection notes, and field painting instruction.
- 3. Detail Shop Drawings showing all members shall be submitted for review. Such drawings shall show size, length, connections and connection locations.
- 4. Acceptance will be for size and arrangement for principal and auxiliary members. Any error in dimensions will be the responsibility of the Contractor.
- 5. The following paragraph in Section 4 Shop and Erection Drawings of the AISC "Code of Standard Practice for Steel Buildings and Bridges" shall be deleted:

"4.2.1 Approval by the owner of shop drawings prepared by the fabricator indicates that the fabricator has correctly interpreted the contract requirements. This approval constitutes the owner's acceptance of all responsibility for the design adequacy of any connections designed by the fabricator as a part of his preparation of these shop drawings. Approval does not relieve the fabricator of the responsibility for accuracy of detail dimensions on shop drawings, nor the general fit-up of parts to be assembled in the field."

- B. Certificates
  - 1. Mill certificates covering any portion of the steel shall be furnished if requested by the Engineer.
  - 2. AWS welding certificates for shop or field welders shall be furnished if requested by the Engineer.

# PART 2 - PRODUCTS

# 2.1 MATERIALS

- A. All structural steel wide flange shapes shall conform to the requirements of ASTM A572, Grade 50 or ASTM A992. Plates, channels, angles, and other miscellaneous steel shall conform to the requirements of ASTM A36.
- B. All structural steel tubing shall conform to requirements of ASTM A500, Grade "B", manufactured by seamless or continuous weld process with rounded corners and outside sizes shown.
- C. All structural steel pipe shall conform to requirements of ASTM A53.
- D. Welding electrode types for A36, A572, and A992 steel shall conform to AISC Specifications using E-70XX electrodes.
- E. Shop paint shall be Tnemec Co. No. 88HS-559 gray metal modified alkyd primer, or approved equal.
- F. Bolts shall conform to high strength A325.
- G. Anchor bolts and rods shall conform to ASTM F1554, Grade 36. Use Grade 55 where specifically noted on Documents.

# PART 3 - EXECUTION

# 3.1 FABRICATION AND ERECTION

- A. Connections of structural steel members, not otherwise noted or shown, shall be framed using connections which will develop the full strength of the beam. Design of end connections shall be in accordance with the AISC "Manual of Steel Construction". Field connections may be bolted using three-quarter (3/4") inch bolts, except where noted welded. A minimum of two (2) bolts per member connection is required.
- B. Connections shall be consistent with "Type 2" construction as described in the AISC Specifications, unless otherwise indicated on the Structural Drawings.
- C. All column ends scheduled to receive cap and base plates shall be milled or sawn to

ensure full bearing. All surfaces to be welded shall be free from loose scale, rust, grease, paint or other foreign material, except that mill scale which resists vigorous brushing may remain. Joint surfaces shall be free from fins or tears.

- D. Fillet weld shall be one-quarter (1/4") inch minimum, unless otherwise noted.
- E. Technique of welding employed, the appearance and quality of welds and the methods of correcting defective work shall conform to American Welding Society's latest edition of "Structural Welding Code". All welding shall be by AWS certified welders.
- F. Provide one-half (1/2") inch diameter bolts at two feet six inches (2'-6") on center, staggered where the attachment of wood blocking and/or nailers are indicated on the Drawings.
- G. Provide flexible masonry anchors as required in Division 4.
- H. The Contractor shall accept full responsibility for design strength, safety and adequacy of all temporary bracing and sequencing of structural steel erection to brace the structure. Provide all temporary braces, guys, connections and work platforms required to safely resist all loads to which the structure may be subjected, including storms.
- I. The Contractor shall guy, plumb, and align framing in accordance with limits defined in the "Code of Standard Practice" of AISC.
- J. Any corrections required in field to make members fit shall be brought to the attention of the Engineer for approval.
- K. Provide angle frames for all openings in steel roof deck larger than twelve (12) inches.
- L. Provide angle frame to support all roof drain sump pans.

# 3.2 <u>PAINTING</u>

- A. All structural steel not concrete encased or to which spray fireproofing will not be applied shall receive one (1) coat of shop paint applied only after all fabrication is completed and as specified by the manufacturer's label on the containers. Prior to painting, steel shall be thoroughly cleaned of dirt, mud, loose rust or other foreign matter which may have accumulated. Shop coat dry film thickness shall be two (2.0) mils minimum.
- B. Do not shop paint areas adjacent [two (2") inches either side] to field welds.
- C. Dried shop paint shall be free of abrasions, runs, sags, cracking, delaminations, skipped, and missed areas. All deficiencies shall be corrected at no additional cost to the Owner

#### END OF SECTION 05 12 04

#### SECTION 05 50 00 - METAL FABRICATIONS

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

## 1.2 <u>SUMMARY</u>

- A. This Section includes the following metal fabrications and described and further described on the drawings:
  - 1. Loose steel lintels for all masonry construction
  - 2. Metal pipe bollards for protection of standby emergency generator, utility transformer, and overhead door installations.
  - 3. Miscellaneous framing and supports for the following:
    - a. Continuous galvanized angles embedded within concrete slab at all overhead door conditions (typical of 2 at Sally Port, typical of 1 at Storage Outbuilding).
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 03 30 00 "Cast in Place Concrete" for installation of concrete slabon-grade and reinforcing materials.
  - 2. Section 11 19 00 "Detention Equipment" for security benches within Prisoner Processing / Booking areas.
  - 3. Section 04 20 00 "Unit Masonry" for installation of loose lintels in masonry work.

#### 1.3 <u>SUBMITTALS</u>

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.
- C. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of architects and owners, and other information specified.

#### 1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.
- B. Welding Standards: Comply with applicable provisions of AWS DI.1 "Structural Welding Code--Steel," AWS DI.2 "Structural Welding Code--Aluminum," and AWS DI.3 "Structural Welding Code--Sheet Steel."
  - 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.
- C. Manufacturer: Provide metal fabrications as complete units produced by a single manufacturer, including necessary mounting accessories, fittings and fastenings.

#### 1.6 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting at no additional cost to the Owner.

#### PART 2 - PRODUCTS

# 2.1 FERROUS METALS

- A. Metal Surfaces, General: For surfaces exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, roughness, or, for steel sheet, variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

## CARVER POLICE CARVER, MA

- C. Steel Tubing: Product type (manufacturing method) and as follows:1. Cold-Formed Steel Tubing: ASTM A 500.
  - C C
- D. Rolled Steel Floor Plate: ASTM A 786/A 786M.
- E. Uncoated Structural Steel Sheet: Product type (manufacturing method), quality, and grade as follows:
  - 1. Cold-Rolled Structural Steel Sheet: ASTM A 611, grade as follows:
    - a. Grade A, unless otherwise indicated or required by
- F. Uncoated Steel Sheet: Commercial quality, product type (method of manufacture) as follows:
  - 1. Cold-Rolled Steel Sheet: ASTM A 366/A 366M.
- G. Gray Iron Castings: ASTM A 48, Class 30.
- H. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

# 2.2 <u>PAINT</u>

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

# 2.3 <u>FASTENERS</u>

- A. General: Provide plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electro-deposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
- B. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
  - Material: Group 1 alloy 304 or 316 stainless-steel bolts and nuts complying with ASTM F 593 (ASTM F 738M) and ASTM F 594 (ASTM F 836M).

# 2.4 FABRICATION, GENERAL

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- C. Shear and punch metals cleanly and accurately. Remove burrs.
- D. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Remove sharp or rough areas on exposed traffic surfaces.
- F. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- H. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
  - 1. Include brackets, clips, miscellaneous fittings and anchors for interconnection and attachment of metal fabrications to other work.
  - 2. Furnish inserts, sleeves and other devices for connecting metal fabrications to concrete or masonry work.
- I. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for re-assembly and coordinated installation.
- J. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- K. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

#### 2.5 LOOSE STEEL LINTELS

- A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Weld adjoining members together to form a single unit where indicated.
- C. Size loose lintels as indicated on Contract Documents.

#### D. Galvanize all loose lintels located in exterior wall locations.

#### 2.6 <u>STEEL PIPE BOLLARDS</u>

- A. Bollards shall be constructed of Schedule 40 steel pipe to quantities as shown on contract documents. Each bollard location to be supplied in 8'-0" lengths for installation by General Trades Contractor.
- B. Galvanizing: Bollard must be hot dip galvanized after fabrication in compliance with ASTM A-123, A-153 and/or A-386.
  - 1. To minimize surface imperfections (e.g. flux inclusions), material to be galvanized shall be dipped into a solution of Zinc Ammonium Chloride (ZAC) immediately prior to galvanizing.
  - 2. To minimize distortion and to thoroughly dry the ZAC, material which is less than 30 feet in length shall be placed into a suitable dryer/preheater with a heating capability of not less than 200 degrees F. The type of galvanizing process utilizing a flux blanket overlaying the molten zinc shall not be permitted.
  - 3. Following galvanizing, all items must be chromated by dipping in a chromic acid solution (minimum 0.15% by volume).
  - 4. Field welds must be repaired by applying two coats, each to a dry film thickness of 2.0 mils, of a one package, 95% organic zinc rich paint (equal to ZIRP as manufactured by Duncan Galvanizing) to all damaged areas. Grinding must be limited to the weld area.
- C. Concrete fill for bollards by Section 03 30 00 Cast-in-Place Concrete
- D. Painting of bollards by Section 09 90 00 Painting. Color shall be Safety Yellow.

# 2.7 <u>FINISHES, GENERAL</u>

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designing finishes.
- B. Finish metal fabrications after assembly.

# CARVER POLICE CARVER, MA

#### 2.8 STEEL AND IRON FINISHES

- A. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with the following requirements:
  - 1. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (0.76 mm) thick or thicker.
  - 2. Galvanize miscellaneous metals in the following locations:
    - 1. ALL exterior locations.
    - 2. Other locations as indicated on the Contract Documents.
- B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
  - 1. Exteriors (SSPC Zone 1B): SSPC-SP 6 "Commercial Blast Cleaning."
  - 2. Interiors (SSPC Zone 1A): SSPC-SP 3 "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 111 for shop painting.

## PART 3 - EXECUTION

# 3.1 PREPARATION

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete. Coordinate delivery of such items to Project site.

#### 3.2 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.

# CARVER POLICE CARVER, MA

- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.
- E. Field Welding: Comply with the following requirements:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

# 3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Clean and touchup paint of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal.
- B. For galvanized surfaces, clean welds, bolted connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05 50 00

## SECTION 05 51 33 - ALUMINUM SHIPS LADDER

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing the following metal fabrications:
  - 1. Aluminum Ships Ladder from **Custodial 141** to **Attic 200** including ladder and handrails.

#### 1.3 SYSTEM DESCRIPTION

A. The system is an aluminum ladder designed to be permanently attached top and bottom.

#### 1.4 DELIVERY, STORAGE, AND HANDLING.

- A. Examine ladder when it arrives on site. Notify the carrier and manufacturer of any damage.
- B. Store ladder until installation under roof, if possible; or, if stored outside, under a tarp or suitable cover.

#### 1.5 WARRANTY

- A. The unit carries a limited warranty of five (5) years against defective material and workmanship, covering parts only, no labor or freight.
- B. Defective parts, if deemed so by the manufacturer, will be replaced no charge, freight excluded, upon inspection at manufacturer's plant which warrants same.

#### 1.6 <u>MAINTENANCE</u>

- A. Under normal usage, the ladder shall require no preventive maintenance.
- B. No "spare parts" shall be required.

#### PART 2 - PRODUCTS

## CARVER POLICE CARVER, MA

## 2.1 <u>MANUFACTURERS</u>

A. Basis of Design: Precision Ladders, LLC, 5727 Superior Drive, Morristown, Tennessee 37814. Phone: (800) 225-7814. FAX: (423) 586-2091, or approved equal.

#### 2.2 <u>MATERIALS</u>

## A. LADDER

- 1. Design Requirements (Model SL)
  - a. Floor to Floor Height: as indicated on the drawings (field verify dimensions)
  - b. Pitch of Ladder: as indicated on the drawings (field verify dimensions)
  - c. Tread Width: As indicated on the drawings.
- 2. Stringers (Siderail)
  - a. Aluminum Channel: 5" X 2" X 3/16" (6005-T5).
- 3. Treads
  - a. 5-3/16 inch by 1-1/8 inch by 1/8 inch extruded 6005-T5 aluminum with serrated slip resistance surface standard. 1-1/4 inch by 1-1/4 by 1-1/4 inch angle welded to underside of treads. Treads shall be welded and bolted to stringer with 1/4" stainless steel bolts.
- 4. Mounting Bracket
  - a. Floor Brackets: 2 inch by 3 inch by 1/4 inch aluminum angle.
  - b. Top Bracket: 4-3/4 inch by 5 inch by 1/4 inch aluminum angle.

#### B. HANDRAILS

- 1. 1 1/4" Schedule 40 Aluminum pipe (6061 T-6).
- 2. Internal aluminum fittings provide smooth uninterrupted finish.
- 3. **Provide extended handrails at upper landing as indicated on the drawings.**
- C. SAFETY
  - 1. Deeply serrated aluminum channel treads.
  - 2. Tread both welded and bolted to stringer.

#### D. FABRICATION

- 1. Ladder is completely fabricated ready for installation before shipment to the site.
- 2. Handrail components are completely fabricated and assembled to the ladder before shipment to the site.
- E. FINISHES
  - 1. Standard Mill finish on aluminum components.

#### PART 3 - EXECUTION

# CARVER POLICE CARVER, MA

# 3.1 INSTALLATION

A. Install per the manufacturer's installation instructions.

END OF SECTION 05 51 33
## SECTION 06 10 00 - ROUGH CARPENTRY

#### PART 1 - GENERAL

### 1.1 <u>RELATED DOCUMENTS</u>

 A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing and/or installing the following:
  - 1. Wood sills, plates, stud walls, blocking, wall and roof sheathing, ceiling framing, temporary enclosures and duststops, shoring, bracing and rough hardware.
  - 2. Insulated nail base panel with plywood siding, air infiltration barriers / seam tape for exterior wall and plywood sheathing for roofing construction as indicated.
  - 3. Wood blocking and wood ledgers for support of roofing and trim, fastening of built-in components, etc.
  - 4. Wood backer boards (plywood) and associated wood blocking for support of Division 15 and Division 16 wall mounted equipment where indicated on the drawings.
  - 5. Laminated Veneer Lumber (LVL's) and Laminated Strand Lumber (LSL's), as indicated on the drawings.
  - 6. Miscellaneous blocking, grounds, nailers, and panels including bracing for prefabricated wood roof trusses.
  - 7. Miscellaneous joist hangers, strapping, metal connectors, as indicated on the drawings.
  - 8. Plywood flooring and protective wood rails at Attic Catwalk construction as indicated on the drawings.
  - 9. Soffit venting as indicated on the drawings.
  - 10. Aluminum flashings related to exterior trim details not made part of roofing systems.
  - 11. Plywood interior wall finish within Storage Outbuilding (Alternate No. 1)
  - 12. Bond breaker membranes where indicated on the drawings.
  - 13. Safing insulation where indicated on the drawings.
  - 14. Installation of fiber cement siding and trims.
  - 15. Installation of transaction windows.
  - 16. Installation of high security key box.
  - 17. Installation of steel door frames, door hardware, setting of all door frames and installation of all doors within frames.
  - 18. Installation of toilet and bath accessories as specified.
  - 19. Installation of Postal Specialties as specified.

- 20. Installation of cellular PVC and cast plastic products as indicated on the drawings.
- 21. Installation of all exterior window units as indicated on the drawings.
- 22. Installation of recessed high security key box (knox box).
- 23. Installation of display case, visual display boards, and required wood blocking to support installations.
- 24. Installation of all required access panels as specified in Section 08305 and Division 15 and 16.
- 25. Installation of aluminum ships ladder as specified in Section 05 51 33.
- 26. Installation of equipment and/or accessories not specifically identified within the specifications.
- 27. Rough carpentry work not specified elsewhere and generally intended for support of other work.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 01 23 00 "Alternates" for work affection this section.
  - 2. Section 03 30 00 "Cast-In-Place Concrete" for wood formwork.
  - 3. Section 06 17 54 "Wood Trusses" for prefabricated wood roof trusses and wood bridging requirements, including engineering.
  - 4. Section 08 71 00 "Door Hardware" for hardware furnished for installation under this Section.
  - 5. Section 09 21 00 "Gypsum Board Assemblies" for gypsum sheathing, batt insulation, and metal stud wall construction.
  - 6. Section 10 11 00 "Visual Display Boards" for tackboards / markerboards that require wood blocking and to be installed under this section.
  - 7. Section 10 28 00 "Toilet and Bath Accessories" for toilet and bath accessories for installation under this Section.
  - 8. Section 10 55 00 "High Security Key Box" for knox box to be installed under this Section.
  - 9. Section 10 55 16 "Postal Specialties" for patrol mail boxes to be assembled and installed under this Section.

## 1.3 <u>REFERENCE STANDARDS</u>

- A. American Wood Council (AWC): ANSI NDS-2015 "National Design Specification for Wood Construction"
- B. Southern Pine Inspection Bureau (SPIB): SPIB "Grading Rules" (latest edition).
- C. Western Wood Products Association (WWPA): WWPA "Grading Rules for Western Lumber" (latest edition)
- D. National Lumber Grades Authority (NLGA): NLGA "Standard Grading Rules" (latest edition)
- E. American Plywood Association (APA): APA C-20 "Plywood Specification and Grade Guide"

- F. American Wood Preserver's Association (AWPA): LP-2 "Above Ground Use, Pressure Treated with Water-Bourne Preservatives"
- G. American Wood Council (AWC): AWC SDPWS-2015 "Special Design Provisions for Wind and Seismic"

## 1.4 <u>SUBMITTALS</u>

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
- B. Manufacturers information pertaining to dimensional and board lumber including design strengths, species, and moisture content.
- C. Wood treatment data from chemical treatment manufacturer. Include chemical treatment manufacturer's instructions for handling, storing, installing, and finishing treated material.
  - 1. Preservative Treatment: Include certification by treatment plant stating type of solution and pressure process used, net amount of preservative retained, and compliance with applicable standards.
  - 2. Waterborne Preservative Treatment: Include certification that moisture content of treated wood was reduced to levels specified prior to shipment to Project site.
  - 3. Warranty: Include warranty of chemical treatment manufacturer for each type of treatment.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack material above ground level on uniformly spaced supports to prevent deformation.
  - 1. For material pressure treated with waterborne chemicals, place spacers between each bundle for air circulation.
- B. All wood must be covered and completely weather protected and stored at least twelve (12") inches above grade.

## PART 2 - PRODUCTS

## 2.1 FRAMING LUMBER

A. All horizontal or sloping framing lumber two by six (2x6), two by eight (2x8), two by ten (2x10), and two by twelve (2x12), shall be No. 2 Douglas-Fir, having an allowable extreme fiber stress in bending "Fb" of 875 psi for single use and 1000 psi for repetitive member uses, and an "E" value of 1,600,000 psi, unless otherwise shown.

- B. All two by six (2x6) bearing studs, unless otherwise shown, shall be No. 2 Douglas Fir Construction Grade, having an allowable compression parallel to grain "Fc" of 1600 psi, and an "E" value of 1,500,000 psi.
- C. All horizontal sills in contact with earth bearing slabs, or concrete shall be Pressure-Treated.
- D. Light framing lumber used for studs in non-bearing walls and partitions shall not be less than Stud or Standard grade and shall have a compressive stress parallel to grain "Fc" of not less than 850 psi, Douglas Fir.
- E. Moisture content at delivery shall not exceed 19% for all general framing lumber. "Grade Mark", "Trade Mark" and Mill Identification Mark of Association having jurisdiction shall appear on each member.

### 2.2 WALL SHEATHING

A. APA Rated Sheathing Structural I, exterior glue. Span rating to suit framing spacing.

### 2.3 <u>ROOF SHEATHING</u>

A. APA Rated Sheathing Structural I, exterior glue. Span rating to suit framing spacing.

## 2.4 <u>ROUGH HARDWARE</u>

- A. General: Provide fasteners of size and type indicated that comply with requirements and products specified in this Article for material and manufacture.
  - 1. Where carpentry is installed at exterior locations, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M, or Type 304 stainless steel fasteners, as recommended in writing by wood-preservative-treatment manufacturer.
- B. Nails, Wire, Brads, and Staples: FS FF-N-105
- C. Power-Driven Fasteners: CABO NER-272.
- D. Wood Screws: ASME B18.6.1.
- E. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M)
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load

imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

- 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5, for interior applications.
- 2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Grade A1 or A4), for exterior applications.

## 2.5 BOARDS FOR EXPOSED AND CONCEALED CONDITIONS

- A. Species: The following:
  - 1. Douglas Fir.
- B. Moisture Content: Kiln-dry, KD 19 or MC 19 (19 percent maximum moisture content).
- C. Grade: No. 2 or better.

## 2.6 <u>CONSTRUCTION PANELS</u>

- A. Standards: Comply with requirements of PS 1 Voluntary Product Standard "Construction and Industrial Plywood" for veneer plywood and APA PRP-108 "Performance Standards and Policies for Structural-Use Panels" for performancerated panels.
  - 1. Trademark: Furnish construction panels that are each factory-marked with APA trademark for grade specified.
- B. Roof Decking: Grade: CDX, 3/4" (23/32) APA-trademarked plywood with span rating (48/24), Exposure 1 Classification, Fire Classification: Class III or C, Flame Spread Rating: 76-200, square edge construction. <u>Species Group 5 not permitted</u>.
- C. Attic Catwalk Decking: Grade: CDX, 3/4" (23/32) APA-trademarked plywood with span rating (48/24), Exposure 1 Classification, Fire Classification: Class III or C, Flame Spread Rating: 76-200, square edge construction. <u>Species Group 5</u> not permitted.
- D. Wall Sheathing: See Insulated Nail Base Insulation with plywood face.
- E. Miscellaneous Concealed Plywood: C-C Plugged Exterior, thickness as indicated but not less than 1/2 inch nominal.
- F. Miscellaneous Exposed Plywood / Storage Outbuilding interior wall finish: A-D Interior, thickness as indicated but not less than 5/8 inch nominal.

G. Electrical/Telephone Backing Panels: A-D Interior, FIRE-TREATED, thickness as indicated but not less than 3/4 inch nominal. Furnish and install fire treated wood blocking as indicated on the drawings for fastening of backer boards to wall surfaces.

### 2.7 <u>FASTENERS</u>

- A. General: Where miscellaneous carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide stainless steel fasteners of AISI Type 304 stainless steel.
- B. Nails, Wire, Brads and Staples: FS FF-N-105.
- C. Wood Screws: ANSI B18.6.1., except item D.
- D. Bolts: ASTM A 307, Grade A or ASTM A36; with ASTM A 563 hex nuts and flat washers.
- E. Strapping and metal connectors as required or as indicated on the Drawings, as manufactured by Simpson Strong-Tie Company, Pleasanton, CA, or equal.
- F. Miscellaneous metal strapping and metal anchorage hardware, such as truss anchors, shall be items as indicated on the drawings as manufactured by Simpson Strong Tie Company, Pleasanton, CA, or approved equal.
- G. Minimum fastening requirements shall meet or exceed State Building Code requirements and shall also be in accordance with exceptions that are noted or shown on the Structural Drawings and Specifications.

### 2.8 PRESERVATIVE WOOD TREATMENT BY PRESSURE PROCESS

- A. General: Obtain preservative-treated lumber complying with AWPA Standard C2. Mark each treated item with AWPB or SPIB Quality Mark Requirements. Coat surfaces cut after treatment to comply with AWPA M4.
- B. Above-Ground Wood Treatment: Pressure treat with waterborne preservatives to a minimum retention of 0.25 pcf.
  - 1. Kiln-dry interior dimension lumber after treatment to 15 percent maximum moisture content.
  - 2. Kiln-dry interior construction panels after treatment to 15 percent maximum moisture content.
  - 3. Treat wood items indicated and in the following circumstances:
    - a. In contact with roofing, flashing, or waterproofing.
      - b. In contact with masonry or concrete.
      - c. Within 18 inches of grade.

C. Ground-Contact Wood Treatment: Pressure treat with waterborne preservatives to a minimum retention of 0.40 pcf.

## 2.9 AIR INFILTRATION BARRIER AND SEAM TAPE

- A. Air Infiltration Barrier products to be DuPont Tyvek "<u>DrainWrap</u>", as manufactured by DuPont, or equal.
- B. Material:
  - 1. Air Penetration Resistance: less than .004 cfm/ft2 @ 1.57psf as per ASTM E2178
  - 2. Water Vapor Transmission: 36 perms as per ASTM E96-00
  - 3. Water Penetration Resistance: 210 cm as per ATTCC 127
  - 4. Basis Weight: 2.1 oz/square yd
  - 5. Breaking Strength: 30/30 lbs. / in as per ASTM D882
  - 6. Surface Burning Characteristics: Class A Flame Spread Index as per ASTM E84
  - 7. UV light Exposure: 4 months (120 days)
- C. Seaming Tape / Window Flange Tape: to be DuPont 3.0 mil Tyvek Tape, as manufactured by DuPont, or equal. Tape material to be UV resistant, biaxially oriented polypropylene film coated with a specially formulated permanent acrylic adhesive. Moisture transmission rate to be no more than 0.3 g/100in/24 hour @100 degrees F and 90% relative humidity.

## 2.10 VERTICAL NAILABLE POLYISO INSULATED PANELS

- A. Vertical nailable polyiso insulated panel products to be Hunter Panels Xci NB, as manufactured by Hunter Panels, 15 Franklin Street, Portland, Maine, or equal.
- B. General: High thermal rigid insulation panel composed of a closed cell polyisocyanurate foam core bonded to a premium performance coated glass fiber on one side and 5/8" plywood on the other to provide continuous insulation (ci) within the building envelope.
  - 1. ASTM C 1289 Type V, Class 2 grade 2 (20psi)
  - 2. Exterior Face: 5/8" plywood. C-D EXT-APA, square edge construction, or better, thickness as indicated but not less than 5/8 inch nominal. Species Group 5 not permitted.
  - 3. R-value: 9.6, minimum (2")
  - 4. Size: 4' x 8'

### 2.11 <u>SOFFIT VENTING</u>

- A. Soffit vents to be "#SV202" Continuous Soffit Vent as manufactured by Air Vent Inc., or equal.
- B. Soffit vents to be provided as follows:

- 1. Material: aluminum
- 2. Color: white
- 3. Size: 2-3/4" x 96"
- 4. Required Venting: 9 square inches / l.f.

## 2.12 LAMINATED VENEER LUMBER (LVL'S)

A. Laminated Veneer Lumber (LVL): Manufactured of structurally bonded wood veneer to have the following minimum structural properties:

 $F_b$ = 2,600 psi Ft=1,555 psi  $F_c$  (perp)=750 p.s.i.  $F_c$  (parallel)=2,510 psi  $F_v$ =285 psi E=1.9x10<sup>6</sup> psi G=118,750 psi.

- C. Laminated Veneer Lumber shall be designed and manufactured to the standards set forth in the ICC Evaluation Service, Inc., report ESR-1387. Adhesives shall be waterproof type and conforming to the requirements of ASTM D-2559.
- D. Laminated Veneer Lumber shall be designed to fit the dimensions and loads on the plans.
- E. Laminated Veneer Lumber (LVL's) shall be Microllam LVL, as manufactured by iLevel<sup>™</sup> Trus Joist<sup>®</sup>, Boise, ID, or equal meeting the performance criteria listed above, in a plant listed in the reports referred to above and under the supervision of an approved third-party inspection agency. It shall be manufacturer in a continuous process with all grain parallel with the length of the members. All members are to be free of finger or scarf joints or mechanical connections in full-length members.

## 2.13 WOOD COMPONENT "I" BEAM

- A. Wood component "I" beams shall be "TJI" series as manufactured by iLevel<sup>™</sup> Trus Joist®, Boise, ID or approved equal with the following components and requirements.
  - 1. Flange material shall be wood veneers permanently bonded together with the grain in each sheet running parallel to the next (Microllam® as manufactured by iLevel<sup>TM</sup> Trus Joist®, Boise, ID or approved equal).
  - 2. Web material shall be seven-sixteenth (7/16") inch orientated strand board with web section installed with face grain vertical and shall be joined by a glued-butt joint to form a continuous web.
  - 3. The flange/web connection shall be made by inserting the compressionbeveled edge of the web into a beveled groove in the wide face of the flange. The glue used in the joints shall be exterior-type conforming to ASTM D 2559.

## 2.14 JOIST AND BEAM HANGERS

A. Provide prefabricated metal hangers for framing members which do not bear directly on top of supporting members. Beam hangers shall be top flange bearing. Hangers shall be as manufactured by Simpson Strong-Tie Co., Inc., San Leandro, CA.

## 2.15 BOND BREAKER MEMBRANE

- A. Flashing Description: 0.8 mm of self-adhesive rubberized asphalt integrally bonded to 0.2 mm of cross-laminated, high-density polyethylene film to provide a min. 1.0 mm (40 mil) thick membrane. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
- B. Performance Requirements:
  - 1. Water Vapor Transmission: ASTM E96, Method B 2.9 ng/m2sPa (0.05 perms) maximum
  - 2. Water Absorption: ASTM D570 Max. 0.1% by weight
  - 3. Puncture Resistance: ASTM E154 356 N (80 lbs)
  - 4. Tear Resistance:
  - a. Initiation ASTM D1004 min. 58 N (13.0 lbs) M.D.
  - b. Propagation ASTM D1938 min. 40 N (9.0 lbs) M.D.
  - 5. Lap Adhesion at -4°C (25°F): ASTM D1876 880 N/M (5.0 lbs/in.) of width
  - 6. Low Temperature Flexibility ASTM D1970 Unaffected to -43°C (-45°F)
  - 7. Tensile Strength: ASTM D412, Die C Modified Min. 5.5 MPa (800 psi)
  - Elongation, Ultimate Failure of Rubberized Asphalt: ASTM D412, Die C – Min. 200%
- C. Product: Perm-A-Barrier® Wall Flashing manufactured by GCP Advanced Technologies Construction Products.

## 2.16 SAFING INSULATION

A. Product: Thermafiber Safing, Mineral Wool Insulation, manufactured by Owens Corning, or approved equal. Provide at locations and at thicknesses as indicated on the drawings.

## 2.17 ALUMINUM FLASHING AND MATERIALS

- A. ALUMINUM FLASHING AND MATERIALS (see drawings for location) shall be 0.0225", 17,000 PSI, ASTM B209-66, with baked enamel finish. Color to match trim materials
  - 1. All joints shall be lapped 4" over concealed splice plate with caulk.
  - 2. Shop/factory fabricate all metal components to the maximum extent possible. All trim and flashing, whether factory formed or not, shall

exhibit clear, sharp, straight and uniform bends. Hem all exposed edges or flashings.

- 3. Form flashing components from full single width sheet. Provide shop fabricated, mitered corners, joined using closed end pop rivets and joint sealant.
- 4. Fabricate sheet metal work in accordance with approved shop drawings and applicable standard.

### PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of miscellaneous carpentry and in sizes that would require an excessive number or poor arrangement of joints.
- B. Cut and fit miscellaneous carpentry accurately. Install members plumb and true to line and level.
- C. Coat cut edges of preservative-treated wood to comply with AWPA M4.
- D. Securely fasten miscellaneous carpentry as indicated and according to applicable codes and recognized standards.
- E. Countersink nail heads on exposed carpentry work and fill holes.
- F. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.
- G. Install long dimension of plywood roofing panels crossing main framing members (trusses) and wall studs.
- H. Implement all framing details, typical and specific, as shown on Structural Drawings. As example, required details include, but are not limited to, wall top plate splice, wall base anchorage, roof vented blocking, exterior wall header, multi-layer LVL construction (screwing), and stud partition abutting bearing wall details.
- I. Care should be taken to properly store all wood materials from damage due to handling, storage, or environmental conditions. Store all materials off of the ground and properly secured and protected.
- J. Carefully inspect the installed work of other trades and verify that all such work is complete where this installation may properly commence. Verify that rough carpentry may be performed in strict accordance with the design and all pertinent codes and regulations. In the event of discrepancy, notify Architect. Do not proceed with work until directions are received from Architect.

### 3.2 GENERAL FRAMING

- A. General: All rough carpentry shall produce joints true, tight, and well nailed with all members assembled as indicated. Set all horizontal and sloped members with crown up. Double members minimum for headers and trimmers.
- B. Selection of Lumber Pieces: Carefully select all members. Select individual pieces so that knots and obvious defects will not interfere with placing bolts or proper nailing or making proper connections. Cut out and discard all defects which will render a piece unable to serve its intended function. Lumber may be rejected by the Architect, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.
- C. Bearing: Make all bearings full unless otherwise indicated. Finish all bearing surfaces on which structural members are to rest so as to give sure and even support. Where framing members slope, cut or notch the ends as required to give uniform bearing surface. Minimum bearing one and one-half (1 1/2") inches on wood, four (4") inches on steel.
- D. Shimming: Do not shim any framing components.
- E. Alignment: On all framing members to receive a finished surface, alignment of the finish subsurface to vary not more than one-eighth (1/8") inch from the plane of surfaces of adjacent framing and furring members. Provide "padding" as required to achieve proper surfaces for finish materials.
- F. Holes and Notches: Do not bore holes closer than 2 inches from top or bottom of joists with hole diameter not to exceed one-third (1/3) the depth of member. Do not notch in middle third (1/3) of joist. Depth of notches in top or bottom of joists not to exceed one-sixth (1/6) the member depth. Notched ends not to exceed one-third (1/3) member depth. DO NOT cut holes or notches in truss members. Notches or holes over one (1") inch diameter in two by four (2x4) studs will require metal stud plates equal to Strong Tie SS Stud plates. Include nail stopper at all piping.
- G. Sills: Set in bed of Portland Cement mortar. Secure each member with a minimum of two (2) bolts. Secure sills to bolts with recessed washer and nut.
- H. Preservatives: Treat all wood in contact with concrete or masonry with wood preservative. Include blocking at perimeter of exterior wall openings.

## 3.3 <u>BLOCKING</u>

A. Install all blocking required to support all items of finish and to cut off all concealed draft openings, both vertical and horizontal, between ceiling and floor areas. Firestop concealed spaces with wood blocking not less than two (2")

inches thick unless blocked by other framing members. Provide blocking to support edges of all soffits, flashing, etc. Provide two (2")-inch solid blocking as required for securing edges of gypsumboard. Provide continuous blocking for gypsumboard ceiling at all edges. Also, provide blocking behind all wall or ceiling mounted accessories such as grab bars, cabinets, fans, light fixtures, plumbing lines, electrical panelboards, bathroom accessories, etc. Note that grab bars must be capable of supporting three hundred (300 LB) pounds after installation.

## 3.4 <u>BACKBOARDS</u>

A. Install three-quarter (3/4") inch thick C-D fir plywood backboards for mounting of electrical, telephone panels, etc. Backboards are to be painted by Section 06 10 00 prior to installation of equipment.

# 3.5 INSTALLATION OF PLYWOOD SHEATHING

A. Place plywood with face grain perpendicular to supports and continuously over at least two (2) supports, except where otherwise specifically indicated. Center joints accurately over supports; unless otherwise indicated. Protect all plywood from moisture by use of all required waterproof coverings until the plywood has in turn been covered with the next succeeding component of finish. Install one (1) plywood "H" clip between each framing member to support plywood at mid-span. Install insulation baffle at eave to ensure ventilation air passage between top of insulation and underside of roof sheathing.

## 3.5 <u>FASTENING</u>

- A. Rough Hardware: Anchor and nail shall comply with State Building Code.
- B. Nailing: Use only common wire nails or spikes of the dimensions shown on the Fastening Schedule, except where otherwise specifically noted on the drawings. For conditions not covered in the Fastening Schedule, provide penetration into the piece receiving the point of not less than one-half (1/2") inch the length of the nail or spike, provided, however, that 16d nails may be used to connect two (2) pieces of two (2") inch (nominal) thickness. Do all nailing without splitting wood. Prebore as required. Replace all split members.
- C. Bolting: Drill holes one-sixteenth (1/16) inch larger in diameter than the bolts being used. Drill straight and true from one (1) side only. Bolt threads shall not bear on wood. Use washers under head and nut where both bear on wood. Use washers under all nuts.
- D. Screws: For lag screws and wood-screws, prebore holes same diameter as root of threads; enlarge holes to shank diameter for length of shank. Screw, do not drive, all lag-screws and wood-screws.

# 3.6 LAMINATED VENEER LUMBER

A. Provide one-half (1/2") inch diameter at two (2') feet on center thru-bolts top and bottom of multiple units. Provide top flange hangers where laminated members are supported by trusses or other members.

### 3.8 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

- A. Install where shown and where required for screeding or attachment of other work. Cut and shape to required size. Coordinate location with other work involved.
- B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated.
- C. Provide wood blocking for all wall mounted or recessed equipment including, but not limited to, toilet accessories, fire extinguisher cabinet, visual display boards, metal fabrications, and wall mounted hardware.

## 3.9 DOOR HARDWARE INSTALLATION

- A. Mount hardware units at heights indicated in following applicable publications, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.
  - 1. "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.
- B. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.
- C. Set units level, plumb, and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- D. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.
- E. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section "Joint Sealers."
- F. Weatherstripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

### 3.10 TOILET ACCESSORIES INSTALLATION

A. Install each toilet accessories in compliance with the manufacturer's instructions and recommendations

### 3.11 TEMPORARY ENCLOSURES

A. Provide temporary enclosures, doors and dust barriers as required to protect building from weather and construction damage and to ensure building security. Upon completion, remove all temporary work and repair any damage to permanent finishes and installations. Verify requirements with Architect and Owner.

END OF SECTION 06 10 00

### SECTION 06 17 54 - WOOD TRUSSES

### PART 1 - GENERAL

### 1.1 <u>RELATED DOCUMENTS</u>

- A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.
- B. The General Provisions of the Contract, including the General and Supplementary conditions, apply to the work specified in this Section.

#### 1.2 SCOPE OF WORK

- A. The work of this Section includes all labor, supervision, material and equipment necessary for the completion of wood trusses in place, as shown on the Contract Drawings and as specified:
  - 1. Roof trusses
- B. All the miscellaneous parts, including: bridging, temporary and permanent bracing, and all related items of hardware, metal hangers necessary for the proper prefabrication, erection, assembly, supporting and anchoring of the wood trusses shall be provided.

#### 1.3 <u>RELATED WORK</u>

A. Section 06 10 04 - Rough Carpentry

#### 1.4 <u>REFERENCE STANDARDS</u>

- A. All trusses shall be designed, fabricated and erected in accordance with the following publications:
  - 1. Truss Plate Institute's "National Design Standard for Metal-Plate-Connected Wood Truss Construction".
  - 2. American Institute of Timber Construction (AITC) 102-72 "Appendix A, Trusses and Bracing".
  - 3. American Institute of Timber Construction (AITC) 102-72 "Standards for the Design of Structural Timber Framing".
  - 4. "National Design Specifications for Stress Grade Lumber and its Fastening" by National Forest Products Association.

5. Wood Truss Council of America and Truss Plate Institute BCSI 1-03 "Guide to Good Practice for Handling, Installing and Bracing of Metal Plate Connected Wood Trusses".

# 1.5 <u>SUBMITTALS</u>

- A. The Contractor shall submit two (2) prints and one (1) reproducible of Truss Shop Drawings showing:
  - 1. All truss locations, spacing, bearing details, member sizes, pitch, spans and dimensions.
  - 2. Sizes, species and stress grade of lumber.
  - 3. Loading conditions and stress increases.
  - 4. Nominal sizes and locations of connector plates at all joints.
  - 5. Actual axial loads in each member.
  - 6. Camber requirements.
  - 7. Location of permanent lateral bracing as required by the truss design and overall framing stability.
  - 8. Location of temporary lateral bracing as required for erection.

## 1.6 TRUSS ENGINEERING DESIGN

- A. All truss designs shall be prepared by a Professional Engineer licensed to practice in the State of Massachusetts.
- B. All submissions shall bear registration seal of Design Engineer.
- C. All truss designs shall include dead load and live load in accordance with the State of Massachusetts Basic Building Code and as hereinafter specified.
  - 1. Dead load shall be not less than the weight of materials used for construction and service equipment, including the following:
    - a. Roof trusses bottom chord.....10 PSF.
  - 2. Live load shall be the greatest load produced by the intended use and occupancy, but in no case less than the following:
    - a. Roof snow.....40 PSF.

## 1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver and handle trusses in a manner to avoid deforming member and excessive stresses.
- B. If trusses are stockpiled prior to erection, sufficient bearing points and/or bracing shall be provided to prevent excessive lateral bending that might result in distortion of truss

joints.

## PART 2 - PRODUCTS

## 2.1 LUMBER MATERIALS

- A. All truss materials shall be subject to approval by the Engineer, and shall conform to the Lumber Grade Use Guide of the National Lumber Manufacturer's Association.
- B. Truss Lumber shall conform to commercial association grades and dimensions based on American Lumber Standards as described in the latest edition of Department of Commerce Simplified Practice Recommendation R16. Sizes shown or specified are nominal dimensions required.
- C. All truss lumber shall bear the grade and trademark of the association under which rules and standards it was graded, or each shipment shall be accompanied with a certificate of inspection issued by that association.
- D. Truss lumber for framing shall be kiln dried to a moisture content not greater than 20% by weight.
- E. Truss Lumber: Lumber shall be No. 1 Southern Pine, or approved equal.
- F. Truss lumber for framing shall be 2x4 minimum.

### 2.2 <u>CONNECTORS</u>

- A. All truss connector plates shall be manufactured from ASTM A446-72 Grade A prime commercial quality galvanized sheet steel of no less than 20 gauge thickness which has a minimum yield of 33,000 psi and a minimum ultimate tensile strength of 45,000 psi. The corrosive resistant coating shall be ASTM A525-71 G90 or G60 commercial class hot dipped galvanized before stamping.
- B. Where field assembly of truss sub-components is necessary, the connections shall be in accordance with details shown on the truss design drawings approved by the Engineer.

### 2.3 FABRICATION

- A. All roof truss components shall be fabricated in a properly equipped manufacturing facility of a permanent nature. They shall be manufactured by experienced workmen, using precision cutting and truss fabricating equipment, under the direct supervision of a qualified foreman. All trusses shall be fabricated under strict rules of inspection and quality control, open to the inspection of the Architect or his representatives at all times.
- B. All truss members shall be accurately cut to length, angle and be true to line to assure tight joints for finished truss.

- C. All truss members and connector plates shall be properly placed in special jigs and the members tightly clamped in place, remaining in that position until the connector plates have been completely installed.
- D. Camber shall be built into trusses, as noted on the engineering truss designs, by properly positioning the members in the fabricating jig.
- E. Each truss shall be stamped with the name and address of the truss manufacturer.

# PART 3 - EXECUTION

## 3.1 ERECTION AND BRACING

- A. Framing anchors and/or truss hangers shall be provided by the Contractor in accordance with the engineering truss design.
- B. Field erection of the trusses, including items such as proper handling, safety precautions, temporary bracing to prevent toppling or dominoing of the trusses during erection, and any other safeguards or procedures consistent with good building erection practices, shall be the responsibility of the General Contractor and/or the Erection Contractor.
- C. During the entire construction period, all Contractors shall provide means for adequate distribution of concentrated loads so that the carrying capacity of any one truss and/or other component is not exceeded.
- D. Proper erection bracing shall be installed to hold the trusses true and plumb and in safe condition until permanent bracing and bridging can be solidly nailed in place to form a structurally sound framing system. All erection and permanent bracing shall be installed, and all components permanently fastened as soon as possible before the application of any loads.
- E. The permanent structural cross-bracing, to ensure the overall rigidity of the framing system, shall be in accordance with the building component safety information BCSI 1-03 "Guide to Good Practice for Handling, Installing & Bracing of Metal Plate Connected Wood Trusses" by the Wood Truss Council of America and Truss Plate Institute.
- F. All trusses shall be installed plumb at the specified spacing, in plane and adequately braced.
- G. Cutting of truss members or field alteration of any trusses is not permitted.

END OF SECTION 06 17 54

### SECTION 06 40 00 - COMPOSITE COLUMNS

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing the following exterior, decorative column units at the Public Entry (3 total) and Training Classroom (11 total):
  - 1. Expanded cellular PVC Columns (full columns and pilasters) with base and capital as indicated on the drawings and specified herein.
  - 2. Installation of PVC Columns and Pilasters by Section 06 10 00 Rough Carpentry

### 1.3 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data: Submit manufacturer's literature to show column requirements.
- C. Shop Drawings: Provide shop drawings for each type of column, base, and capital required. Include sections of typical members and dimensioned elevations. Show anchors, accessories, layout, and installation details.
- D. Samples: Provide the following samples of each product for initial selection of textures, as required, and for verification of compliance with requirements indicated.
  - 1. Samples for initial selection of texture:
    - a. Column: Sample of expanded cellular PVC material equal to specified manufacturer.
- E. Verification Samples: For each finish product specified, two (2) samples, minimum size four (4) inches square, representing actual product, color, and patterns.

### 1.4 **QUALITY ASSURANCE**

A. Design Criteria: The drawings indicate dimensional width requirements of columns and are based on the specific type and model indicated. Other columns

having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions and profiles are minor and do not change the design concept or intended performance as judged by the Architect. The burden of proof of equality is on the proposer.

## 1.5 **PROJECT CONDITIONS**

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.
  - 1. Allow for trimming and fitting wherever taking field measurements before fabrication might delay the Work.

### 1.6 <u>WARRANTY</u>

A. The columns shall be guaranteed in writing against defects in materials or workmanship for the lifetime of the original owner.

## 1.7 VERIFICATION OF DESIGN

- A. The components indicated on the drawings show dimensions established to accomplish the Architect's intended visual result and to conform to the building's configuration. The contractor shall verify that all components that will actually be provided for the work of this section will fit the building's structural elements and conform to the visual design criteria indicated on the drawings without materially altering profiles and alignments.
- B. Any additional support or backing components shall be provided by the installing contractor as part of the work of this section.

## PART 2 - PRODUCTS

## 2.1 <u>MANUFACTURERS</u>

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
  - 1. Melton Classics DuraClassic Columns, as manufactured by Melton Classics Incorporated, Lawrenceville, Georgia, (800)-963-3060, or equal to specification.

### 2.2 <u>MATERIALS</u>

A. Description: Training Classroom (Total of 11). Refer to floor plans for installations requiring <sup>1</sup>/<sub>2</sub> columns, <sup>3</sup>/<sub>4</sub> columns, and inside corner columns.

- 1. Columns shall be Melton Classics DuraClassic Column according to their Design No. #200DC-R (Tuscan Column Round).
- 2. Overall height: 9 feet
- 3. Bottom Diameter: 14 inches
- 4. Top Diameter: 12 inches
- 5. Base/Plinth Height: 7-3/8 inches
- 6. Plinth Width: 18.75 inches
- 7. Cap Height: 4 inches
- 8. Cap Width: 17.25 inches

Description: Entry Porticos (Total of 3)

- 1. Columns shall be Melton Classics DuraClassic Column according to their Design No. #200DC- R (Tuscan Column Round).
- 2. Overall height: 9 feet
- 3. Bottom Diameter: 14 inches
- 4. Top Diameter: 12 inches
- 5. Base/Plinth Height: 7-3/8 inches
- 6. Plinth Width: 18.75 inches
- 7. Cap Height: 4 inches
- 8. Cap Width: 17.25 inches
- B. Column design shall have proportions based on the Orders of Architecture.
- C. Columns shafts shall be manufactured from a fiber reinforced polyester resin and marble composite.
- D. Capitals and base/plinths shall be the manufacturer's standard for the size and design indicated.
- E. Refer to floor plans, wall sections, details, and structural drawings for installations requiring split columns due to structural elements.

# 2.3 FIBERGLASS AND RESIN MATERIALS

- A. Shaft shall meet the UL 94 rating.
- B. Final ratio of materials shall be 10% fiber 90% resin composite for the body of components.
- C. Shaft thickness shall be 3/8" to 1" depending on diameter.

## 3.1 <u>PHYSICAL PROPERTIES</u>

- A. Flexural Strength, psi 77 degrees F = 30,000
- B. Flexural Modulus, 77 degrees F = 1.3

- C. Tensile Strength, psi 77 degrees F = 18,000
- D. Barcol Hardness, 50-55

### PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.2 <u>PREPARATION</u>

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### 3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

## 3.4 <u>PROTECTION</u>

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 06 40 00

### SECTION 06 44 00 - ORNAMENTAL WOODWORK

### PART 1 - GENERAL

### 1.1 <u>RELATED DOCUMENTS</u>

 A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

### 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing and installing the following:
  - 1. Wood trim (White Maple, plain sliced) at **Vestibule 101, Public Lobby 106, Training Classroom 100** where indicated on the drawings.
  - 2. Wood chair rail trim (White Maple, plain sliced) at **Corridor 131**, **Corridor 139, and Corridor 152** where indicated on the Finish Drawings.
  - 3. Wood window trims including surrounds, sills, aprons (White Maple, plain sliced & MDF) as indicated on the drawings.
  - 4. Wood trim (White Maple, plain sliced) for closet pole and shelf detail as indicated on drawing.
- B. Related Sections: The following sections contain requirements that relate to this section:
  - 1. Furring, blocking, and other carpentry work that is not exposed to view is specified in Section 06 10 00 "Rough Carpentry".
  - 2. Section 09 90 00 "Painting" for final finishing of installed decorative wood trims as indicated on the drawings.
  - 3. Section 10 51 13 "Wardrobe Lockers" for wood benches furnished and installed by locker manufacturer.
  - 4. Section 12 32 16 "Manufactured Architectural Casework" for all plastic laminate casework, cabinetry, and countertops.

## 1.3 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of product and process specified in this section and incorporated into items of architectural woodwork during fabrication, finishing, and installation.
- C. Shop drawings for woodwork and fittings showing plan layout, elevations, ends and cross-sections.

- D. Product certificates signed by woodwork manufacturer certifying that products comply with specified requirements.
- E. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.

## 1.4 QUALITY ASSURANCE

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- A. Manufacturer Qualifications: Firm experienced in successfully producing architectural woodwork similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.
- B. Single-Source manufacturing and Installation Responsibility: Engage a qualified Manufacturer to assume undivided responsibility for woodwork specified in this section, including fabrication, finishing, and installation.
- C. AWI Quality Standard: Comply with applicable requirements of "Architectural Woodwork Quality Standards" published by the Architectural Woodwork Institute (AWI) except as otherwise indicated.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration. Keep covered with polyethylene film or other protective coating.
- B. Do not deliver woodwork until painting, wet work, grinding, and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."
  - 1. Follow procedures and schedules as provided by the General Trades Contractor.
- C. Store and dispose of solvent-based materials, and materials used with solventbased materials, in accordance with requirements of local authorities having jurisdiction.

## 1.6 **PROJECT CONDITIONS**

A. Environmental Conditions: Do not install woodwork until optimum temperature and humidity conditions for woodwork have been attained and stabilized so that woodwork is within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.

- B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing woodwork; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with construction progress to avoid delay of Work.
  - 1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with manufacture of woodwork without field measurements. Coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.
- C. Field Measurements: Verify sizes and shapes prior to fabrication by field measurements taken after base materials are installed.

## PART 2 - PRODUCTS

## 2.1 <u>MATERIALS</u>

- A. General: Provide materials that comply with requirements of the AWI woodworking standard for each type of woodwork and quality grade indicated.
- B. Lumber Standards: Comply with PS 20 "American Softwood Lumber Standard" for lumber and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee Board of Review.
- C. Plywood Standards: Comply with PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood and, for products not manufactured under PS 1, with APA PRP-108.
- D. Hardwood Lumber Standard: Comply with NHLA, National Hardwood Lumber Association rules.
- E. Inspection Agencies: Inspection agencies and the abbreviations used to reference them with lumber grades and species include the following:
  - 1. SPIB Southern Pine Inspection Bureau.
  - 2. WCLIB West Coast Lumber Inspection Bureau.
  - 3. WWPA Western Wood Products Association.
- F. Woodworking Standard: Where indicated for a specific product, comply with specified Divisions of the following:
  - 1. Architectural Woodwork Institute (AWI) Quality Standards.
- G. Glued-Up Lumber Standard: Comply with PS 56.

# 2.2 FABRICATION, GENERAL

- A. Wood Moisture Content: Comply with requirements of referenced quality standard for moisture content of lumber in relation to relative humidity conditions existing during time of fabrication and in installation areas.
- B. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:
  - 1. Corners and edges of solid wood (lumber) members less than 1 inch in nominal thickness: 1/16 inch.
  - 2. Edges of rails and similar members more than 1 inch in nominal thickness: 1/8 inch.
- C. Complete fabrication, including assembly, finishing, and hardware application, before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- D. Factory-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges of cutouts with a waterresistant coating.

# 2.3 <u>WOOD DOOR SURROUNDS, WALL BASE, DISPLAY CASE SURROUND,</u> <u>WINDOW SILLS, APRONS, CLOSET SHELVING, AND ALL WOOD TRIM</u> <u>EXPOSED TO VIEW TO RECEIVE CLEAR FINISH ON STAIN COAT</u>

- A. Material: White Maple, plain sliced, 3/4 inch thickness with radius edge condition. Material to be sanded, edges to be caulked to provide suitable base for clear finish (by Section 09 90 00)
- B. Finish: Stain coat and clear finish, by Section 09 90 00, "Painting".

# 2.4 <u>WOOD WINDOW SILLS, APRONS, AND WINDOW SURROUNDS TO RECEIVE</u> <u>PAINTED FINISH</u>

- A. Material: Medium Density Fiberboard (MDF), 3/4 inch thickness with radius edge condition. Material to be sanded, edges to be caulked to provide suitable base for paint finish (by Section 09 90 00)
- B. Finish: Painted finish, by Section 09 90 00, "Painting".

# 2.5 FASTENERS AND ANCHORS

A. Screws: Select material, type, size, and finish required for each use. Comply with FS FF-S-111 for applicable requirements.

- 1. For metal framing supports, provide screws as recommended by metal framing manufacturer.
- B. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.
  - 1. Countersink nails, fill surface flush, and sand where face nailing is unavoidable.
- C. Anchors: Select material, type, size, and finish required by each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts and anchors, as required, to be set into concrete or masonry work for subsequent woodwork anchorage.
- D. Adhesives: Comply with manufacturer's recommendations for adhesives.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

 Examine substrates for compliance with requirements for installation tolerances and other conditions affecting installation and performance of finish carpentry. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 <u>PREPARATION</u>

- A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.
- B. Deliver inserts and similar anchoring devices to be built into substrates well in advance of time substrates are to be built.
- C. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

## 3.3 <u>INSTALLATION</u>

- A. Quality Standard: Install woodwork to comply with AWI Section 1700 for same grade specified in Part 2 of this section for type of woodwork involved.
- B. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 8 feet-0 inch for plumb and level (including tops) and with no variations in flushness of adjoining surfaces.

- C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts. All surfaces of exterior trim to receive primed finish following cutting and scribing.
- D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fastener heads are required, use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.
- E. Caulk all exposed joints of installed woodwork prior to receiving finish paint.

### 3.4 <u>PROTECTION</u>

A. Provide final protection and maintain conditions in a manner acceptable to manufacturer and installer that ensures woodwork is without damage or deterioration at time of Substantial Completion.

END OF SECTION 06 44 00

### SECTION 06 60 00 - PLASTIC FABRICATIONS

#### PART 1 - GENERAL

## 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 **DESCRIPTION**

- A. This Section includes furnishing the following:
  - 1. Cast Plastic Fabrications as specified and indicated on the drawings including, but not limited to, cyma returns, crown moldings, flat astragals, crossheads (2), and as indicated on the drawings.
  - 2. Cellular PVC products as specified and indicated on the drawings including, but not limited to column wraps with decorative moldings, watertable, frieze boards, corner boards, fascia trims, window trims, soffit trims, decorative beadboard, trim boards and 5/4" and ½" sheet products.
  - 3. Manufacturer's recommended adhesives and fasteners
- B. Installation by Section 06 10 00 Rough Carpentry
- C. Refer to Section 01 23 00 "Alternates" for work affection this section.

#### 1.3 <u>SUBMITTALS</u>

- A. Product data: Submit manufacturer's descriptive literature, specifications, installation instructions, and limited warranty.
- B. Shop drawings: Submit full size details and methods of installation.
- C. Samples: Provide samples of standard design or profile of custom design. Submit three (3) material samples representing the texture, thickness and widths shown and specified herein.

## 1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store and handle according to manufacturer's instructions.

### 1.5 **PROJECT SITE CONDITIONS**

A. Furnish and install in cooperation with other trades.

B. Coordinate field measurements and shop drawings with fabrication and shop assembly.

### 1.6 <u>WARRANTY</u>

- A. Contractor's one year limited warranty against defects in materials and workmanship as stated in product literature.
- B. Cellular PVC and Cast Plastic Fabrications: Provide manufacturer's 25 year warranty against defects in manufacturing that cause the products to rot, corrode, delaminate, or excessively swell from moisture.

### PART 2 - PRODUCTS

## 2.1 CAST PLASTIC FABRICATIONS

- A. Use product catalog numbers as noted on drawings and specifications. For the purposes of comparison, all catalog numbers refer to FYPON molded millwork, Stewartstown, PA, 800-537-5349. Alternate manufacturers are acceptable if meeting the performance and profile criteria of this product.
- B. General:
  - 1. Ultra Violet: If properly coated, not affected.
  - 2. Solvent Resistance: Resistant.
  - 3. Odor I Gas: Under normal conditions, releases no gasses, odor free.
  - 4. Vermin and Fungus Resistance: Resistant.
  - 5. Insulation: Greater insulating value than comparable wood products.
- C. Standard FYPON:
  - 1. Material: High-density polymer comparable to kiln dried white pine with higher skin density.
  - 2. Moisture Resistance: Non-water absorbing, impervious.

## 2.2 <u>CELLULAR PVC TRIM BOARDS AND SHEET PRODUCTS</u>

- A.. Cellular PVC trim boards and sheet products to be AZEK Trimboards, Moosic, PA 18507, Toll Free: 877-ASK-AZEK or 877-275-2935. Alternate manufacturers are acceptable if meeting the performance and profile criteria of this product.
- B. Material: Free foam cellular PVC material with a small-cell microstructure and density of .55 grams/cm3.

## 2.3 <u>ACCESSORIES</u>

- A. Fasteners: "Cortex" concealed fastening system and matching PVC plugs designed for fastening PVC trimboards (thinner shank, blunt point, full round head).
  - 1. Staples, small brads and wire nails must not be used as fastening members.
  - 2. Fasteners shall be long enough to penetrate the solid wood substrate and a minimum of  $1\frac{1}{2}$ ".
  - 3. Utilize two (2) fasteners per every framing member for trimboard applications. Trimboards 12" or wider, as well as sheets, will require additional fasteners.
  - 4. Fasteners must be installed no more than 2" from the end of the board.
  - 5. Fasteners shall be corrosion and fade resistant over the life of the product.
  - 6. PVC plugs to match the color and finish of trimboards.
- B. Adhesives: Glue all plastic fabrication joints with manufacturer's recommended adhesives to prevent joint separation.
  - 1. Surfaces to be glued shall be smooth, clean and in complete contact with each other.
  - 2. Glue joints shall be secured with a fastener and / or fastened on each side of the joint to allow adequate bonding time.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Comply with manufacturer's product catalog installation instructions and product technical bulletin instructions.
- B. Fill all nail holes with manufacturer's approved filler material and sand for uniform appearance of finished product and finish material.
- C. Final finishing and painting by Section 09900 Painting.

## END OF SECTION 06 60 00

### SECTION 07 21 00 - BUILDING INSULATION

#### PART 1 - GENERAL

### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing and installing the following:
  - 1. Foundation wall insulation (rigid type) occurring at all slab on grade and vertical foundation wall conditions as indicated on Contract Documents.
  - 2. Acrylic Polymer coating and reinforcing mesh over all rigid insulation at perimeters of all <u>exposed foundation walls</u> as indicated on the drawings and specified herein.
  - 3. Extruded foam rafter vents at eaves as indicated on the drawings and specified herein.
- B. Related Sections: The following sections contain requirements that relate to this section:
  - 1. Section 07 21 13 "Spray Cellulose Insulation" for insulation in spray cellulosic form.
  - 2. Section 07 21 19 "Thermal Foam Insulation" for polyurethane foam insulation and accessories.
  - 3. Section 07 84 0 "Firestopping" for insulation installed as part of fire and smoke resistance assemblies.
  - 4. Section 09 21 00 "Gypsum Board Assemblies" for sound attenuation insulation installed as part of wall and partition assemblies.

### 1.3 **DEFINITIONS**

A. Thermal Resistivity: Where the thermal resistivity of insulation products are designated by "r-values," they represent the reciprocal of thermal conductivity (k-values). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivities are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

### 1.4 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product test reports from and based on tests performed by qualified independent testing laboratory evidencing compliance of insulation products with requirements including r-values (aged values for plastic foam insulation), fire performance characteristics, perm ratings, water absorption ratings, and other properties, based on comprehensive testing of current products.
- C. Foundation coating system information including coatings, mesh, and manufacturer's installation instructions.

# 1.5 **QUALITY ASSURANCE**

- A. Fire Performance Characteristics: Provide insulation materials identical to those whose indicated fire performance characteristics have been determined per the ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.
  - 1. Surface Burning Characteristic: ASTM E 84.
  - 2. Fire Resistance Ratings: ASTM E 119.
  - 3. Combustion Characteristics: ASTM E 136.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's recommendations for handling, storage, and protection during installation.
- B. Protect plastic insulation as follows:
  - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
  - 2. Protect against ignition at all times. Do not deliver plastic insulating materials to project site ahead of installation time.
  - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.
- C. Fire Precaution: Do not store rigid insulation or similar combustible materials inside the building or within 15 feet of any structure on the site. Observe proper fire precautions during installation of insulation.

## PART 2 - PRODUCTS

## 2.1 <u>MANUFACTURERS</u>

- A. Manufacturers: Subject to compliance with requirements, provide insulation products of one of the following:
  - 1. Extruded Polystyrene Board Insulation:
    - a. Amoco Foam Products Co.
      - b. Dow: The Dow Chemical Company.
      - c. UC Industries, Inc.
  - 2. Foundation Coating System:
    - a. Styro Industries, Madison, WI
    - b. "or equal" product meeting, or exceeding, product specifications

## 2.2 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
  - 1. Preformed Units: Sizes to fit applications indicated, selected from manufacturer's standard thickness, widths, and lengths.
- B. Extruded Polystyrene Board Insulation: Rigid, cellular polystyrene thermal insulation with closed-cells and integral high density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578, Type VII, with a compressive resistance of 60 psi; in manufacturer's standard lengths and widths; thickness as indicated on drawings.
  Products: "Styrofoam SM/SB", Dow Chemical USA, or equal.

# 2.3 <u>FOUNDATION FINISHING SYSTEM</u>

- A. Foundation finishing system: For vertical acrylic coating system applied to concrete foundation walls of the <u>areas containing a radiant slab heating system</u> <u>only</u>, provide TUFF II, pre-mixed acrylic trowel / spray-on foundation finishing system, manufactured by Styro Industries Inc., Madison, WI, ., or equal, consisting of the following components:
  - 1. Sticky Mesh HD to be applied over all rigid foam insulation board both above, and below grade.
  - 2. TUFF II Foundation finishing system: Furnish and install system coating top layer in coarse finish to all areas of grade foundation insulation system. Top coat to provide durable, UV-resistant, and weather resistant properties to all above grade, exposed areas of foundation walls.
- B. Install foundation finishing system according to all manufacturer's recommendations for application, temperature ranges, minimum thickness, crack control. Installation to be over R-15 rigid insulation board as specified herein.
- C. Color: Concrete Grey
- D. Physical Properties:

- 1. PH (wet): Approximately 10.5
- 2. Density (wet): 12 pounds per gallon
- 3. Chemistry: Polymer based 100% acrylic
- 4. Coverage: 80 s.f. per 5 gallon pail.

## 2.3 EXTRUDED FOAM RAFTERVENTS

- A. Rigid polystyrene sheet shaped to create an air channel in the cavity between the insulation and the roof deck.
  - 1. AtticMate under Deck Attic Vent, Owens Corning, or equal.
  - 2. Net free air flow: 22.3 square inches
  - 3. Material: Extruded plystyrene
  - 4. Air Channel Depth: 1.5", minimum
  - 5. Width: Sized to fit rafter spacing as indicated on the drawings.
  - 6. Length: 4'-0"

### PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates and conditions with Installer present, for compliance with requirements of the Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

### 3.2 **PREPARATION**

A. Clean substrates of substances harmful to insulations or vapor retarders, including removal of projections that might puncture vapor retarders.

### 3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's instructions applicable to products and application indicated if printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with installation of insulation.
- B. Extend insulation full thickness as indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation. Remove projections that interfere with placement.
- C. Apply a single layer of insulation of required thickness, unless otherwise shown or required to make up total thickness.

## 3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

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A. Extend two inch total thickness of rigid insulation extending from concrete slab to dimensions as indicated on the drawings.

# 3.5 <u>PROTECTION</u>

A. General: Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00
## SECTION 07 21 13 - SPRAY CELLULOSE INSULATION

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing and installing the following:
  - 1. Building insulation in spray cellulosic fiber form for horizontal attic and perimeter eave installations where indicated on the drawings.
  - 2. Storage Outbuilding (Alternate No. 2/3): Non-woven polypropylene sheeting securely fastened to framing members to receive spray cellulosic fiber insulation.
- B. Related Sections: The following sections contain requirements that relate to this section:
  - 1. Section 01 23 00 "Alternates" for work affection this section.
  - 2. Section 07 21 00 "Building Insulation" for polystyrene board insulation installed at concrete foundation wall conditions and foam insulation baffles at eaves.
  - 2. Section 07 84 00 "Firestopping" for insulation installed as part of fire and smoke resistance assemblies.

#### 1.3 <u>DEFINITIONS</u>

A. Thermal Resistivity: Where the thermal resistivity of insulation products are designated by "r-values," they represent the reciprocal of thermal conductivity (k-values). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivities are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

#### 1.4 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product test reports from and based on tests performed by qualified independent testing laboratory evidencing compliance of insulation products with requirements including r-values, fire performance characteristics, perm ratings, water

absorption ratings, and other properties, based on comprehensive testing of current products.

# 1.5 **QUALITY ASSURANCE**

- A. Fire Performance Characteristics: Provide insulation materials identical to those whose indicated fire performance characteristics have been determined per the ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.
   1. ASTM C-739 and ASTM C-1149 standards
- B. Single-Source Responsibility for Insulation Products: obtain each type of building insulation from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- C. Cellulose insulation must be installed by a National Fiber certified applicator, in accordance with manufacturer's specifications.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's recommendations for handling, storage, and protection during installation.

# PART 2 - PRODUCTS

# 2.1 <u>MANUFACTURERS</u>

- A. Manufacturers: Subject to compliance with requirements, provide cellulose insulation products of one of the following:
  - 1. Manufacturers of Cellulose Insulation:
    - a. National Fiber, 50 Depot Street, Belchertown MA 01007, or equal.
    - b. Product Name: NuWool Premium Blown-in Cellulose Insulation at horizontal installations where indicated on the drawings.

# 2.2 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
  - 1. All ceilings and horizontal installations forming the thermal envelope of the structure shall be supplied with cellulose fiber insulation to the full thickness / R-value as indicated on the drawings. Installed density of 1.6 pcf, R-3.8 / inch, minimum required. Install foam rafter vents to maintain 2" vented air space at all times from soffit venting to attic areas.

- B. Material: Cellulose insulation shall contain a total borate fire retardant and be EPA certified to resist mold. Cellulose insulation must conform to ASTM C-739 and ASTM C-1149 standards.
- C. Physical Properties:
  - 1. R-value (Thermal resistance): 3.8 per inch, ASTM C518
  - 2. Settled density: 1.6 lbs/cu ft at horizontal installations
  - 3. Recycled content: Greater than 82%
  - 4. Fire retardancy: Class 1 material, ASTM C739
  - 5. Fire retardant: All borate (boric acid)
  - 6. Fire testing: Meets ASTM E84 surface burning and ASTM E119 fire resistance
  - 7. Flame spread: 15
  - 8. Smoke developed: 5
  - 9. Critical radiant flux: Greater than or equal to 0.12 watts/sq cm
  - 10. Smoldering combustion: Less than or equal to 15%
  - 11. Moisture absorption: Less than 15%
  - 12. Corrosiveness: Acceptable, ASTM C739
  - 13. Fungal growth: Acceptable
  - 14. Starch content: Acceptable
  - 15. Odor emission: Non-apparent

## 2.2 <u>NON-WOVEN POLYPROPYLENE SHEET (STORAGE OUTBUILDING)</u>

- A. Material: 100% Polypropylene sheet material, color, White, meeting ASTM E 84-01.
- B. Physical Properties:
  - 1. Description: Non-woven polypropylene sheet
  - 2. Composition: 100% polypropylene
  - 3. Thickness: 0.006 in (nominal, 9.5 mils
  - 4. Unit Weight: 1.22 oz/yd squared
  - 5. Color: Natural (white)
  - 6. Fire testing: Meets ASTM E84 surface burning
  - 7. Flame spread: 5
  - 8. Smoke developed: 40
- C. Staple to all wood framing members at 1" o/c. Securely fasten material to substrate to support the applied weight of spray cellulose insulation at settled thicknesses as indicated.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates and conditions with Installer present, for compliance with requirements of the Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are

satisfactory. Do not proceed with installation of insulation until unsatisfactory conditions have been corrected.

## 3.2 <u>PREPARATION</u>

A. Clean substrates of substances harmful to insulations and vapor retarders, including removal of projections that would impair the thermal performance of the insulating material.

## 3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's instructions applicable to products and application indicated. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with installation of insulation.
- B. Extend insulation full thickness as indicated to envelop entire area to be insulated. Fit tightly around obstructions, and fill voids with insulation. Remove projections that interfere with placement.

## 3.4 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation to substrate by method indicated complying with manufacturer's recommendations.
- B. Spray cellulose fiber insulation into all miscellaneous voids and cavity spaces.
  - 1. Loosefill insulation shall be installed to provide the rated R-value at manufacturer's settled density.
  - 2. Spray applied insulation shall be installed at a minimum cured density of 3.25 lbs/cuft.
  - 3. <u>All installations within walls and vertical installations shall be rolled</u> <u>flat, ready for drywall.</u>

# 3.5 <u>PROTECTION</u>

A. General: Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 13

## SECTION 07 21 19 - THERMAL FOAM INSULATION

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

 A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

#### 1.2 <u>SECTION INCLUDES</u>

- A. This Section includes furnishing and installing the following:
  - 1. Spray-in-place, rigid, closed cell, 2 pound polyurethane foam insulation in all new vertical wall assemblies, to provide a continuous thermal resistance barrier as specified herein and indicated on the drawings.
  - 2. All accessories required and customary for a complete and continuous thermal barrier at vertical walls planes and where indicated on the drawings.

#### 1.3 <u>RELATED SECTIONS</u>

- A. Section 07 21 00 "Building Insulation" for insulation in board form.
- B. Section 07 84 00 "Firestopping" for insulation installed as part of fire and smoke resistance assemblies.
- C. Section 09 21 00 "Gypsum Board Assemblies" for fiberglass batt sound insulation within interior wall construction.

## 1.4 <u>REFERENCES</u>

- A. American Society for Testing and Materials (ASTM):
  - 1. ASTM C 518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
  - 2. ASTM D 1621 Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
  - 3. ASTM D 1622 Standard Test Method for Apparent Density of Rigid Cellular Plastics.

- 4. ASTM D 1623 Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
- 5. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- 6. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials.
- 7. ASTM E 283 Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

#### 1.5 <u>SUBMITTALS</u>

- A. Submit under provisions of Section 01300.
- B. Before commencing work, submit in accordance with local code.
  - 1. Submit technical data sheets and samples as required by local code officials.
  - 2. Submit the technical data sheet from the manufacturer showing the test results from the ASTM E84 (Surface Burning Characteristics).
- C. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.

## 1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
  - 1. Contractor performing work under this section shall be trained by manufacturer in the art of applying spray polyurethane foam insulation.
  - 2. Provide current manufacturer's Authorized Contractor Certification.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Materials shall be delivered in manufacturer's original sealed containers clearly labeled with manufacturer's name, product identification, safety information, net weight of contents and expiration date.
- B. Material shall be stored in a safe manner and where the temperatures are in the limits specified by the material manufacturer.
- C. Empty containers shall be removed from site on a daily basis.
- D. Store and dispose of solvent-based materials, and materials used with solventbased materials, in accordance with requirements of local authorities having jurisdiction.

## CARVER POLICE CARVER, MA

#### 1.8 **PROJECT CONDITIONS**

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Ventilate area to receive insulation to maintain safe working conditions.
- C. Protect workers as recommended by standards and manufacturer's recommendations.
- D. Protect adjacent surfaces, windows, equipment and site areas from damage of overspray.

#### 1.9 WARRANTY

- A. Manufacturer's Warranty: Manufacturer warrants spray-in-place urethane foam insulation, when installed by certified contractors using factory-trained applicators and applied in accordance to the Product Specification, will perform as stated in the Product Technical Data Sheet.
  - 1. This warranty is in effect throughout the life of the building provided the original purchaser registers with the Warranty Department of the Manufacturer within thirty days of occupancy.
  - 2. Manufacturer's sole responsibility under this Limited Lifetime Warranty shall be to repair or replace any defective Product at the cost of the material only.
  - 3. Manufacturer shall not be responsible for labor cost or any other costs whatsoever related to, or in connection with the removal or installation of either the original or replacement product.

## PART 2 - PRODUCTS

## 2.1 <u>MANUFACTURERS</u>

A. Acceptable Manufacturer: DEMILEC USA LLC, Arlington, TX 76011; or approved equal meeting the performance requirements specified herein.

## 2.2 SPRAY FOAM INSULATION

- A. Spray Applied Rigid Polyurethane Foam Insulation System:
  - 1. Product: HEATLOK SOY® 200 PLUS Manufactured by DEMILEC USA®, Arlington, TX
  - 2. Product Approval:
    - a. International Code Council Evaluation Services Report #3210
    - b. Approved for non-structural walls in building types I, II, III, IV, and V construction under IBC and dwellings for IRC.

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## THERMAL FOAM INSULATION

- c. Approved for exterior walls in building types I, II, III, and IV construction. (In Progress)
- d. Passed AC 377 Appendix X compliant NFPA 286.
- 2. Physical Properties:
  - a. Density (ASTM D 1622): 2.1 lb/cf (0.034 gm/cu. cm).
  - b. Thermal Resistance (ASTM C 518): Aged R value at 1 inch (180 days at 76 degrees F (23 degrees C)) R-7.4 (sf.h degree F/BTU)
  - c. Water Vapor Permeance @ 1.2"(ASTME 96-05): < 1 perms (is a vapor barrier per IBC Section 202 definitions at 1.2")
  - d. Air Permeance @ 75 Pa @ 1" (ASTME 2178-03): 0.02 L/sm<sup>2</sup>
  - e. Air Leakage of Air Barrier Assembly (static loading to 600 Pa and gust loading to 1,200 PA) Complies with ABAA requirements (ASTME 2357-05): <0.02L/sm<sup>2</sup>
  - f. Compressive Strength (ASTM D 1621): 28.7 psi (198 kPa).
  - g. Tensile Strength (ASTM D 1623): 46.2 psi
  - h. Off Gassing Test (VOC Emissions) (CGSB 51.23-92): Pass (no toxic vapor).
  - i. Surface Burning Characteristics (ASTM E 84) 4 inches: Class I. Flame Spread Index 20, Smoke Developed Index 400.
  - j. Closed Cell Content (ASTM D2856) : >90%
  - k. Equipment used to apply the foam insulation shall have fixed ratio positive displacement pumps and approved by foam manufacture

## PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- C. Commencement of work outlined in this section shall be deemed as acceptance of existing work and conditions.

#### 3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Apply only when surfaces and environmental conditions are within limits prescribed by the material manufacturer.
- C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

## 3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions. Apply as recommended by manufacturer to thickness as indicated on drawings.

#### 3.4 <u>PROTECTION</u>

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

## END OF SECTION 07 21 19

## SECTION 07 31 13 - ASPHALT SHINGLES

#### (FILED SUB BID REQUIRED)

#### PART 1 - GENERAL

#### 1.1 TIME, MANNER AND REQUIREMENTS FOR FILING SUB-BIDS

- A. Sub-Bids shall be submitted in accordance with the provisions of General Laws, Chapter 149, Section 44A, inclusive, as amended.
- B. Sub-Bids for work under this Section shall be received electronically, until 2:00
   p.m. on Tuesday, October 29, 2019, at which time and place all Trade Contractor Bids shall be duly recorded.
- C. This project is being Electronically Bid (E-Bid). All bids shall be submitted online at <u>www.Projectdog.com</u>. Hard copy bids will not be accepted by the Awarding Authority. E-Bid tutorials and instructions are available within the specifications and online at <u>www.Projectdog.com</u>. For assistance, call Projectdog, Inc at (978)499-9014, M-F 8:30AM-5PM.
  - a. All required bid forms must be submitted in **PDF** format only. The bidder must complete all required signatures either digitally (using Adobe Acrobat) or manually (print, sign and scan as a PDF file).
  - b. Bid Bonds issued by a surety company shall be submitted on the E-Bid page. Bid bonds in the form of cash or check shall be completed and delivered as outlined on the Bid Bond Affidavit form.
  - c. The bidder must enter bid price on the E-Bid form as a whole dollar value only with no punctuation. Sums shall be expressed in both words and figures on the bid form. Note: The E-Bid form will automatically match the word value to the numeric figure entered by the bidder.
  - d. Bidders may save, submit or modify an E-Bid at any time prior to bid close. Once submitted, a bid cannot be edited. To modify a bid the bidder must retract the bid, make any necessary changes, and then submit the bid again. Upon submitting or retracting the bidder will receive a convenience email for informational purposes only. Bidders are encouraged to contact Projectdog, Inc at (978) 499-9014, M-F 8:30AM-5PM, if an email is not received.
  - e. If a bid is submitted prior to an Addendum being issued, the bidder will receive an automated email for informational purposes only. The bidder must review the addendum, retract the bid, acknowledge all addenda, and submit the bid again. If a bidder fails to acknowledge addenda their bid may be rejected by the Awarding Authority.
  - f. Timely submission of an E-Bid shall be the full responsibility of the Bidder. The server clock is the time of record. It is the bidder's

responsibility to review and confirm online that a bid has been submitted and/or retracted and that the bid is 100% true, complete and accurate. All bidders are required to review their submitted E-Bid via the **"View My Bid Package"** link.

- D. Sub-Bids filed with the Awarding Authority shall be accompanied by a Bid Deposit in the form of a certified check or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to the "**Town of Carver**". A bid bond shall be:
  - 1. In a form satisfactory to the Awarding Authority.
  - 2. With a surety company qualified to do business in the Commonwealth and satisfactory to the Awarding Authority.
  - 3. Conditioned upon the faithful performance by the principal of the agreements contained in the Bid. The amount of such bid deposit shall be five percent (5%) of the value of the Bid.
- DI. Sub-Bids for work under this Section shall be for the complete work required as specified and as shown on the drawings.
- DII. Sub-Bidders are directed to the Instructions to Bidders, and to the requirements that all bidders visit the site to determine the scope of work required under this Section.
- DIII. Sub-Bidders must comply with all provisions of Division 1, General Requirements, in the same manner as the General Contractor.

# 1.2 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

# 1.3 <u>SCOPE OF WORK</u>

- A. This section includes all labor, materials, equipment and appliances required to furnish and install the following work and related items as shown on the drawings and in accordance with good roofing practice.
  - 1. The inspection and acceptance of the new plywood substrate.
  - 2. Asphalt shingle roofing, roof deck protection, and leak barrier on designated roof areas.
  - 3. Aluminum flashing associated with roofing installations as detailed, designated or required.
  - 4. Aluminum K-style gutters, downspouts, and accessories.
  - 5. Ridge vents where indicated on the drawings and specified herein.
  - 6. Roof hatch (1 total) where indicated on the drawings and specified herein.

B. Refer to Section 01 23 00 "Alternates" for work affection this section.

#### 1.4 <u>APPROVALS AND CERTIFICATES</u>

- A. Examine and carefully review the Specifications and Drawings with the manufacturer of the materials and systems, and deliver the following written certificates prior to approval.
- B. Certificate from the roofing materials manufacturer that he has carefully reviewed and is in conformance with the Contract Documents as they are applicable to his roofing system that the roofing information and details indicated and specified, including flashing accessories, are acceptable and in conformance with his system.
- C. Prior to final payment, submit written certification in a form acceptable to the Owner, that all material and workmanship in connection with this Section has been furnished and installed in complete conformance with these Specifications and the approved manufacturer's requirements.

#### 1.5 **PROCEDURE AND SEQUENCE**

- A. Contractor will prosecute the work diligently and maintain a full crew of competent men on the job full time for each consecutive day that weather permits.
- B. The Contractor will legally dispose of all removed material and all debris at the end of each working day.
- C. On a daily basis, the Contractor will clean up, carefully removing all dirt, dust, debris, insulation, etc.

## 1.6 <u>GUARANTEE</u>

- A. Submit a written guarantee, executed by the Contractor agreeing to repair and/or replace roofing work defective in either materials or workmanship, for a period of two (2) years. Guarantee shall include equivalent materials to perform the remedial work, in full accordance with all aspects of this contract, at no additional cost to the Owner. Guarantee to commence at Date of Substantial Completion.
- B. Submit manufacturer's written material guarantee covering shingles for a <u>forty</u> (40) year warrantee period. Guarantee to commence at Date of Substantial Completion.

#### PART 2 – PRODUCTS

## 2.1 ASPHALT SHINGLE ROOFING MATERIALS

A. MATERIALS

- 1. Except as herein specified, materials shall conform to ASTM or Federal Specifications. All materials must be clearly labeled with all pertinent information. Materials delivered in bulk equipment shall be accompanied by a certification by the roofing system material manufacturer. All materials for use in roofing and flashing system must be manufactured by, or approved by, the approved roofing material manufacturer for use in his system.
- 2. ASPHALT SHINGLES shall be fiberglass asphalt mat, approximately 270 lbs. per square, Class A, UL certified to meet ASTM D3462, dimensional shingles. "Landmark 40" as manufactured by Certanteed, "Prestique I High Definition" as manufactured by Elk Premium Roofing, or "Timberline Select 40" as manufactured by GAF Corporation. Submit samples for approval. Provide manufacturer's 40 yr. limited warrantee on product, 5 yr wind warranty up to 80 mph. Provide compatible ridge cap shingles for ridge conditions.
- 3. ROOF DECK PROTECTION shall be breathable "Deck Armor" shingle underlayment as manufactured by GAF Corporation, or equal.
- 4. PERIMETER UNDERLAYMENT shall be "Weather Watch" granular surfaced leak barrier underlayment as manufactured by GAF Corporation, or Ice and Water Shield as manufactured by W. R. Grace and Co., or equal.
- 5. FASTENERS shall be large head, stainless steel roofing nails, 1<sup>1</sup>/<sub>2</sub>" long, with holding power of 20 pound minimum as required for proper securement of the material. Staples will not be considered.
- 6. ASPHALTIC PRIMER shall be conforming to ASTM D41-41.
- 7. RIDGE VENT Nailable ridge vents to be covered with ridge shingles to match specified asphalt shingles. Shinglevent II as manufactured by Air Vent Inc., or equal.

# 2.2 <u>ALUMINUM FLASHING AND MATERIALS</u>

- A. ALUMINUM FLASHING AND MATERIALS (see drawings for location) shall be 0.0225", with 0.050" continuous cleats, 17,000 PSI, ASTM B209-66, with baked enamel finish. Color to match roofing / siding materials
  - 1. Nail flange into wood blocking at 4" o.c. maximum, staggered. Prime surface to receive flashing.
  - 2. All joints shall be lapped 4" over concealed splice plate with caulk.
  - 3. Shop/factory fabricate all metal components to the maximum extent possible. All trim and flashing, whether factory formed or not, shall exhibit clear, sharp, straight and uniform bends. Hem all exposed edges or flashings.
  - 4. Form flashing components from full single width sheet. Provide shop fabricated, mitered corners, joined using closed end pop rivets and joint sealant.
  - 5. Fabricate roofing and related sheet metal work in accordance with approved shop drawings and applicable standard.

- 6. Provide linear sheet metal items in minimum 10'-0" sections except as otherwise noted. From flashing using single pieces for the full width. Provide shop fabricated mitered and joined corners where required.
- 7. Back paint flashings with bituminous paint where expected to be in contact with dissimilar metals.

## 2.3 <u>ROOF ACCESSORIES</u>

## A. GUTTERS AND DOWNSPOUTS

- 1. Provide and install 5" K-Style painted aluminum gutter and downspout system as manufactured by Berger Building Products, Inc., 805 Pennsylvania Boulevard, Feasterville, PA, 19053, Tel 1-800-523-8852.
- 2. Gutter shall be 5" Standard K-Style type aluminum gutter with 2" x 3" corrugated square downspouts. Provide all necessary accessories, i.e., Premium K-style fascia gutter hanger with crossbar, 2" x 3" corrugated square A-style elbows (45 degree bend), strainers, end caps, downspout hangers, etc in material to match gutter.
- 3. Aluminum gutter and accessories shall meet or exceed the following specification:
  - a. Painted aluminum gutters and downspouts, color to be determined from manufacturer's standard colors.
  - b. Provide 20 foot continuous gutter lengths (min.)
  - c. Provide 10 foot continuous downspout lengths (min.)
- 4. Furnish and install removable <u>leaf guard system</u> to protect debris from entering gutters. Leaf guard system to be compatible with style and size of gutter systems.
- B. ROOF ACCESS HATCH (1 total): Furnish and install where indicated on drawings, Type NB-50TB (aluminum, thermally broken), 30" x 54", ship stair access hatch as manufactured by The Bilco Company, New Haven, CT. Cover shall be 11 gauge aluminum with 3" beaded flange, neatly welded. Insulation shall be fiberglass 1" thickness fully protected by a 18 gauge aluminum liner. All mounting hardware shall be Type 316 stainless steel. Factory finish shall be mill finish aluminum.
  - 1. Performance characteristics:
    - a. Cover shall be reinforced to support a minimum live load of 40 psf with a maximum deflection of 1/150th of the span or 20 psf wind uplift.
    - b. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing.
    - c. Operation of the cover shall not be affected by temperature.
    - d. Entire hatch shall be weather tight with fully welded corner joints on cover and curb.
  - 2. Manufacturer shall provide a 5-year warranty against defects in material and workmanship.

PART 3 - EXECUTION

#### 3.1 SHINGLE ROOFING APPLICATION

- A. GENERAL
  - 1. Shingle roofing, leak barrier, and underlayment will be applied over wood roof decks.
  - 2. Entire roof sections, once begun, shall be completed daily, including flashing.
  - 3. All materials subject to damage by exposure to the weather shall be stored free off the ground or deck on pallets and, when not in use, shall be kept completely covered with watertight coverings to prevent the intrusion of moisture.
  - 4. The Contractor shall carefully examine the substrates prior to installing new roofing. Defects found in the roof deck substrates shall be immediately brought to the attention of the Architect and Owner. Any areas of the substrates judged to be unserviceable shall be reported to the Architect and Owner immediately.

## B. APPLICATION OVER WOOD DECK

- 1. Inspect wood deck substrate prior to shingle installation. Start of application institutes acceptance of substrate.
- 2. Underlayment: Cover entire surface with one (1) layer of either roof deck protection / shingle underlayment or perimeter leak barrier underlayment before laying asphalt shingles. Leak barrier underlayment must be applied horizontally. Extend up all valleys. Overlap 6" at all joints. Install in strict accordance with manufacturer's instructions.
- 3. Apply starting course and field courses with true horizontal and vertical lines and nail securely, both in exact accordance with the printed instructions of the manufacturer. Strip shingles shall be laid with 2" head lap.
- 4. Nail shingles with large head, galvanized coated roofing nails 1<sup>1</sup>/<sub>2</sub>" long in strict accordance with manufacturer's instructions. Staples will not be approved. Apply six (6) roofing nails per shingle strip for "high wind" application.
- 5. Ridges shall be applied by bonding individual rectangular shingles so as to have equal exposures, not less than 5" on each side. Lay with no over 5" exposure or less than 2" head lap, nailing 5½" from exposed end and 1" each side. Cover nails in last shingles with plastic cement. Warm shingles in cold weather before bending.

## 3.2 <u>SHEET METAL WORK</u>

## A. WORKMANSHIP

1. Surfaces to be covered with sheet metal shall be cleaned of dirt, rubbish and other foreign material before sheet metal work is started. All projecting nails shall be driven flush.

- 2. All sheet metal work shall be of watertight and weather tight construction lines, arises and angles shall be sharp and true. Plane surfaces shall be free from waves and buckles.
- 3. Provide for thermal expansion of all exposed sheet metal work exceeding 15'-0" running length, except as otherwise indicated. Flashing and trim, 10'-0" maximum spacing, and located 2'-0" from corners and intersections. Ample provisions shall be made for expansion and contraction.
- 4. Take special care in the fabrication, handling and installation of prefinished work to avoid damage to finish. Remove protective film from each unit after installation. Touch up minor defects to match factory finish. Replace excessively damaged material as determined by Architect.

## 3.3 <u>REMOVAL OF RUBBISH</u>

- A. The Subcontractors shall clean up their own waste periodically and legally dispose of it off the job site.
- B. Dust chutes shall be erected and used for removal of rubbish and debris.
- C. The Contractor and Subcontractor shall provide all necessary trash removal containers. The cost of rubbish removal and containers and their disposal shall be borne by the Contractor and or Subcontractor.

## 3.4 DOWNSPOUT CONNECTIONS TO UNDERGROUND DRAINAGE

- A. Site Contractor to provide and install all underground drainage piping to connect to aluminum downspouts, including connections to downspouts.
- B. Roofing Contractor to coordinate all downspout locations and connection requirements with the Site Contractor <u>prior to</u> installations.
- C. Coordinate requirements and dimensions for downspout boot with subsurface drainage systems.
- D. All aluminum downspouts to extend to underground drainage piping, or as indicated on the drawings.

# 3.5 EXTRA MATERIALS / ATTIC STOCK

- A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with appropriate labels.
  - 1. Asphalt Shingles: Furnish two (2) unopened bundles. Deliver to location designated by the Owner.

END OF SECTION 07 31 13

# CARVER POLICECARVER, MARESIDENTIAL SIDING AND ACCESSORIES

#### SECTION 07 46 00 - RESIDENTIAL SIDING AND ACCESSORIES

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 DESCRIPTION OF WORK:

- A. This Section includes furnishing the following:
  - 1. Cellular PVC siding and related work <u>at the gable end walls</u> as shown on the drawings and specified herein.
- B. Installation of Residential Siding and Accessories by Section 06 10 00 Rough Carpentry.

## 1.3 <u>SUBMITTALS</u>

- A. Submit manufacturer's product data, and standard color samples, and manufacturer's installation instructions.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Verification Samples: For each finish product specified, two samples, minimum size 12 inches long, representing actual product, color, exposure, and texture.
- D. Related Sections: 06 60 00 "Plastic Fabrications" for cellular pvc and cast plastic trim.

#### 1.4 STORAGE & PROTECTION

- A. Store siding materials to prevent warping and weather damage.
- B. Elevate materials above ground on level blocking and cover allowing adequate ventilation within bundles.
- C. Protect edges and surfaces from damage.
- 1.5 <u>REFERENCES</u>

- A. ASTM D256 Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics
- B. ASTM D570 Standard Test Method for Water Absorption of Plastics
- C. ASTM D635 Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position
- D. ASTM D638 Standard Test Method for Tensile Properties of Plastics
- E. ASTM D648 Standard Test Method for Deflection Temperature of Plastics under Flexural Load in the Edgewise Position
- F. ASTM D695 Standard Test Method for Compressive Properties of Rigid Plastics
- G. ASTM D696 Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics between -30°C and 30°C
- H. ASTM D790 Standard Test Method for Flexural Properties of Unreinforced Plastics and Electrical Insulating Materials
- I. ASTM D792 Standard Test Method for Density and Specific Gravity (Relative Density) of Plastics by Displacement
- J. ASTM D1525 Standard Test Method for Vicat Softening Temperature of Plastics
- K. ASTM D1761 Standard Test Method for Mechanical Fasteners in Wood
- L. ASTM D2240 Standard Test Method for Rubber Property Durometer Hardness
- M. ASTM D3679 Standard Specification for Rigid Poly Vinyl Chloride (PVC) Siding
- N. ASTM D5206 Standard Test Method for Windload Resistance of Rigid Poly Vinyl Chloride (PVC) Siding
- O. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials
- P. BS 476, Part 7 Method of Test to Determine the Classification of the Surface Spread of Flame of Products (UK)
- Q. NF P 92-501 Epiradiateur Test (France)
- R. UBC-26-7 Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position

S. UL 94 Standard Test Method for Flammability of Plastic Materials for Parts in Devices and Appliances

## 1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Products must be installed in accordance with all local and national building codes.
- B. Allowable Tolerances:
  - 1. Variation in component length:  $-0.00^{\circ}/+0.50^{\circ}$
  - 2. Variation in component width:  $\pm 1/16$ "
  - 3. Variation in component thickness:  $\pm 1/16$ "
  - 4. Variation in component edge cut:  $\pm 2^{\circ}$
  - 5. Variation in component density: -0% / + 10%
- C. Finish and Appearance:
  - 1. Cellular PVC siding that is free of voids, holes, foreign inclusions, or other defects.
  - 2. Uniform finished surface free from cracks, drips, foreign inclusions, or other defects.

#### 1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results.
- B. Do not install products under environmental conditions outside manufacturer's absolute limits.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging in the shade and on a flat surface until ready for installation.
- B. Boxed product should be carried on edge by two people to minimize damage.
- C. Do not store product in a location where ambient temperatures may exceed 120°F.

## 1.9 <u>WARRANTY</u>

- A. Provide manufacturer's standard warranty as follows:
  - 1. 25 year transferable on the substrate.
  - 2. 25 year transferable warranty on the finish.

#### PART 2 - PRODUCTS

# CARVER POLICECARVER, MARESIDENTIAL SIDING AND ACCESSORIES07 46 00 - 4

## 2.1 <u>MANUFACTURERS</u>

- A. Acceptable Manufacturer: NuCedar Mills, Inc., 1000 Sheridan Street, Chicopee, MA 01022. Tel: 866-393-8883; Email: info@nucedar.com; Web: <u>www.nucedar.com</u>, or equal.
- B. Substitutions will be considered in accordance with provisions of Section 01 33 00.

#### 2.2 <u>MATERIALS</u>

- A. Provide products made of extruded polyvinyl chloride and milled to shape as specified in this section and manufactured to comply with requirements of ASTM D3679 and Florida Building Code, Chapter 14 (2004).
- B. Performance and physical characteristic requirements:

Property	Test Method	Unit	Value
Density	ASTM D792	g/cm <sup>3</sup>	0.55
Water Absorption	ASTM D570	%	$\leq 1.0$
Hardness	ASTM D2240	Shore D	$\geq$ 50
Tensile Strength	ASTM D638	psi	> 2150
Elongation at Break	ASTM D638	%	> 13
E-Modulus	ASTM D638	psi	130000-220000
Flexural Strength	ASTM D790	psi	>4600
Compressive Strength			
at 10% Deformation	ASTM D695	psi	> 900
Nail Hold	ASTM D1761	lbf/in of p	enetration 60
Screw Hold	ASTM D1761	lbf/in of p	enetration 400
Charpy Impact Strength	ASTM D256	ft lb / in	> 1.7
Izod Impact Strength	ASTM D256	ft lb / in	> 1.7
Vicat (B/50)	ASTM D1525	°F	>160
Heat Deflection Temp			
@ 1.8 MPa	ASTM D648	°F	>135
Coefficient of Linear Expansion	ASTM D696	in / in / ° H	$3.2 \times 10^{-5}$
Flammability (USA)	UL 94		V-0
Burn Rate	ASTM D635/UBC-26-7		none
Flame Spread Index	ASTM E84		20
Windload Resistance	ASTM D5206	psf	$\geq 70$
Surface Distortion	ASTM D3679	°F	> 180
Camber	ASTM D3679	in	1/16
Heat Shrinkage	ASTM D3679	%	0.23
Uniformity of Color	ASTM D3679		Passed

C. Provide cellular PVC siding that is milled to shape.

D. Provide Interlocking Matrix System<sup>TM</sup> for support and alignment.

E. Factory finish ends of products to allow for consistent color at joints. Provide manufacturer's touch up kits for field finishing of cut ends.

## 2.3 <u>FINISH</u>

- A. Factory applied: Water based solar-reflective acrylic urethane coating, manufactured by PPG Aquacron HR200 Coatings.
- B. Field repairs: Manor Hall exterior latex coating, manufactured by PPG.
- C. Pre-finished colors for siding and accessories:
  - 1. Selected at a later date from manufacturer's listing of sixteen (16) standard colors.

## 2.4 <u>CELLULAR PVC SIDING (ACTUAL DIMENSIONS)</u>

- A. Shingles
  - 1. Texture: Rough Sawn
  - 2. Length: 18"
  - 3. Width: 5", 6", 7",8", and 9"
  - 4. Thickness: 1/2"
  - 5. Color: As selected by Architect from manufacturer's standard colors (see 2.3.C).

#### 2.5 <u>ACCESSORIES</u>

- A. Fasteners
  - 1. Siding: Refer to manufacturer's installation instructions for further guidelines for each type of siding material.
  - 2. Trim and Accessories: Provide stainless steel fasteners as recommended by manufacturer and approved by the Architect.
  - 3. Where fasteners are exposed to view, only utilize fasteners that colormatched to the siding / trim.
- B. Sealants: Manufacturer's recommended sealants, ensure sealant compatibility with cellular PVC.
- C. Miscellaneous Accessories: Furnish and install manufacturer's recommended accessories to provide a complete installation as recommended by the manufacturer. Provide and use miscellaneous accessories necessary to complete work in accordance with manufacturer's installation instructions.

## PART 3 - EXECUTION

## 3.1 <u>PREPARATION</u>

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- A. Examine, clean, and repair as necessary any substrate conditions that would be detrimental to a proper installation.
- B. Do not begin installation until unacceptable conditions have been corrected.

## 3.2 EXAMINATION

- A. Do not begin installation until the substrate has been properly prepared.
- B. If substrate preparation is the responsibility of another subcontractor, notify the Architect if unsatisfactory preparation before proceeding.

#### 3.3 <u>INSTALLATION</u>

- A. Comply with manufacturer's latest printed instructions.
- B. Installation must comply with local building codes and regulations.
- C. Install siding with tolerances and fastener spacing printed in manufacturer's instructions. Allow for expansion at penetrations and corners. Interlock subsequent courses to form a weathertight surfacing.
- D. Ensure fasteners are not driven too tight to preclude provisions for expansion and contraction.

#### 3.4 INSTALLATION - TRIM AND SEALANTS

- A. Install perimeter surface trim and accessories to provide watertight and wind resistant installation.
- B. Seal all gaps where moisture could otherwise accumulate and cause damage to materials and integral structure. Use sealants as recommended by the manufacturer. Apply sealant according to manufacturer's instructions.

#### 3.5 **PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

## 3.6 <u>CLEANING</u>

A. At completion of work, remove all debris caused by siding / trim installation and dispose of properly.

#### END OF SECTION 07 46 00

#### **SECTION 07 46 46 – FIBER CEMENT SIDING**

#### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SECTION INCLUDES</u>

A. This Section includes furnishing factory-finished fiber cement lap siding and accessories as indicated on the drawings and specified herein.

#### 1.3 <u>RELATED SECTIONS</u>

- A. Section 01 23 00 "Alternates" for work affection this section.
- B. Section 06 10 00 Rough Carpentry for installation of fiber-cement siding.
- C. Section 07 21 13 Spray Cellulose Insulation.
- D. Section 09 21 00 Gypsum Board Assemblies.

#### 1.4 <u>REFERENCES</u>

- A. ASTM D3359 Standard Test Method for Measuring Adhesion by Tape Test, Tool and Tape.
- B. ASTM E136 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.

#### 1.5 <u>SUBMITTALS</u>

- A. Submit under provisions of Section 01 30 00.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Shop Drawings: Provide detailed drawings of atypical non-standard applications of cementitious siding materials which are outside the scope of the standard details and specifications provided by the manufacturer.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

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E. Verification Samples: For each finish product specified, two samples, minimum size 4 by 6 inches, representing actual product, color, and patterns.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum of two (2) years' experience with installation of similar products.
- B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
  - 1. Finish areas designated by Architect.
  - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
  - 3. Refinish mock-up area as required to produce acceptable work.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store siding on edge or lay flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.
- C. Store and dispose of solvent-based materials, and materials used with solventbased materials, in accordance with requirements of local authorities having jurisdiction.

## 1.8 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

## 1.9 <u>WARRANTY</u>

- A. Product Warranty: Limited product warranty against manufacturing defects.
  1. Smooth lap siding for 30 years.
- B. Finish Warranty: Limited product warranty against manufacturing finish defects.
  - 1. When used for its intended purpose, properly installed and maintained according to manufacturer's published installation instructions, James Hardie's ColorPlus finish with ColorPlus Technology, for a period of 15 years from the date of purchase: will not peel; will not crack; and will not chip. Finish warranty includes the cost of labor and material.
- C. Workmanship Warranty: Application limited warranty for two (2) years.

## PART 2 - PRODUCTS

## 2.1 <u>MANUFACTURERS</u>

A. Acceptable Manufacturer: James Hardie Building Products, Inc., which is located

at: 26300 La Alameda Suite 400 ; Mission Viejo, CA 92691; Toll Free Tel: 866-274-3464; Tel: 949-367-4980; Email: request info (info@jameshardie.com); Web: www.jameshardiecommercial.com

B. Substitutions: Equal products meeting quality and performance requirements as stated herein.

#### 2.2 <u>SIDING</u>

- A. Code Compliance Requirement for Materials:
  - 1. National Evaluation Report No. NER 405 (BOCA, ICBO, SBCCI, IBC, IRC).
  - 2. City of Los Angeles, Research Report No. 24862.
  - 3. Metro Dade County, Florida Acceptance No. 07-0418, 04.
  - 4. US Department of Housing and Urban Development Materials Release 1263d.
  - 5. California DSA PA-019.
  - 6. City of New York M EA 223-93-M.
  - 7. Florida State Product Approval FL889.
  - 8. Non-asbestos fiber-cement siding where required to be non-combustible shall be tested in accordance with ASTM E136.
- B. HardiePlank Lap Siding: <u>Smooth</u> Lap Siding as manufactured by James Hardie Building Products, Inc.
  - 1. Type: Smooth 7.25 inches with 6 inch exposure.
  - 2. Thickness: 5/16"
  - 3. Length: 12' planks

#### 2.3 <u>FASTENERS</u>

- A. Wood Framing:
  - 1. Wood Framing: 1-1/4 inches, No. 8-18 by 0.375 inch head self-drilling, corrosion resistant S-12 ribbed buglehead screws.

#### 2.4 <u>FINISHES</u>

- A. Factory Primer and Topcoat: Provide factory applied universal primer and topcoat.
  - 1. Primer: PrimePlus by James Hardie.
  - 2. Topcoat: Factory finished top coat equal to manufacturer's Color-Plus finish. Color to be selected from manufacturer's standard color selection.

#### PART 3- EXECUTION

- 3.1 EXAMINATION
  - A. Do not begin installation until substrates have been properly prepared.
  - B. If framing preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

- C. Nominal 2 inch by 6 inch wood framing selected for minimal shrinkage and complying with local building codes, including the use of water-resistive barriers or vapor barriers where required. Minimum 1-1/2 inches face and straight, true, of uniform dimensions and properly aligned.
  - 1. Install water-resistive barriers and claddings to dry surfaces.
  - 2. Repair any punctures or tears in the water-resistive barrier prior to the installation of the siding.
  - 3. Protect siding from other trades.

## 3.2 <u>PREPARATION</u>

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

## 3.3 INSTALLATION - LAP SIDING

- A. Install materials in strict accordance with manufacturer's installation instructions.
- B. Starting: Install a minimum 1/4 inch thick lath starter strip at the bottom course of the wall. Apply planks horizontally with minimum 1-1/4 inches wide laps at the top. The bottom edge of the first plank overlaps the starter strip.
- C. Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
- D. Align vertical joints of the planks over framing members.
- E. Maintain clearance between siding and adjacent finished grade.
- F. Locate splices at least one stud cavity away from window and door openings.
- G. Use off-stud metal joiner in strict accordance with manufacturer's installation instructions.
- H. Wind Resistance: Where a specified level of wind resistance is required Hardieplank lap siding is installed to framing members and secured with fasteners described in Table No. 2 in National Evaluation Service Report No. NER-405.
- I. Blind nail to sheathing.
- J. Locate splices at least 12 inches (305 mm) away from window and door openings.
- K. Wind Resistance: Where a specified level of wind resistance is required Hardieplank lap siding is installed to framing members and secured with fasteners described in Table No. 2 in National Evaluation Service Report No. NER-405.

## 3.4 <u>PROTECTION</u>

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 07 46 46

#### SECTION 07 53 23 - MEMBRANE ROOFING & RELATED WORK PART OF FSB

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SCOPE OF WORK</u>

- A. This section includes all labor, materials, equipment and appliances required to complete the following work and related items as shown on the Drawings and in accordance with good roofing practice.
  - 1. The preparation of wood roof decks to receive new roofing as hereinafter specified.
  - 2. Single ply EPDM <u>fully adhered membrane</u> roofing on designated roof areas.
  - 3. Cover board, base layer tapered insulation and crickets.
  - 4. Membrane base flashing throughout.
  - 5. Sheet steel flashings related to membrane roofing, edge conditions, termination bars, metal counterflashings, and as indicated on the drawings to produce a watertight condition.
- B. Related Sections:
  - 1. Section 06 10 00, "Rough Carpentry" for all wood nailers, grounds, and plywood decking to receive new roofing products.

#### 1.4 <u>APPROVALS AND CERTIFICATES</u>

- A. Examine and carefully review the Specifications and Drawings with the manufacturer of the materials and systems, and deliver the following written certificates prior to approval.
- B. Certificate from the roofing materials manufacturer that he has carefully reviewed and is in conformance with the Contract Documents as they are applicable to his roofing system that the roofing information and details indicated and specified, including flashing accessories, are acceptable and in conformance with his system.
- C. Prior to final payment, submit written certification in a form acceptable to the Owner, that all material and workmanship in connection with this Section has been furnished and installed in complete conformance with these Specifications and the approved manufacturer's requirements.

#### 1.5 MEMBRANE ROOFING AND RELATED WORK

### A. <u>MANUFACTURERS</u>

- 1. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
  - 1. Carlisle Syntec Sytems, Carlisle, PA
  - 2. Firestone Building Products, Rubberguard EPDM
  - 3. Johns Manville EPDM
- 2. Specifications have been based upon products manufactured by Carlisle Syntec Systems, Carlisle, PA.

## B. MATERIALS

- 1. Except as herein specified, materials shall conform to ASTM or Federal Specifications. All materials must be clearly labeled with all pertinent information. Materials delivered in bulk equipment shall be accompanied by a certification by the roofing system material manufacturer. All materials for use in membrane roofing, roof insulation, and flashing system, must be manufactured by, or approved by, the approved roofing material manufacturer for use in his system.
- 2. FULLY ADHERED EPDM ROOFING shall be Carlisle Design A, with a thirty (30) year full No Dollar Limit (NDL) Guarantee as manufactured by Carlisle Syntec Systems, Carlisle, PA.
- 3. MEMBRANE (30 Year Warranty) shall be EPDM (Ethylene Propylene Diene Monomer), Sure Seal .090 FR non-reinforced, fire rated compound elastomer, black, .090" thick, 10' x 100', or the largest sheet possible as determined by job conditions, as manufactured by Carlisle Syntec Systems, Carlisle, PA.
- 4. FLASHING shall be .060 Sure Seal Cured EPDM, and .060 Sure Seal Uncured EPDM as manufactured by Carlisle Syntec Systems.
- 5. COVER BOARD shall be 1/2" Securock by Carlisle Syntec Systems, sheet size 4' x 8', supplied directly by Carlisle for inclusion in warranty.
- TAPERED INSULATION crickets shall be polyisocyanurate foam, Carlisle Polyiso HPH, as manufactured by Carlisle Syntec Systems. Submit detailed roof insulation plan for approval. Insulation to be tapered at 1/4" per linear foot with a minimum thickness of 1/2" at low point. Tapered insulation crickets to be tapered at 1/2" per linear foot, 1/4" in place. All boards, including fill to be 4' x 4' max.
- 7. ROOF INSULATION base layer flat stock shall be polyisocyanurate foam, Carlisle Polyiso HPH, as manufactured by Carlisle Syntec Systems, thickness as shown on the drawings, sheet size 4' x 8'.
- 8. FASTENERS and PLATES shall be specifically approved by Carlisle Syntec Systems. Contactor shall perform pull tests to confirm holding power as required by the specifications.
- 9. BONDING ADHESIVE shall be compatible with materials to which the membrane is to be bonded, as manufactured by Carlisle Syntec Systems.
- 10. LAP CLEANER shall be Carlisle HP-250 Primer, as manufactured by Carlisle Syntec Systems.

- 11. SPLICING SYSTEM shall be Carlisle SecurTape, with 6" wide as required by manufacturer for specified warranty, as manufactured by Carlisle Syntec Systems.
- 12. LAP SEALANT shall be Carlisle EPDM Lap Sealant, as manufactured by Carlisle Syntec Systems.
- 13. WATER CUT-OFF MASTIC shall be compatible with materials with which it is used, as manufactured by Carlisle Syntec Systems.
- 14. NIGHT SEAL shall be compatible with materials with which it is used, as manufactured by Carlisle Syntec Systems.
- 15. POURABLE SEALER shall be compatible with materials with which it is used, as manufactured by Carlisle Syntec Systems.
- 16. NAILING STRIP shall be RUSS securement strip, as manufactured by Carlisle Syntec Systems.
- 17. ASPHALTIC PRIMER shall be conforming to ASTM D41-41.

# C. PROCEDURE AND SEQUENCE

- 1. Contractor will prosecute the work diligently and maintain a full crew of competent men on the job full time for each consecutive day that weather permits.
- 2. The Contractor will legally dispose of all removed material and all debris at the end of each working day.
- 3. On a daily basis, the Contractor will clean up the inside and the outside of the building, carefully removing all dirt, dust, debris, insulation, etc.

# D. MEMBRANE ROOFING APPLICATION

- 1. GENERAL
  - a) Membrane roofing, cover board, flat stock insulation and or tapered insulation will be applied over new wood roof decks.
  - b) The entire roofing and insulation systems, once begun, shall be completed daily, including flashing.
  - c) All Materials subject to damage by exposure to the weather shall be stored free off the ground or deck on pallets and, when not in use, shall be kept completely covered with watertight coverings to prevent the intrusion of moisture.
  - d) The Contractor shall carefully examine the new substrates prior to installing new roofing. Substandard conditions found in the roof deck substrates shall be immediately brought to the attention of the Architect.
- 2. APPLICATION OVER NEW WOOD DECKS
  - a) Install over the wood substrate the first layer of insulation by lightly adhering each board in construction adhesive. Install all crickets where applicable.
  - b) Install second and subsequent layers of insulation (see drawings for thickness schedule) by mechanically fastening each sheet.
     Only as much insulation will be applied as can be covered by a complete roofing membrane at day's end. <u>Carefully note that it is the Contractors responsibility to verify location of existing conduits, cables, wires, equipment, etc., located below existing</u>

roof deck. Contractor shall adjust fastening pattern accordingly to avoid contact between fastener and existing conduits, cables, wires, equipment, etc. Perimeter insulation shall be fastened with a minimum of sixteen (16) fasteners per 4' x 8' insulation board. Corner recovery board shall be fastened with a minimum of thirty two (32) fasteners per 4' x 8' insulation board. Insulation in the field of the roof shall be fastened with a minimum of ten (10) fasteners per 4' x 8' insulation board. Fastening pattern shall be as approved by the Architect and shall conform in all respects to Factory Mutual I-90 requirements and the manufacturer. Carefully note that the Contractor is responsible for all interior cleaning resulting from reroofing operations.

- c) Position EPDM membrane over prepared substrate without stretching, and allow membrane to relax approximately <sup>1</sup>/<sub>2</sub> hour before bonding. Fold membrane back so half of the underside of sheet is exposed. Sheet fold should be smooth without wrinkles. Lay out the adjoining sheets in the same manner, lapping the edges a min. 6", or as required for Splice System for specified warranty. Sheets should be laid out in an offset pattern, with a min. of 3 feet between adjacent end laps. Laps should be constructed with the upslope sheet overlapping the adjoining sheet in a shingle manner, to avoid any laps opposing natural drainage.
- d) Apply Bonding Adhesive evenly, without globs or puddles with a plastic core medium nap roller. Apply the Bonding Adhesive to both the membrane and the substrate to achieve continuous coating of both surfaces at a coverage rate of approximately 120 s.f. per gallon per each surface, or 60 s.f. per gallon per finished surface (both membrane + substrate). If a mechanical spreader or spray equipment is used to apply adhesive, adhesive should be back rolled after application to insure continuous mating. Allow adhesive to dry until it is tacky but will not string or stick to a dry finger touch. Caution: due to solvent flash off, condensation can form on freshly applied Bonding Adhesive if ambient temperature is near the dew point. If condensation develops, application of Bonding Adhesive should be discontinued, and after surfaces with adhesive applied already have dried, a thin freshener coat applied at  $\frac{1}{2}$  typical coverage rate. Roll the adhered membrane into the adhered substrate, avoiding wrinkles. Broom in the bonded half of the membrane with a soft push broom to insure maximum contact. Fold back the un-adhered half, and repeat the procedure.
- e) Secure all EPDM roof membrane at perimeters, inside angle changes, and penetrations with Carlisle RUSS securement strip. Fastening should be 12" o.c., with appropriate fastener for substrate secured to. Vertical attachment should be used on this project, to eliminate fastening through lightweight concrete and metal pan. RUSS strip should be attached to vertical wall or curb, and must extend min. 3" onto horizontal substrate. Gaps between

adjoining sections of RUSS strip should not exceed 1". Refer to flashing specification and details.

- Remove all dirt, oil, water, and other contaminants from the f) surfaces to be spliced, using Carlisle Weathered Membrane Cleaner if significant contamination is apparent. Membrane should be positioned to allow a min. 6" overlay for standard 6" tape applications. When using Pre-Kleened EPDM membrane, apply Sure Seal HP-250 Primer to both membrane mating surfaces with  $\frac{1}{2}$ " medium nap paint roller, to achieve a thin, even coat. On projects with sheets wider than 10' where dusted EPDM sheets are used, remove all excess mica dust from sheet with clean natural fiber rag, and scrub membrane with Carlisle Splice Cleaner or HP-250 prior to application of primer. Coverage rate is approximately 250 s.f. per gallon, equating to 300 lf of 3" tape lap. Caution: due to solvent flash-off, condensation may form on freshly applied HP-250 Primer when ambient temperatures are near the dew point. If condensation is detected, discontinue application of Primer and Tape, after Primer dries, apply thin freshener coat of HP-250, to the previously coated surface and apply Splice Tape when conditions allow. Unroll approximately 3' of Secur Tape, and apply to bottom sheet using firm, even hand pressure. Continue for the length of the splice. Tape roll ends must be overlapped 1". Allow top sheet to rest on release film on back side of tape. Note: tape placement must obtain a 5  $\frac{1}{2}$ " lap, with min. 1/8" to max. of 1/2" tape extending beyond the splice edge. Pull release film from SecurTape, and allow top sheet to fall freely onto exposed tape. Press top sheet onto tape, using firm, even hand pressure across the splice towards the splice edge. IMMEDIATELY roll the splice with a 2" wide steel roller, using positive pressure. Roll across the splice edge. Install a 6" wide section (corners rounded) of Sure Seal Pressure Sensitive Flashing at all field splice intersections (tee-laps), and seal the edges of the flashing with Lap Sealant. Use .060 cured EPDM membrane for all base flashings. Uncured Elastoform Flashing should only be used when it is necessary to form flashing around corners, pipe penetrations, other situations requiring three way angle change. Cut the flashing material into the longest lengths practical to handle. The flashing material should be wide enough to provide the required splice width onto the roof surface beyond base membrane securement, and to reach flashing heights and terminations specified. Adhere flashings to typical substrates with 90-8-30 Bonding Adhesive, metal substrates with EP-95 Adhesive, at a coverage rate of 60 s.f. per gallon of finished surface area (both surfaces). After 90-8-30A Bonding Adhesive has dried to the point it does not string or stick to a dry finger touch, roll the flashing material up the wall or curb, adhering it to the Bonding Adhesive on that substrate. Apply hand pressure immediately to insure complete contact, and apply pressure with 2" wide steel roller over the entire flashing surface.
- **g**)

At corners, Pressure Sensitive Corners or uncured Elastoform flashing can be used. When fabricating at temps below 50° F., materials should be heated with a hot air gun as required to let materials conform to planar changes without significant stretching or gouging. Apply pressure to flashing surface with a 2" steel roller over the entire flashing surface, and stitch the material tight in areas where the sheet makes elevation changes. Lap all joints min. 4". Do not use Bonding Adhesive for laps. All cured membrane tee laps should be covered with a target patch of Pressure Sensitive Flashing, or uncured EPDM Elastoform. Top of flashing to be terminated to meet project details drawn, and meet all manufacturer's requirements for warranty specified.

h) The installed system must comply in all respects with the Factory Mutual 1-90 design parameters for metal roof decks, and comply with UL Class A rating.

## 1.6 <u>REMOVAL OF RUBBISH</u>

- A. The Subcontractors shall clean up their own waste periodically and legally dispose of it off the job site.
- B. The Contractor and Subcontractor shall provide all necessary trash removal containers. The cost of rubbish removal and containers and their disposal shall be borne by the Contractor and or Subcontractor.

## 1.7 <u>GUARANTEE</u>

A. This Contractor shall install this roof in strict accordance with the terms and requirements of Carlisle Syntec Systems Thirty (30) Year NDL Roofing System Guarantee. The Contractor shall provide a Carlisle Syntec Systems Thirty (30) Year NDL Roofing System Guarantee to the Owner prior to final acceptance of this roof by the Owner.

END OF SECTION 07 53 23

#### SECTION 07 84 00 - FIRESTOPPING

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes firestopping for the following:
  - 1. Joints along the top of fire-resistance-rated wall construction and the underside of structure above.
  - 2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
  - 3. Sealant joints in fire-resistance-rated construction.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 01 23 00 "Alternates" for work affection this section.
  - 2. Section 07 92 00 "Joint Sealers" for non-fire-rated joint sealers.
  - 3. Division 23 Sections specifying ducts and piping penetrations.
  - 4. Division 26 and 27 Sections specifying cable and conduit penetrations.

### 1.3 <u>SYSTEM PERFORMANCE REQUIREMENTS</u>

- A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.
  - 1. All firestopping systems shall be reviewed and approved for use by the local fire authority prior to submission to Architect.
- B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined pet ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.
- C. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E 814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where the following conditions exist:

- 1. Where firestop systems protect penetrations located outside of wall cavities.
- 2. Where firestop systems protect penetrations located outside fire-resistive shaft enclosures.
- 3. Where firestop systems protect penetrations located in construction containing doors required to have a temperature-rise rating.
- 4. Where firestop systems protect penetrating items larger than a 4-inchdiameter nominal pipe or 16 sq. in. in overall cross-sectional area.
- D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.
- E. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
  - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
  - 2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- F. For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.

# 1.4 <u>SUBMITTALS</u>

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified.
  - 1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCS) and are nontoxic to building occupants.
- C. Product test reports from, and based on tests performed by, a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.

# 1.5 **QUALITY ASSURANCE**

- A. Fire-Test-Response Characteristics: Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" article:
  - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or Warnock Hersey.

- 2. Through-penetration firestop systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 0.01 inch of water is maintained at a distance of 0.78 inch below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:
  - a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
  - b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by UL in their "Fire Resistance Directory," or by Warnock Hersey.
- 3. Fire-resistive joint sealant systems are identical to those tested for fireresponse characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least 0.01 inch of water, asmeasured 0.78 inch from the face exposed to furnace fire. Provide systems complying with the following requirements:
  - a. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
  - b. Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.
- B. Installer Qualifications: Engage an experienced Installer who has completed firestopping that is similar in material, design, and extent to that indicated for Project and that has performed successfully.
- C. Single-Source Responsibility: Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.
- D. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."
- E. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.

# 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multi-component materials.
B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

#### 1.7 **PROJECT CONDITIONS**

- A. Environmental Conditions: Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilation: Ventilate firestopping per firestopping manufacturers, instructions by natural means or, where this is inadequate, forced air circulation.

#### 1.8 SEQUENCING AND SCHEDULING

A. Do not cover up those firestopping installations that will become concealed behind other construction until the owner's Representative and authorities having jurisdiction, if required, have examined each installation.

#### PART 2 - PRODUCTS

#### 2.1 FIRESTOPPING, GENERAL

- A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.
- B. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:
  - 1. Permanent forming/damming/backing materials including the following:
    - a. Ceramic fiber.
    - b. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
    - c. Joint fillers for joint sealants.
  - 2. Temporary forming materials.
  - 3. Substrate primers.
  - 4. Collars.
  - 5. Steel sleeves.
- C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

#### 2.2 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

FIRESTOPPING

- A. Ceramic-Fiber Forming/Backing/Damming Material: Formulation of continuous filament ceramic fibers and inorganic binders.
- B. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Ceramic-Fiber Forming/Backing/Damming Material:
    - a. Ultra Block, Backer Rod Mfg. & Supply Co.
  - 2. Silicone Sealants:
    - a. Dow Corning Firestop Sealant SL 2002, Dow Corning Corp.
    - b. Pensil 100 Firestop Sealant, General Electric Co.
    - c. Nelson CLK Firestop Sealant, Hevi-Duty/Nelson.

#### 2.3 <u>FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS</u>

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that complies with ASTM 920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.
- B. Sealant Colors: Provide color of exposed joint sealants to comply with the following:
  - 1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.
- C. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Single Component, Neutral Silicone Sealant:
    - a. 864/Pecora Corp.
    - b. Dow Corning 795, Dow Corning Corp.
    - c. Silproof, General Electric Company
  - 2. Multicomponent, Nonsag, Urethane Sealant:
    - a. Dynatrol II, Pecora Corp.
    - b. Sonolastic NP 2, Sonneborn Building Products Div., ChemRex Inc.
    - c. Dymeric Plus, Tremco Inc.

#### 2.4 <u>MIXING</u>

A. For those products requiring mixing prior to application, comply with firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce firestopping products of uniform quality with optimum performance characteristics for application indicated.

#### PART 3 - EXECUTION

#### 3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

#### 3.2 <u>PREPARATION</u>

- A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:
  - 1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
  - 2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form release agents from concrete.
- B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration on to exposed surfaces.
- C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.

#### 3.3 INSTALLING THROUGH-PENETRATION FIRESTOPS

- A. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- B. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
  - 1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.

- 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
- 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

#### 3.4 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

- A. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.
- B. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.
- C. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

#### 3.5 FIELD QUALITY CONTROL

- A. The Owner's Representative will examine completed firestopping to determine, in general, if it is being installed in compliance with requirements.
- B. The Owner's Representative will report observations promptly and in writing to Contractor and Architect.
- C. Do not proceed to enclose firestopping with other construction until installations are approved.
- D. Where deficiencies are found, repair or replace firestopping so that it complies with requirements.

#### 3.6 <u>CLEANING</u>

A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.

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#### FIRESTOPPING

B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to produce firestopping complying with specified requirements.

END OF SECTION 07 84 00

#### SECTION 07 92 00 - JOINT SEALERS

#### (FILED SUB BID REQUIRED)

#### PART 1 - GENERAL

#### 1.1 TIME, MANNER AND REQUIREMENTS FOR FILING SUB-BIDS

- A. Sub-Bids shall be submitted in accordance with the provisions of General Laws, Chapter 149, Section 44A, inclusive, as amended.
- B. Sub-Bids for work under this Section shall be received electronically, until 2:00
   p.m. on Tuesday, October 29, 2019, at which time and place all Trade Contractor Bids shall be duly recorded.
- C. This project is being Electronically Bid (E-Bid). All bids shall be submitted online at <u>www.Projectdog.com</u>. Hard copy bids will not be accepted by the Awarding Authority. E-Bid tutorials and instructions are available within the specifications and online at <u>www.Projectdog.com</u>. For assistance, call Projectdog, Inc at (978)499-9014, M-F 8:30AM-5PM.
  - a. All required bid forms must be submitted in **PDF** format only. The bidder must complete all required signatures either digitally (using Adobe Acrobat) or manually (print, sign and scan as a PDF file).
  - b. Bid Bonds issued by a surety company shall be submitted on the E-Bid page. Bid bonds in the form of cash or check shall be completed and delivered as outlined on the Bid Bond Affidavit form.
  - c. The bidder must enter bid price on the E-Bid form as a whole dollar value only with no punctuation. Sums shall be expressed in both words and figures on the bid form. Note: The E-Bid form will automatically match the word value to the numeric figure entered by the bidder.
  - d. Bidders may save, submit or modify an E-Bid at any time prior to bid close. Once submitted, a bid cannot be edited. To modify a bid the bidder must retract the bid, make any necessary changes, and then submit the bid again. Upon submitting or retracting the bidder will receive a convenience email for informational purposes only. Bidders are encouraged to contact Projectdog, Inc at (978) 499-9014, M-F 8:30AM-5PM, if an email is not received.
  - e. If a bid is submitted prior to an Addendum being issued, the bidder will receive an automated email for informational purposes only. The bidder must review the addendum, retract the bid, acknowledge all addenda, and submit the bid again. If a bidder fails to acknowledge addenda their bid may be rejected by the Awarding Authority.
  - f. Timely submission of an E-Bid shall be the full responsibility of the Bidder. The server clock is the time of record. It is the bidder's

responsibility to review and confirm online that a bid has been submitted and/or retracted and that the bid is 100% true, complete and accurate. All bidders are required to review their submitted E-Bid via the **"View My Bid Package"** link.

- D. Sub-Bids filed with the Awarding Authority shall be accompanied by a Bid Deposit in the form of a certified check or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to the "**Town of Carver**". A bid bond shall be:
  - 1. In a form satisfactory to the Awarding Authority.
  - 2. With a surety company qualified to do business in the Commonwealth and satisfactory to the Awarding Authority.
  - 3. Conditioned upon the faithful performance by the principal of the agreements contained in the Bid. The amount of such bid deposit shall be five percent (5%) of the value of the Bid.
- E. Sub-Bids for work under this Section shall be for the complete work required as specified and as shown on the drawings.
- F. Sub-Bidders are directed to the Instructions to Bidders, and to the requirements that all bidders visit the site to determine the scope of work required under this Section.
- G. Sub-Bidders must comply with all provisions of Division 1, General Requirements, in the same manner as the General Contractor.

### 1.2 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

### 1.3 <u>SCOPE OF WORK</u>

- A. This Section includes furnishing and installing joint sealants for the following locations:
  - 1. Exterior joints in vertical surfaces and nontraffic horizontal surfaces as indicated below:
    - a. Control and expansion joints in soffits and overhead surfaces.
    - b. Perimeter joints of exterior openings, metal frames, aluminum doors / frames / louvers.
    - c. Other joints as indicated on the drawings.
    - d. Perimeter joints of all cellular PVC construction.

- 2. Interior joints in vertical surfaces and horizontal nontraffic surfaces as indicated below:
  - a. Control joints on exposed interior surfaces of exterior walls.
  - b. Perimeter joints of exterior openings (doors / windows)
  - c. Perimeter joints of hollow metal frames and gypsum board construction.
  - d. Perimeter joints of toilet fixtures.
  - e. Perimeter joints of wood window trims / window sills / wood base.
  - f. Perimeter joints within detention plumbing fixtures and detention door frames with security sealants.
  - g. All exposed joints between drywall and other dissimilar materials.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 01 23 00 "Alternates" for work affection this section.
  - 2. Section 07 84 00 "Firestopping" for fire-resistance-rated joint sealants.
  - 3. Section 08 80 00 "Glass and Glazing" for sealants used in glazing.

#### 1.3 <u>SYSTEM PERFORMANCE REQUIREMENTS</u>

- A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.
- B. Provide joint sealants for interior applications that have been produced and installed to establish and maintain airtight continuous seals that are water resistant and cause no staining or deterioration of joint substrates.

#### 1.4 <u>SUBMITTALS</u>

A. Product data from manufacturers for each joint sealant product required.

### 1.5 **QUALITY ASSURANCE**

- A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.
- B. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration

period for use, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

#### 1.7 **PROJECT CONDITIONS**

- A. Environmental Conditions: Notify Architect and do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.
  - 2. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40 deg F (4.4 deg C).
  - 3. When joint substrates are wet.
- B. Joint Width Conditions: Notify Architect and do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.
- C. Joint Substrate Conditions: Notify Architect and do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

#### 1.8 <u>SEQUENCING AND SCHEDULING</u>

A. Sequence installation of joint sealants to occur not less than 21 nor more than 30 days after completion of waterproofing, unless otherwise indicated.

### PART 2 - PRODUCTS

#### 2.1 <u>MATERIALS, GENERAL</u>

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors: Provide color of exposed joint sealants to comply with the following:
  - 1. Provide selections made by Architect from manufacturer's full range of standard colors for products of types indicated.

#### 2.2 ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealants that comply with those requirements referencing ASTM 920 classifications for Type, Grade, Class, and Uses.

- B. Products: Subject to compliance with requirements, provide one of the following:
  1. Multi-Part, Non Sag Urethane Sealants:
  - a. "Dynatrol II", Pecora Corp.
  - b. "Sonolastic NP2", Sonneborn Building Products Division
  - c. "Dymeric Plus", Tremco.
  - 2. Multi-Part, Self Levelling Urethane Sealant:
    - a. "Sikaflex 20 SL", Sika Corp.
    - b. "Sonolastic SL2", Sonneborn Building Products Division.

#### 2.3 <u>LATEX JOINT SEALANTS</u>

- A. General: Provide manufacturer's standard one-part, nonsag, mildew-resistant, paintable latex sealant of formulation indicated that is recommended for exposed applications on interior and protected exterior locations and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.
- B. Acrylic-Emulsion Sealant: Provide product complying with ASTM C 834 that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.
- C. Products: Subject to compliance with requirements, provide one of the following: 1. Acrylic-Emulsion Sealant:
  - a. "AC-20", Pecora Corp.
    - b. "Sonolac," Sonneborn Building Products Div., ChemRex, Inc.
  - c. "Tremco Acrylic Latex 834, " Tremco, Inc.

#### 2.4 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
  - 1. Open-cell polyurethane foam.
  - 2. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.
  - 3. Proprietary, reticulated, closed-cell polymeric foam, nonoutgassing, with a density of 2.5 pcf and tensile strength of 35 psi per ASTM D 1623, and with water absorption less than 0.02 gms/cc per ASTM C 1083.
  - 4. Any material indicated above.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

#### 2.5 <u>SECURITY SEALANTS</u>

- A. General: Provide manufacturer's standard rigid, two-part, high solids, high modulus epoxy resin compound that is recommended for high security areas of prisons and other security areas and that provides high abrasion resistance and "pick-proof" properties.
- B. Epoxy Resin Sealant: Provide product complying with ASTM C 881, Type I.
- C. Products: Subject to compliance with requirements, provide one of the following: 1. Epoxy Resin Sealant:
  - a. "DynaPoxy EP-1200", Pecora Corp., or equal.

#### 2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

#### PART 3 - EXECUTION

#### 3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Notify Architect and do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

#### 3.2 <u>PREPARATION</u>

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:

- 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
- 2. Clean concrete, masonry, unglazed surfaces of ceramic tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
- 3. Remove laitance and form release agents from concrete.
- 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

## 3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
  - 1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
    - a. Do not leave gaps between ends of joint fillers.
    - b. Do not stretch, twist, puncture, or tear joint fillers.
    - c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
  - 2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.

- C. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.
- D. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
  - 1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

## 3.4 <u>CLEANING</u>

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

## 3.5 <u>PROTECTION</u>

A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

## 3.6 <u>GUARANTEE AND CERTIFICATION</u>

- A. This Contractor shall guarantee <u>in writing</u> that all sealant work will be free from defects of materials and workmanship for a period of five (5) years. The following types of failure will be adjusted:
  - 1. Leakage, cracking, crumbling, melting, shrinking or running of caulking, or staining of adjacent work by caulking.
- B. This Contractor shall repair and replace work which becomes defective during guarantee term without cost to the Owner.

### 3.7 <u>SCHEDULE</u>

- A. Exterior Joints:
  - 1. All expansion and control joints: Multi-Part, Non-Sag Urethane Sealant

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2.	Exterior openings, metal frames and aluminum doors / frames / louver
2	perimeters: Multi-Part, Non-Sag Urethane Sealant
3.	All exposed joints between dissimilar materials: MultiPart, Non-Sag Urethane Sealant
4.	Perimeter joints of all cellular PVC construction: MultiPart, Non-Sag Urethane Sealant
B. Interi	or Joints
1.	Perimeter joints of hollow metal frames and gypsum board construction: Acrylic-Emulsion Sealant
2.	Perimeter joints of exterior openings: Acrylic-Emulsion Sealant
3.	All expansion and control joints: Acrylic-Emulsion Sealant
5.	Perimeter joints of toilet fixtures: Acrylic-emulsion Mildew-Resistant Sealant
6.	Perimeter joints of wood window trims / window sills / wood base: Acrylic-Emulsion Sealant
7.	Detention plumbing fixtures, detention door frames: Epoxy Resin Sealant.
7.	All exposed joints between drywall or other dissimilar materials: Urethane Sealant or Acrylic-Emulsion Sealant if in contact with epoxy paint.
END OF SECTION	07 92 00

#### SECTION 08 11 13 - STANDARD STEEL DOORS AND FRAMES

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing the following products:
  - 1. Doors: standard steel doors for interior and exterior locations.
  - 2. Frames: Pressed steel frames for doors, sidelights, borrowed lite, transom frames
  - 3. Assemblies: Provide standard steel door and frame assemblies as required for the following:
    - a. Labeled and fire rated.
    - b. Thermal rated (insulated).

#### 1.3 <u>RELATED SECTIONS</u>

- A. Section 01 23 00 "Alternates" for work affection this section.
- B. Section 06 10 00 "Rough Carpentry" for installation of Standard Steel Doors and Frames.
- C. Painting primed doors and frames is specified in Section 09 90 00, "Painting."
- D. Wood doors are specified in Section 08 14 00, "Flush Wood Doors".
- E. Door hardware is specified in Section 08 71 00 "Door Hardware".
- F. Glass and Glazing is by Section 08 80 00 "Glass and Glazing".

#### 1.4 <u>REFERENCES</u>

- A. NFPA 80: Standard for Fire Doors and Other Opening Protectives
- B. NFPA 101: Life Safety Code
- C. NFPA 252: Standard Methods of Fire Tests of Door Assemblies
- D. NFPA 257: Standard on Fire Tests for Window and Glass Block Assemblies

- E. UL 10C: Standard for Positive Pressure Fire Tests of Door Assemblies
- F. ICC/ANSI A117.1: Accessible and Usable Buildings and Facilities
- G. ANSI A 250.4: Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors and Hardware Reinforcings
- H. ANSI A250.10: Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames
- I. ANSI/DHI A115.1G: Installation Guide for Doors and Hardware
- J. ASTM A 653: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- K. ASTM A 1008: Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- L. NAAMM HMMA 840-99: Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames
- M. C518 04 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

#### 1.5 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, sound ratings, profiles, finishes, detail of molding, conduit and prep for power signal and control systems.
- C. Shop drawings showing fabrication and installation of standard steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
  - 1. Provide schedule of doors and frames using same reference numbers for details and openings as those on contract drawings.
  - 2. Indicate coordination of glazing frames and stops with glass and glazing requirements.

D. Label Construction Certification: For door assemblies required to be fire-rated and exceeding limitations of labeled assemblies, submit manufacturer's certification that each door and frame assembly has been constructed to conform to design, materials and construction equivalent to requirements for labeled construction.

#### 1.6 QUALITY ASSURANCE

- A. Provide doors and frames from a single source manufacturer.
- B. Distributor's qualifications: Five (5) years' experience in similar projects.
- C. Installer's qualifications: Five (5) years' experience in similar projects.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
- B. Inspect doors and frames upon delivery for quantity and damage. Minor damages may be repaired provided refinished items are equal in all respects to new work and acceptable to Architect; otherwise, remove and replace damaged items as directed.
- C. Store and protect materials in accordance with NAAMM HMMA 840. Store doors and frames at building site under cover. Place units on minimum 4-inches high wood blocking. Avoid use of non-vented plastic or canvas shelters which could create humidity chamber. If cardboard wrapper on door becomes wet, remove carton immediately. Provide 1/4-inches spaces between stacked doors to promote air circulation.
- D. Identify products with a label indicating:
  - 1. Manufacturer's name
  - 2. Architect's opening number
  - 3. Product description and dimensions

#### 1.8 <u>WARRANTY</u>

A. Provide written manufacturer's warranty for one (1) year from substantial completion of the project on both material and workmanship.

#### PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

## **STEEL DOORS AND FRAMES**

#### **CARVER POLICE** CARVER, MA

- Manufacturer: Subject to compliance with requirements, provide standard steel A. doors and frames by one of the following:
  - Standard Steel Doors and Frames: 1.
    - a. De la Fontaine Industries
      - Amweld Building Products, Inc. b.
      - c. Ceco Corp.
      - Republic Builders Products. d.
      - Steelcraft Manufacturing Co. e.

#### 2.2 MATERIALS

- A. Steel requirements
  - Interior doors and frames: Comply with ASTM A653, Designation A40. 1.
  - 2. Exterior doors and frames: Comply with ASTM A653, Designation A60.
- B. Door cores
  - 1. Interior openings: Impregnated Honeycomb, with 1" cell diameter.
  - 2. Exterior openings: Polyurethane with an R value of 8.66 (hr °F-sq/ft)/BTU or better

#### 2.3 FABRICATION

- Frames A.
  - 1. Frame assembly: face welded, dressed smooth with seamless face.
  - 2. Gauges
    - Interior openings up to 48" width: 16-gauge a.
    - Interior openings over 48" width: 14-gauge b.
    - Exterior openings: 14-gauge c.
    - Side light, transom and borrowed light: 16-gauge d.
  - 3. Side light, transom and borrowed light
    - Install screws on non-secure side. a.
    - Glazing bead: 18-gauge 5/8"x 5/8", screw applied with countersunk b. holes, butted corners.
    - Glazing by Section 08800 c.
- B. Anchors
  - 1. Suitable for wall conditions.
  - 2. Located close to hinge reinforcements and at the same height on strike jamb.
    - Quantity: 2 per jamb up to 60" of door opening height, one additional a. anchor for each additional 30" of door height (or fraction thereof).
    - An additional floor anchor at the bottom of each jamb. b.
- C. Doors
  - Interior openings: Full flush lock seam on edge, 18-gauge 1.
  - Exterior openings: Full flush lock seam on edge, 16-gauge 2.
  - Door performance: Comply with ANSI A250.4 3.
    - Level A (heavy duty) for exterior doors a.

#### CARVER POLICE CARVER, MA

- b. Level B (moderate duty) for interior doors
- 4. End channels: 16-gauge, spot welded every 6".
  - a. Interior openings: Steel flush channel unfilled at top location. Steel inverted channel at bottom location.
  - b. Exterior openings: Steel flush channel sealed water tight at top location. Steel inverted channel with weep holes at bottom location.
- 5. Vertical edges on active doors:
  - a. Beveled edges on both sides: 1/8" in 2".
  - b. Square vertical edges are not acceptable.
- D. Clearances
  - 1. On fire rated openings: comply with NFPA 80.
  - 2. On non-fire rated openings:
    - a. Between door and frame: 1/8"
    - b. Between meeting edges of pair of doors: 1/8"
    - c. Between bottom of door and bottom of frame: <sup>3</sup>/<sub>4</sub>" without threshold.
- E. Manufacturing tolerances:

1.	Frames:	Width: +1/16", -1/32"
		Face, stop, rabbet and jamb depth: +/-1/32
2.	Doors:	Width and height: +/- 3/64"
		Thickness: +/- 1/16"
		Flatness: +/- 1/16"
		Door Twist: +/- 1/16"

- F. Fire rated openings
  - 1. Manufacture doors and frames as successfully tested, in accordance with:
    - a. NFPA 80
    - b. NFPA 252
    - c. NFPA 257
    - d. UL10C
  - 2. Identify each product with a fire label from one of the following testing agency:
    - a. Underwriters Laboratories (UL)
    - b. Warnock Hersey (ITS)
- G. Frame hardware preparation
  - 1. Surface-applied hardware: factory reinforced only, 12-gauge
  - 2. Mortise hardware: factory reinforced, drilled and tapped.
  - 3. Hinge and pivot reinforcements: to prevent door sagging.
    - a. 7-gauge flat hinge reinforcements at all locations or
    - b. 10-gauge high frequency hinge reinforcements, with a flange.
  - 4. Strike reinforcement: 16-gauge.
  - 5. Closer reinforcement: 12-gauge.
  - 6. Other reinforcements: 16-gauge.
- H. Door hardware preparation

#### CARVER POLICE CARVER, MA

- 1. Surface-applied hardware: factory reinforced only, 16-gauge
- 2. Mortise hardware: factory reinforced, drilled and tapped.
- 3. Hinge and pivot reinforcements: to prevent door sagging.
  - a. 7-gauge flat hinge reinforcements at all locations or
  - b. 10-gauge high frequency hinge reinforcements, with a flange.
- 4. Lock front reinforcement: 12-gauge
- 5. Flush bolt reinforcement: 12-gauge
- 6. Closer reinforcement: 16-gauge
- 7. Other reinforcements: 16-gauge
- I. Finishing
  - 1. Hot dipped galvanized A40/A60
    - a. Factory applied primer to protect the area where zinc was removed in the welding process.
  - 2. Primer
    - a. Factory applied primer. Primer shall comply with ANSI A250.10.

#### 2.4 <u>ACCESSORIES</u>

- A. Vision kits
  - 1. Sandwich overlapping kit.
  - 2. 20-gauge.
  - 3. Countersunk holes.
  - 4. Install screws on non-secure side.
  - 5. 18-gauge channel reinforcements on half-glass doors.
  - 6. Glazing by Section 08800.
- B. Frame accessories
  - 1. Dust/mortar box at strike location on drywall frames
  - 2. Shipping bars on welded frames
    - a. 1 for frames with less than 7" jamb depth
    - b. 2 for frames with 7" jamb depth and more
  - 3. Drill holes for silencers:
    - a. Single openings: 3 per strike jamb.
    - b. Pair openings: 2 per header.

#### PART 3 - EXECUTION

- 3.1 EXAMINATION
  - A. Inspect rough openings to detect problems that would prevent the proper installation of doors and frames.
  - B. Rough openings shall be square, level and plumb with accurate dimensions.
- 3.2 <u>INSTALLATION</u>

# A.

**CARVER POLICE** CARVER, MA

- Plan and manage a pre-installation meeting to explain the proper methods to install hollow metal doors and frames.
- B. Remove shipping bars on welded frames before installation and verify frame dimensions.

**STEEL DOORS AND FRAMES** 

- C. For grouted frames, apply on site a coat of bituminous coating inside the frame throat.
- D. Install doors and frames in accordance with:
  - Approved door and hardware schedule 1.
  - Approved shop drawings 2.
  - Manufacturer's recommendations 3.
  - Local building codes 4.
  - 5. NFPA 80
  - 6. ANSI/DHI A115.1G
  - 7. NAAMM HMMA 840

#### 3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Repair or replace damaged products.
- В. Correct defects in installation.
- C. Clean area in accordance with Section 01700.
- D. Protect doors and frames until transfer of the building to the Owner.

END OF SECTION 08 11 13

#### SECTION 08 14 00 - FLUSH WOOD DOORS

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS:</u>

 A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction," Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>:

- A. Extent and location of each type of flush wood door is indicated on drawings and in schedules.
- B. Types of doors required include the following:
  - 1. Solid core flush wood doors with wood veneer faces (Plain Sliced White **Oak**) and factory finishing
- C. **Factory-premachining** for hardware for wood doors is **mandatory**.
- D. **Factory finishing** of wood doors is **mandatory**.
- E. Additional woodwork other than flush wood doors is specified in Section 06 44 00, "Ornamental Woodwork".
- F. Metal door frames for flush wood doors are specified in Section 08 11 13 -"Standard Steel Doors and Frames".
- G. Door hardware is specified in Section 08 71 00 "Door Hardware".
- H. Glazing of wood doors is specified in Section 08 80 00 "Glass and Glazing".

#### 1.3 <u>SUBMITTALS:</u>

- A. Product Data: Door manufacturer's technical data for each type of door, including details of core and edge construction, trim for openings and factory-finishing specifications.
- B. Shop Drawings: Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for factory finishing and other pertinent data.
  - 1. For factory-premachined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light and louver openings.

- C. Samples: Submit samples for the following:
  - 1. Doors for Transparent Finish: Door faces with solid wood edging representing typical range of color and grain for each species of veneer and solid lumber required.

#### 1.4 **QUALITY ASSURANCE**:

- A. Quality Standards: Comply with the following standards:
  - 1. NWWDA Quality Standard: I.S.1 "Industry Standard for Wood Flush Doors", of National Wood Window and Door Association (NWWDA).
  - 2. AWI Quality Standard: "Architectural Woodwork Quality Standards"; including Section 1300 "Architectural Flush Doors", of Architectural Woodwork Institute (AWI) for grade of door, core construction, finish and other requirements exceeding those of NWWDA quality standard.
- B. NWWDA Quality Marking: Mark each wood door with NWWDA Wood Flush Door Certification Hallmark certifying compliance with applicable requirements of NWWDA I.S. 1 Series.
- C. Fire-Rated Wood Doors: Provide wood doors which are identical in materials and construction to units tested in door and frame assemblies per ASTM E 152 and which are labeled and listed for ratings indicated by UL or Warnock Hersey.
- D. Manufacturer: Obtain doors from a single manufacturer.
- E. Factory prefinishing shall meet the performance standards of AWI finish system TR-6 (AWI #5) and OP-6 (AWI #11) with stain coat.

#### 1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING:

- A. Protect doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations of NWWDA pamphlet "How to Store, Handle, Finish, Install, and Maintain Wood Doors", as well as with manufacturer's instructions.
- B. Identify each door with individual opening numbers which correlate with designation system used on shop drawings for door, frames, and hardware, using temporary, removable or concealed markings.

### 1.6 **PROJECT CONDITIONS:**

- A. Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during remainder of construction period to comply with the following requirements applicable to project's geographical location:
  - 1. Referenced AWI quality standard including Section 100-S-3 "Moisture Content".

#### 1.7 <u>WARRANTY:</u>

- A. General: Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.
- B. Door Manufacturer's Warranty: Submit written agreement in door manufacturer's standard form signed by Manufacturer, Installer and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup or twist) or that show telegraphing of core construction in face veneers, or do not conform to tolerance limitations of referenced quality standards.
  - 1. Warranty shall also include reinstallation which may be required due to repair or replacement of defective doors where defect was not apparent prior to hanging.
  - 2. Warranty shall be in effect during following period of time after date of Substantial Completion.
  - 3. Solid Core Interior Doors:
    - a. Life of installation.
- C. Contractor's Responsibilities: Replace or refinish doors where Contractor's work contributed to rejection or to voiding of manufacturer's warranty.

#### PART 2 - PRODUCTS

#### 2.1 <u>MANUFACTURERS</u>:

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
  - 1. Solid Core Doors with Wood Veneer Faces:
    - a. Marshfield Door Systems, Inc.
    - b. Eggers industries, architectural door division.
    - c. VT Industries, Inc.

#### 2.2 INTERIOR FLUSH WOOD DOORS:

- A. Solid Core Doors for Transparent Finish: Comply with the following requirements:
  - 1. Veneers: Grade A, **White Oak**, Plain sliced cut veneers. Match veneers for all pair doors.
  - 2. AWI Grade: Custom
  - Particleboard Core (PC-5) to comply with ANSI Stnd. A208.1- 1989 LD-2, with screw holding power of 125 lbs., modulus of rupture of 800 psi, modulus of elasticity of 150,000 psi and density of 30-35 lbs. per cubic foot.
  - 4. Crossbands are wood-based composites of a minimum thickness of 1/16". Crossbands and face veneers are laminated to the core with Type 2 interior use glue using the Hot Press process. Crossbands must extend the full width of the door. Minimum properties include internal bond of 100 psi and density of 50 lbs. per cubic foot.

- 5. Stile Type: Matching
- 6. Rails (Horizontal Edges) Rails are solid wood, structural composite lumber meeting the minimum requirements of WDMA, or medium density fiberboard meeting requirements of ANSI 208.2 (Medium Density Fiberboard for Interior Use).
- 7. Blocking Requirements Specified: Minimum 5" top rail and 5" bottom rail required
- B. Fire-Rated Solid Core Doors: Comply with the following requirements:
  - 1. Faces and AWI Grade: Provide faces and grade to match non-rated doors.
  - 2. Construction: Manufacturer's standard core construction as required to provide fire-resistance rating indicated.
  - 3. Edge Construction: Provide manufacturer's standard laminated edge construction for improved screw-holding capability and split resistance as compared to edges composed of a single layer of treated lumber.
  - 4. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
  - 5. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
- C. Factory Finishing All doors to be finished at the factory, with UV cured system with performance properties equivalent to TR-6 or OP-6 Catalyzed Polyurethane per AWI Section 1500, Premium grade. Factory pre-finished doors to be individually protected with transparent poly-wrap at the factory. Final color, build, and sheen to be approved by architect based on actual review samples supplied by the manufacturer.
  - 1. Finish Type: Transparent with stain coat. Color matching to Marshfield Door Systems, "**NUTMEG**".

### 2.3 LOUVERS AND LIGHT FRAMES:

- A. Metal Frames for Light Openings in Fire Doors: Manufacturer's standard frame formed of veneer wrapped 18-gage cold-rolled steel, factory-primed, and approved for use in door of fire-rating indicated.
- B. Wood Frames for Light Openings in Non-rated Doors: Manufacturer's standard wood frame to match door veneer species.

### 2.4 <u>FABRICATION</u>:

- A. Fabricate flush wood doors to produce doors complying with following requirements:
  - 1. In sizes indicated for job-site fitting.

- 2. Factory-prefit and premachine doors to fit frame opening sizes indicated with the following uniform clearances and bevels:
  - a. Comply with tolerance requirements of AWI for prefitting. Comply with final hardware schedules and door frame shop drawings and with hardware templates.
  - b. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory premachining.
- B. Metal Astragals: Premachine astragals and formed steel edges for hardware where required for pairs of fire-rated doors.
- C. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of doors required.
  - 1. Light Openings: Trim openings with moldings of material and profile indicated.
- D. Factory Finish Treatment: Clear finish over stain coat with satin gloss top coat. Color as specified above.

#### PART 3 - EXECUTION

#### 3.1 <u>EXAMINATION</u>:

- A. Examine installed door frames prior to hanging door:
  - 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
  - 2. Reject doors with defects.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.

#### 3.2 <u>INSTALLATION</u>:

- A. Hardware: For installation see Section 08710 "Door Hardware" section of these specifications.
- B. Manufacturer's Instructions: Install wood doors to comply with manufacturer's instructions and of referenced AWI standard and as indicated.
  - 1. Install fire-rated doors in corresponding fire-rated frames in accordance with requirements of NFPA No. 80.
- C. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.

- 1. Fitting Clearances for Non-Rated Doors: Provide 1/8 inch, at jambs and heads; 1/16 inch per leaf at meeting stiles for pairs of doors; and 1/8 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide <sup>1</sup>/<sub>4</sub> inch clearance from bottom of door to top of threshold.
- 2. Fitting Clearances for Fire-Rated Doors: Complying with NFPA 80.
- 3. Bevel non-rated doors 1/8 inch in 2 inches at lock and hinge edges.
- 4. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Prefit Doors: Fit to frames for uniform clearance at each edge.

#### 3.3 ADJUSTING AND PROTECTION:

- A. Operation: Rehang or replace doors which do not swing or operate freely.
- B. Finished Doors: Refinish or replace doors damaged during installation.
- C. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 08 14 00

#### SECTION 08 31 13 - ACCESS DOORS

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing access doors for installation in the following types of construction:
  - 1. Gypsum drywall construction, sized for adequate access to otherwise concealed valves, gauges, operable parts.
  - 2. Fire rated (90 min.) lockable access panel (36" x 36") for access to attic space where indicated on the drawings.
- B. Access doors required for Division 23, and Division 26 installations are to be furnished and installed by those Trade Contractors.

#### 1.3 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
  - 1. Product data in form of manufacturer's technical data and installation instructions for each type of access door assembly, including setting drawings, templates, instructions, and directions for installation of anchorage, devices.

#### 1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility: Obtain access doors for entire project from one source from a single manufacturer.
- B. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units, which may vary slightly from sizes indicated.
- C. Coordination: Furnish inserts and anchoring devices that must be built into other work for installation of access doors. Coordinate delivery with other work to avoid delay.

#### 1.5 PROJECT CONDITIONS

A. Verification: Obtain specific locations and sizes for required access doors from trades requiring access to concealed equipment, and indicate on submittal schedule.

#### PART 2 - PRODUCTS

#### 2.1 <u>MANUFACTURERS</u>

- A. Manufacturers: Subject to compliance with requirements, provide access doors by one of the following:
  - 1. Cesco Products
  - 2. J.L. Industries
  - 3. Milcor, Inc.
  - 4. Nystrom, Inc.

#### 2.2 MATERIALS AND FABRICATION

- A. General: Furnish each access door assembly manufactured as an integral unit, complete with all parts, and ready for installation.
- B. Steel Access Doors and Frames: Fabricate units of continuous welded steel construction unless otherwise indicated. Grind welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of support shown.
- C. Frames: Fabricate from 16-gage steel.
  - 1. Fabricate frame with exposed flange nominal 1-inch wide around perimeter of frame for units installed in the following construction:
    - a. Drywall finish.
    - b. Plywood.
  - 2. For gypsum drywall furnish perforated frames with drywall bead.
- D. Flush Panel Doors: Fabricate from not less than 20 gage sheet steel, with concealed continuous piano hinge set to open 175 degrees. Finish with manufacturer's factory-applied prime paint.
- E. Locking Devices: Furnish flush, screwdriver-operated cam locks of number required to hold door in flush, smooth plane when closed.
  - 1. Provide one cylinder lock per access door. Furnish 2 keys per lock. Key all locks alike, unless otherwise scheduled.
- F. Fire rated access door to be Model #3218-036, insulated fire rated access door manufactured by Milcor Commercial Products Group, Bensenville, IL, or equal, for stud wall installation.

#### PART 3 - EXECUTION

#### 3.1 <u>INSTALLATION</u>

- A. Comply with manufacturer's instructions for installation of access doors.
- B. Coordinate installation with work of other trades.
- C. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.

#### 3.2 ADJUST AND CLEAN

- A. Adjust hardware and panels after installation for proper operation.
- B. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08 31 13

#### SECTION 08 33 26 – OVERHEAD COILING SECURITY GRILLE

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201, "The General Conditions of the Contract for Construction," 15th Edition, 1997, the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This section includes the furnishing and installation of upcoiling security grille, motor operator, and accessories as specified for a complete installation within
   Sally Port 118 / Vehicle Processing 125 as indicated on the drawings.
- B. Overhead coiling security grille includes the following:
  - 1. Security grille curtain and hood assembly
  - 2. Guide rail track sized for installation type
  - 3. Motor operator and controls
  - 4. Locking mechanism

Provide complete upcoiling security grille assemblies including guides, motor operator, hardware, and installation accessories.

#### 1.3 <u>SUBMITTALS</u>

- A. Product Data: Submit manufacturer's product data and installation instructions for each type of upcoiling security grille. Include both published data and any specific data prepared for this project.
- B. Shop Drawings: Submit shop drawings for approval prior to fabrication. Include detailed plans, elevations, details of framing members, required clearances, anchors, and accessories. Include relationship with adjacent materials.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturer: Overhead coiling security grille shall be manufactured by a firm with a minimum of five (5) years' experience in the fabrication and installation of overhead coiling security grilles. Manufacturers proposed for use, which are not named in these specifications, shall submit evidence of ability to meet performance and fabrication requirements specified, and include a list of five projects of similar design and complexity completed within the past five years.
- B. Installer: Installation of overhead coiling security grille shall be performed by an authorized representative of the manufacturer.

- C. Single-Source Responsibility: Provide grilles, tracks, and related primary components from one manufacturer for each type of grille. Provide secondary components from source acceptable to manufacturer of primary components.
- D. Pre-Installation Conference: Schedule and convene a pre-installation conference just prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials and products in labeled protective packages. Store and handle in strict compliance with manufacturer's instructions and recommendations. Protect from damage from weather, excessive temperatures and construction operations.

#### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
  - Atlas Door Corp. 1.
  - 2. Cornell Iron Works Inc.
  - 3. Overhead Door Corp.
- B. For the purpose of establishing performance criteria the Contract Documents have been based upon upcoiling security grille by Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: info@overheaddoor.com.

#### 2.2 **OVERHEAD COILING SECURITY GRILLE**

- Trade Reference: 670 Series Upcoiling Security Grilles with motor operator for A. powered doors, by Overhead Door Corporation.
  - Horizontal 5/16 inch diameter rods with network of vertically interlocking 1. links to form a pattern. Bottom bar extruded aluminum tubular shape.
    - Material: Aluminum a.
    - Vertical Rod Spacing: 2 inches on center b.
    - Pattern: Straight lattice; horizontal spacing 3 inches on center c.
  - Finish: 2.
    - Aluminum mill finish a.
  - 3. Bottom Bar:
    - Tubular extruded aluminum, mill finish a.
  - Guides: 4.

- a. Extruded aluminum shapes with retainer grooves and continuous silicone treated wool-pile strips or PVC inserts to reduce noise and assist operation.
- b. Guides between jamb mounted on adjacent construction.
- 5. Brackets: Minimum 3/16 inch steel to support barrel, counterbalance and hood as applicable.
- 6. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with maximum deflection of 0.03 inches per foot of span. Counterbalance adjustable by means of an adjusting tension wheel.
- 7. Hood:
  - a. Aluminum, mill finish with intermediate supports as required.
- 8. Electric Motor: Provide UL listed electric operator, size as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second.
  - a. Medium duty operator required, minimum
  - b. Voltage: 120 volt, single phase
  - c. Horsepower: <sup>1</sup>/<sub>2</sub> HP, minimum
- 9. Mounting:
  - a. Front of hood
- 10. Entrapment Protection:
  - a. 2 wire electric sensing edge
  - b. Photo cell operation.
- 11. Control accessories: Control Panel is to be supplied at same voltage as operator selected.
  - a. Key activated controls for up, down, stop functions
- 12. Locking: Model 670 egress grille self-locking mechanism to prevent forced opening of a closed grille that does not interfere with normal electric operation but fail safe for emergency operation.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Verify opening sizes, tolerances and conditions are acceptable.
- B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

#### 3.2 <u>PREPARATION</u>

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

## CARVER POLICECARVER, MAOVERHEAD COILING SECURITY GRILLE

#### 3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Coordinate installation of electrical service with Electrical Contractor. Complete wiring from disconnect to unit components.
- F. Install perimeter trim and closures.

#### 3.4 <u>ADJUSTING</u>

- A. Test security grilles for proper operation and adjust as necessary to provide proper operation without binding or distortion.
- B. Adjust hardware and operating assemblies for smooth and noiseless operation.

#### 3.5 <u>CLEANING</u>

- A. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.
- B. Remove labels and visible markings.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

#### 3.6 **PROTECTION**

A. Protect installed products until completion of project.

#### 3.7 <u>SCHEDULE</u>

A. Sally Port 118 / Vehicle Processing 125: (one (1) required)

#### END OF SECTION 08 33 26

#### SECTION 08 36 13 - OVERHEAD SECTIONAL DOORS

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

 A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This section includes the furnishing and installing overhead sectional doors as shown on drawings, track, motor operators, and accessories as specified for a complete installation. <u>Base Bid</u>: Total of Two (2) openings required. <u>Alternate No. 1</u>: Total of One (1) opening required.
- B. Types of overhead rolling doors include the following:
  - 1. Insulated steel overhead sectional doors, (size as indicated on drawings) as indicated on the elevations.
  - 2. Lift tracks (2 inch), as indicated on drawings and specified herein
  - 3. Motorized operators for all door installations

4. Remote control devices for remote door operation from building exterior. Provide complete operating door assemblies including guides, hardware, operators, and installation accessories.

- C. Related Sections: Other specification sections which directly relate to the work of this Section include, but are not limited to, the following:
  - 1. Electrical connections for powered operators and controls are specified in Division 26.
  - 2. Section 01 23 00 "Alternates" for work affection this section.

#### 1.3 <u>SUBMITTALS</u>

- A. Product Data: Submit manufacturer's product data and installation instructions for each type of rolling door. Include both published data and any specific data prepared for this project.
- B. Shop Drawings: Submit shop drawings for approval prior to fabrication. Include detailed plans, elevations, details of framing members, required clearances, anchors and accessories. Include relationship with adjacent materials.

#### 1.4 **QUALITY ASSURANCE**

A. Manufacturer: Sectional doors shall be manufactured by a firm with a minimum of five (5) years' experience in the fabrication and installation of rolling doors.

Manufacturers proposed for use, which are not named in these specifications, shall submit evidence of ability to meet performance and fabrication requirements specified, and include a list of five (5) projects of similar design and complexity completed within the past five years.

- B. Installer: Installation of sectional doors shall be performed by an authorized representative of the manufacturer.
- C. Single-Source Responsibility: Provide doors, tracks, motors, and related primary components from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.
- D. Pre-Installation Conference: Schedule and convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

 Deliver materials and products in labeled protective packages. Store and handle in strict compliance with manufacturer's instructions and recommendations.
 Protect from damage from weather, excessive temperatures and construction operations.

#### PART 2 - PRODUCTS

#### 2.1 <u>MANUFACTURERS</u>

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
  - 1. Atlas Door Corp.
  - 2. Cornell Iron Works Inc.
  - 3. Overhead Door Corp.
- B. For the purpose of establishing performance criteria the Contract Documents have been based upon rolling doors by Overhead Door Corporation, Pennsylvania Division; Telephone 800-929-2553 or 717-248-0131; Fax 800-929-1274.

#### 2.2 EXTERIOR, INSULATED SECTIONAL DOORS – (ALL INSTALLATIONS)

- A. Insulated Steel Sectional Overhead Doors: 592 Series Thermacore Insulated Steel Doors by Overhead Door Corporation. Units shall have the following characteristics:
  - 1. Door Assembly: Metal/foam/metal sandwich panel construction, with PVC thermal break and weather-tight ship-lap design meeting joints.
    - a. Panel Thickness: 2 inches
- b. Exterior Surface: Ribbed, textured.
- c. Exterior Steel: .015 inch, hot-dipped galvanized.
- d. End Stiles: 16 gauge with thermal break.
- e. Spring Counterbalance: Sized to weight of the door, with a helically wound, oil tempered torsion spring mounted on a steel shaft; cable drum of diecast aluminum with high strength galvanized aircraft cable. Sized with a minimum 7 to 1 safety factor. Standard cycle spring: 10,000 cycles.
- f. Insulation: CFC-free and HCFC-free polyurethane, fully encapsulated.
- g. Thermal Values: R-value of 17.50; U-value of 0.057.
- h. Air Infiltration: 0.08 cfm at 15 mph; 0.08 cfm at 25 mph.
- 2. Finish and Color:
  - a. Baked-on Trinar polyvinylidene floruoride high performance coating:
  - b. Interior color, white.
  - c. Exterior color, white.
- 3. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
- 4. Lock:
  - a. Interior mounted slide lock.
- 5. Weatherstripping:
  - a. EPDM bulb-type strip at bottom section.
  - b. Flexible Jamb seals.
  - c. Flexible Header seal.
- 6. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.
  - a. Size: 2 inch
  - b. Type: Standard lift
- 7. Electric Motor Operation: Provide UL listed electric operator, size and type as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second. Operator shall meet UL325/2010 requirements for continuous monitoring of safety devices.
  - a. Entrapment Protection: Required for momentary contact, includes radio control operation. Photoelectric sensors monitored to meet UL 325/2010.
  - b. Operator Controls: See Section 2.4, C.
- M. Wall Mounting Condition: Face-of-wall mounting.

## 2.4 MOTOR OPERATORS

- A. Trade Reference: SEL Series by Overhead Door Corporation.
- B. Standard features to include the following:
  - 1. 1/2 hp, 208V, three phase motor. Heavy-duty operator designed to operate standard torsion spring vehicular doors up to 850 pounds.

- 2. Side mount Jack Shaft operation
- 3. Control circuit is a 24V
- 4. 4 wire Fail Safe relay kit, 115volt safety edge
- 5. 6 Channel Programmable Transmitter System 412 MHz

# C. Special Operations:

- BASE BID = Sally Port 118 / Vehicle Processing 125: NO INTERIOR CONTROLS WITHIN SPACE. Division 24 to provide control wiring from motor operator to Communications Equipment Room 114 for remote operation of doors (up, down, stop) from Dispatch Consoles within Communications 107. Coordinate with Owner's Radio Vendor for integration into Owner's console positions.
- 2. ALTERNATE NO. 1 = Outbuilding: Furnish one (1) programmable remote control device programmed for exterior use at door opening.

# PART 3 - EXECUTION

## 3.1 <u>PREPARATION</u>

A. Take field dimensions and examine conditions of substrates, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

# 3.2 INSTALLATION

- A. Strictly comply with manufacturer's installation instructions and recommendations. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.
- B. Instruct Owner's personnel in proper operating procedures and maintenance schedule.

#### 3.3 ADJUSTING AND CLEANING

- A. Test sectional doors for proper operation and adjust as necessary to provide proper operation without binding or distortion.
- B. Touch-up damaged coatings and finishes and repair minor damage. Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer of material or product being cleaned.

END OF SECTION 08 36 13

#### SECTION 08 41 13 - ALUMINUM ENTRANCES & STOREFRONT

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

## 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing and installing the following types of aluminum entrances and storefront work as indicated on the drawings and specified herein:
  - 1. Aluminum entrance doors and matching storefront framing system.
  - 2. 1" insulated metal panel door inserts within aluminum door frames where indicated on the drawings (**Type "IP**") to match color and finish of aluminum entrance doors.
  - 3. Complete weatherstripping, door bottom seals, meeting stiles, and thresholds for aluminum entrances.
- B. Related Sections: The following sections contain requirements that relate to this Section:
  - 1. Section 08 71 00 "Finish Hardware" for additional hardware, including automatic opening devices, for aluminum entrances.
  - 2. Section 08 80 00 "Glass and Glazing" for glazing of all aluminum entrances and storefront framing as indicated on the drawings.

## 1.3 <u>SYSTEM DESCRIPTION</u>

- A. Entrance Performance Requirements:
  - 1. Air Infiltration Test
    - a. With door sash closed and locked, test unit in accordance with ASTM E 283 at a static air pressure difference of 1.57 psf.
    - b. Air infiltration shall not exceed .50 cfm/SF of unit, for single doors.
    - c. Air infiltration shall not exceed .10 cfm/SF of unit, for a pair of doors.
  - 2. Uniform Load Structural Test
    - a. With door sash closed and locked, test unit in accordance with ASTM E 330 at a static air pressure difference of 60.0 psf, both positive and negative pressure.

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- b. At conclusion of test there shall be no glass breakage, permanent damage to fasteners, hardware parts, or actuating mechanisms, nor any other damage that would cause the door to be inoperable.
- 3. Condensation Resistance Test (CRF)
  - a. Test unit in accordance with AAMA 1503.1.
  - b. Condensation Resistance Factor (CRF) shall not be less than 67 (frame) when glazed with 0.29 center of glass U-Factor.
- 4. Condensation Resistance (CR)
  - a. With ventilators closed and locked, test unit in accordance with NFRC 500-2010.
  - b. Condensation Resistance (CR) shall not be less than 45 when glazed with 0.29 center of glass U-Factor.
- 5. Thermal Transmittance Test (Conductive U-Factor)
  - a. With ventilators closed and locked, test unit in accordance with NFRC 100-2010.
  - b. Conductive thermal transmittance (U-Factor) shall not be more than 0.49 BTU/hr•ft<sup>2</sup>•°F when glazed with 0.29 center of glass U-Factor.
- B. Storefront System Performance Requirements:
  - 1. Air Infiltration Test
    - a. Test unit in accordance with ASTM E 283 at a static air pressure difference of 6.24 psf.
    - b. Air infiltration shall not exceed .06 cfm/SF of unit.
  - 2. Water Resistance Test
    - a. Test unit in accordance with ASTM E 331.
    - b. There shall be no uncontrolled water leakage at a static test pressure of 12.0 psf
  - 3. Uniform Load Deflection Test
    - a. Test in accordance with ASTM E 330.
    - b. Deflection under design load shall not exceed L/175 of the clear span.
  - 4. Uniform Load Structural Test
    - a. Test in accordance with ASTM E 330 at a pressure 1.5 times the design wind pressure in 1.4.B.3.b.
    - b. At conclusion of the test, there shall be no glass breakage, permanent damage to fasteners, storefront parts, or any other damage that would cause the storefront to be defective.
  - 5. Condensation Resistance Test (CRF)
    - a. Test unit in accordance with AAMA 1503.1.
    - b. Condensation Resistance Factor (CRF) shall not be less than 56 (frame) when glazed with 0.29 center of glass U-Factor.
  - 6. Condensation Resistance (CR)
    - a. With ventilators closed and locked, test unit in accordance with NFRC 500-2010.
    - b. Condensation Resistance (CR) shall not be less than 37 when glazed with 0.29 center of glass U-Factor.
    - Thermal Transmittance Test (Conductive U-Factor)

7.

- a. With ventilators closed and locked, test unit in accordance with NFRC 100-2010.
- b. Conductive thermal transmittance (U-Factor) shall not be more than 0.41 BTU/hr•ft2•°F when glazed with 0.29 center of glass U-Factor.

# 1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide aluminum entrance and shear block storefront assemblies that comply with performance characteristics specified, as demonstrated by testing the manufacturer's corresponding stock assemblies according to test methods indicated.

# 1.5 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.
  - 1. Product data for each aluminum entrance and storefront system required, including:
    - a. Manufacturer's standard details and fabrication methods.
    - b. Data on finishing, hardware and accessories.
    - c. Recommendations for maintenance and cleaning of exterior surfaces.
  - 2. Shop drawings for each aluminum entrance and storefront system required, including:
    - a. Layout and installation details, including relationship to adjacent work.
    - b. Elevations at 1/4-inch scale.
    - c. Detail sections of typical composite members.
    - d. Anchors and reinforcement.
    - e. Hardware mounting heights.
    - f. Provisions for expansion and contraction.
    - g. Glazing details.
  - 3. Hardware Schedule: Coordinate hardware with doors, frames, and related work to ensure proper size thickness, hand, function, and finish. Include item name, name of the manufacturer and complete designations of every item required for each door opening. Additional hardware is furnished under Section 08710, "Door Hardware".
  - 4. Samples for Initial Color Selection: Submit pairs of samples of each specified color and finish on 12-inch-long sections of extrusions or formed shapes. Where normal color variations are anticipated, include 2 or more units in each set of samples indicating extreme limits of color variations.
  - 5. Samples for Verification Purposes: The Architect reserves the right to require additional samples, that show fabrication techniques and workmanship, and design of hardware and accessories.

6. Test Reports: Provide certified test reports from a qualified independent testing laboratory showing that aluminum entrance systems have been tested in accordance with specified test procedures and comply with performance characteristics indicated.

# 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed installations of aluminum entrances similar in design and extent to those required for the project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer's Qualifications: Provide aluminum entrance systems produced by a firm experienced in manufacturing systems that are similar to those indicated for this project and that have a record of successful in-service performance.
- C. Fabricator Qualifications: Provide aluminum entrance systems fabricated by a firm experienced in producing systems that are similar to those indicated for this Project, and that have a record of successful in-service performance. The fabricator shall have sufficient production capacity to produce components required without causing delay in progress of the Work.
- D. Single Source Responsibility: Obtain aluminum entrance systems from one source and from a single manufacturer.
- E. Design Criteria: The drawings indicate the size, profile, and dimensional requirements of aluminum entrance work required and are based on the specific types and models indicated. Aluminum entrance and storefront by other manufacturers may be considered, provided deviations in dimensions and profiles are minor and do not change the design concept as judged by the Architect. The burden of proof equality is on the proposer.
  - 1. Submit data for alternate manufacturers in accordance with Conditions of the Contract and Section 01300, "Submittals and Product Substitutions".

# 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver aluminum entrance components in the manufacturer's original protective packaging.
- B. Store aluminum components in a clean dry location away from uncured masonry or concrete. Cover components with waterproof paper, tarpaulin or polyethylene sheeting in a manner to permit circulation of air.
  - 1. Stack framing components in a manner that will prevent bending and avoid significant or permanent damage.

## 1.8 <u>PROJECT CONDITIONS</u>

- A. Field Measurements: Check openings by accurate field measurement before fabrication. Show recorded measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of the work.
  - 1. Where necessary, proceed with fabrication without field measurements, and coordinate fabrication tolerances to ensure proper fit.

# 1.9 <u>WARRANTY</u>

- A. Total Entrance Installation
  - 1. The responsible contractor shall assume full responsibility and warrant for one year the satisfactory performance of the total entrance installation which includes that of the door, hardware, glass (including insulated units), glazing, anchorage and setting system, sealing, flashing, etc., as it relates to air, water, and structural adequacy as called for in the specifications and approved shop drawings.
  - 2. Any deficiencies due to such elements not meeting the specifications shall be corrected by the responsible contractor at their expense during the warranty period.
- B. Window Material and Workmanship
  - 1. Provide written guarantee against defects in material and workmanship for three (3) years from the date of final shipment.
- C. Anodic Finish
  - 1. Warranty period shall be for ten (10) years from the date of final shipment.

## PART 2 - PRODUCTS

## 2.1 MANUFACTURER AND MODEL

- A. All entrances shall be EFCO Series D502 Wide Stile ThermaStile Entrances, or approved equal.
  - 1. Acceptable alternates:
    - a. Series 1700 as manufactured by Architectural Window Manufacturing Corporation, Rutherford, New Jersey.
    - b. Trifab® 451UT, as manufactured by Kawneer North America, Norcross, Georgia.
- B. All storefront systems shall be EFCO<sup>®</sup> System 403 Thermal Flush-Glazed Shear Block Storefront, or approved alternate manufacturer providing a comparable framing system to match their entrance framing in dimension, material, performance, and finish.
- C. Equivalents: Subject to compliance with all material and performance requirements outlined in these specifications, "or equal" products by other manufacturers will be considered for use subject to review by the Architect. The Architect's decision regarding equivalency is final.

## 2.2 <u>MATERIAL</u>

#### A. Aluminum

1. Extruded aluminum shall be 6063-T5 or T6 alloy and temper.

#### B. Fasteners

1. All exposed fasteners shall be aluminum or stainless steel.

# C. Thermal Barrier

- 1. All exterior aluminum shall be separated from interior aluminum by a ridged, structural thermal barrier. For purposes of this specification, s structural thermal barrier is defined as a system that shall transfer shear during banding and, therefore, promote composite action between the exterior and interior extrusions.
- 2. The thermal barrier for aluminum entrances shall be thermal struts, consisting of glass reinforced polyamide nylon, mechanically crimped in raceways extruded in the exterior and interior extrusions. Poured and debridged urethane thermal barriers shall not be permitted.
- 4. Barrier material for storefront framing shall be poured-in-place, two-part polyurethane. A nonstructural thermal barrier is unacceptable.
- D. Additional hardware for entrance doors is specified under Section 08710 Door Hardware of the specifications and shall be sent to the door manufacturer for application. The finish hardware supplier shall be responsible for furnishing physical hardware and templates of all hardware to the entrance door manufacturer prior to fabrication, and for coordinating hardware delivery requirements with the hardware manufacturer, the General Trades Contractor and the entrance door manufacturer to ensure the building project is not delayed.

## 2.3 FABRICATION

- A. Aluminum Entrances:
  - 1. Major portions of the door sections shall have .125" wall thickness.
  - 2. Exterior glazing stops shall be an integral part of the door; glazing stop sections shall have .050" wall thickness. Interior stops shall be snap-in type. Both stops will have E.P.D.M. gaskets.
  - 3. Mechanical fasteners, welded components and hardware items shall not bridge thermal barriers. Thermal barriers shall align at all corners.
  - 4. Depth of door frame shall not be less than 2".
  - 5. Stiles shall be no less than 5" in width
- B. Entrance Doors
  - 1. Door stiles and rails shall have hairline joints at corners.
  - 2. Exterior corner construction is true mortise and tenon for physical interlock between the rails and stiles.

- 3. Interior corner construction shall be joined by heavy concealed reinforcement brackets with screws and shall be deep penetration and fillet welded.
- 4. Weather-stripping shall be wool pile and shall be installed in one stile of pairs of doors.
- C. Glazing
  - 1. All units shall be dry glazed with extruded pressure fitting aluminum glazing stops, and E. P. D. M. gasket.
- D. Framing (Door and Storefront)
  - 1. Depth of frame shall not be less than 4-1/2".
  - 2. Face dimension shall not be less than 2".
  - 3. Shear block construction shall be utilized throughout.
  - 4. System design shall be such that raw edges will not be visible at joints.
- E. Door stops shall include wool pile weather-stripping.
- F. Storefront Framing:
  - 1. All aluminum frame extrusions shall have a minimum wall thickness of .080".
  - 2. All exposed work shall be carefully matched to produce continuity of line and design with all joints. System design shall be such that raw edges will not be visible at joints.

# 2.4 <u>GLAZING</u>

A. Glazing of aluminum entrances, sidelights, transom lights, and storefront framing to be by Section 08 80 00 – Glass and Glazing.

## 2.5 <u>FINISH</u>

- A. All aluminum entrances and storefront shall have manufacturers finish on interior and exterior.
- B. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- D. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- E. Exterior / Interior of Framing:
  - 1. Anodic
    - a. Finish all exposed areas of aluminum windows and components with electrolytically deposited color in accordance with Aluminum Association Designation AA-M10-C22-A41.
    - b. Color shall be Bone White.

# 2.6 <u>HARDWARE</u>

A. General: Refer to Section 08710 "Door Hardware" for requirements for hardware items other than those indicated to be provided by the aluminum entrance manufacturer. Section 08400 to coordinate hardware requirements with aluminum entrances and install all scheduled hardware for aluminum entrances.

#### 2.7 <u>COMPONENTS</u>

- A. Storefront Framing System: Provide storefront and entrance framing systems fabricated from extruded aluminum members of size and profile indicated.
- B. Include subframes and other reinforcing members of the type indicated. Provide for flush glazing storefront from the exterior on all sides without projecting stops.
- C. Shop fabricate and preassemble frame components where possible. Provide storefront frame sections without exposed seams.
  - 1. Mullion Configurations: Provide pockets at the inside glazing face to receive resilient elastomeric glazing. Mullions and horizontals shall be one piece. Make provisions to drain moisture accumulation to the exterior.

#### PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Examine substrates and supports, with the Installer present, for compliance with requirements indicated, installation tolerances, and other conditions that affect installation of aluminum entrances. Correct unsatisfactory conditions before proceeding with the installation.
  - 1. Do not proceed with installation until unsatisfactory conditions are corrected.

#### 3.2 <u>INSTALLATION</u>

- A. Comply with manufacturer's instructions and recommendations for installation.
- B. Set units plumb, level, and true to line, without warp or rack of framing members, doors, or panels. Install components in proper alignment and relation to established lines and grades indicated. support and Provide proper anchor securely in place.
- C. Construction Tolerances: Install aluminum entrance to comply with the following tolerances:
  - 1. Variation from Plane: Do not exceed 1/8 inch in 12 feet of length or 1/4 inch in any total length.

- 2. Offset from Alignment: The maximum offset from true alignment between two identical members abutting end to end in line shall not exceed 1/16 inch.
- 3. Diagonal Measurements: The maximum difference in diagonal measurements shall not exceed 1/8 inch.
- 4. Offset at Corners: The maximum out-of-plane offset of framing at corners shall not exceed 1/32 inch.
- D. Separate aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.
  - 1. Zinc or cadmium plate steel anchors and other unexposed fasteners after fabrication.
  - 2. Paint dissimilar metals where drainage from them passes over aluminum.
- E. Drill and tap frames and doors and apply surface-mounted hardware items. Comply with hardware manufacturer's instructions and template requirements. Use concealed fasteners wherever possible.
- F. Set sill members and other members in bed of sealant, or with joint fillers or gaskets to provide weathertight construction. Comply with requirements of Section 07920 for sealants, fillers, and gaskets.
- G. Refer to Section 08800 "Glazing" for installation of glass and other panels indicated to be glazed into doors and framing.

# 3.3 <u>ADJUSTING</u>

A. Adjust operating hardware to function properly, for smooth operation without binding, and for weathertight closure.

# 3.4 <u>CLEANING</u>

A. Clean the completed system, inside and out, promptly after installation, exercising care to avoid damage to coatings.

## 3.5 <u>PROTECTION</u>

A. Institute protective measures required throughout the remainder of the construction period to ensure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION 08 4 1 13

#### SECTION 08 54 00 - FIBERGLASS CLAD WOOD WINDOWS

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

 A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. Factory-assembled, fiberglass clad wood windows, glass and glazing, weather stripping, subsills, mullion covers, and accessories as specified herein and indicated on the drawings.
- B. Fiberglass clad windows in fixed sash configurations.
- C. Accessories, anchorages, attachments and shims as specified and indicated on the drawings.

#### 1.3 <u>RELATED SECTIONS</u>

A. Section 07 92 00 - Joint Sealers

#### 1.4 **REFERENCES**

- A. American Society for testing and Materials (ASTM):
  - 1. E283: Standard Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors
  - 2. E330: Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
  - 3. E547: Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Cyclic Static Air Pressure Differential
  - 4. E2190: Specification for Sealed Insulating Glass Units
  - 5. C1036: Standard Specification for Flat Glass
  - 6. E2068: Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
- B. Window and Door Manufacturer's Association (WDMA): I.S.4: Industry Standard for Water Repellent Preservative Treatment for Millwork
- C. Sealed Insulating Glass Manufacturer's Association/Insulating Glass Certification (SIGMA/IGCC)

- D. American Architectural Manufacturer's Association/Window and Door Manufacturer's Association/Canadian Specifications Association (AAMA/WDMA/CSA):
  - 1. AAMA/WDMA/CSA 101/I.S.2/A440-05: Voluntary Performance Specification for Windows, Skylights, and Glass Doors
  - 2. AAMA/WDMA/CSA 101/I.S.2/A440-08: Voluntary Performance Specification for Windows, Skylights, and Glass Doors
- E. Window and Door Manufacturer's Association (WDMA): Hallmark Certification Program
- F. American Architectural Manufacturer's Association (AAMA): 624-10: Voluntary Specification, Performance Requirements and Test Procedures for Organic Coatings on Fiber Reinforced Thermoset Profiles
- G. National Fenestration Rating Council (NFRC):
  - 1. 101: Procedure for Determining Fenestration Product Thermal Properties

# 1.5 <u>SYSTEM DESCRIPTION</u>

Product	Air Tested to psf	Water Tested to psf	Certification Rating	Max Overall Width	Max Overall Height
Integrity Wood Picture (7359)	1.57	7.5	LC-PG50-FW	72	59 1/8
Integrity Wood Picture (5771)	1.57	8.25	LC-PG50-FW	56	71 1/8

A. Design and Performance Requirements:

# 1.6 <u>SUBMITTALS</u>

- A. Submit in accordance with Division 1 requirements.
- B. Product Data: Submit manufacturer's product data.
- C. Shop Drawings: Indicate pertinent dimensioning, general construction, component connections and locations, anchorage methods and locations, hardware locations and installation details.
- D. Samples: Provide full-size or partial full-size sample of window illustrating glazing system, quality of construction and color of finish.

# 1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to job site in manufacturer's or distributor's packaging undamaged, complete with installation instructions.
- B. Store off ground, under cover, protected from weather and construction activities.

# 1.8 <u>WARRANTY</u>

- A. Insulating glass with stainless steel spacers is warranted against seal failure caused by manufacturing defects and resulting in visible obstruction through the glass for twenty (20) years from the original date of purchase. Glass is warranted against stress cracks caused by manufacturing defects from ten (10) years from the original date of purchase.
- B. Hardware and other non-glass components are warranted to be free from manufacturing defects for ten (10) years from the original date of purchase.

# PART 2 - PRODUCTS

# 2.1 <u>MANUFACTURED UNITS</u>

- A. Basis of Design: Wood-Ultrex<sup>®</sup> stationary or picture units as manufactured by Integrity Windows & Doors, West Fargo, North Dakota.
- B. Alternate manufacturers will be accepted as "equal" if meeting or exceeding the performance requirements indicated herein.

## 2.2 FRAME DESCRIPTION

- A. Interior: clear pine exposed surfaces
  - 1. Kiln-dried to moisture content no greater than twelve (12) percent at the time of fabrication
- B. Water repellant, preservative treated in accordance with ANSI/NWWDA I.S.4.
- C. Exterior: Fiberglass reinforce Ultrex<sup>®</sup>, 0.080" (2mm) thick
- D. Composite frame thickness: 1 5/16" (33mm).
- E. Frame depth: 4 9/16" (116mm).

## 2.3 <u>SASH DESCRIPTION</u>

- A. Interior: pine
  - 1. Kiln-dried to moisture content no greater than twelve (12) percent at time of fabrication
- B. Water repellant preservative treated in accordance with ANSI/NWWDA I.S.4.
- C. Exterior: fiberglass reinforced Ultrex<sup>®</sup>, 0.080" thick
- D. Composite sash thickness: 1 9/16" standard glass

# 2.4 <u>GLAZING</u>

- A. Select quality complying with ASTM C 1036. Insulating glass SIGMA/IGCC certified to performance level CBA when tested in accordance with ASTM E 2190.
- B. Glazing method: 11/16 inch Insulated glass.
- C. Glass type: Low E II Argon gas.
- D. Glazing seal: Silicone bead at exterior and interior.
- E. Refer to drawings for window openings requiring <u>TRANSLUSCENT</u> glazing in lieu of clear.

# 2.5 <u>CERTIFIED MULLING</u>

- A. For Standard
  - 1. Directional mull limits: 7 units wide by 1 unit high: Rough Opening not to exceed 113 x 71 5/8 inches (2870mm x 1819mm)
  - 2. Directional mull limits: 1 unit wide by 5 units high; Rough Opening not to exceed 73 x 94 3/4 inches (1854mm x 2406mm)
  - 3. Directional mull limits: 4 units by 5 units high: Rough Opening not to exceed 85 x 94 3/4 inches (2159mm x 2406mm)

# 2.6 <u>FINISH</u>

- A. Exterior: Pultruded Fiberglass with factory baked on acrylic urethane. Meets AAMA 624-10 requirements.
  - 1. color: White
- B. Interior Finish:
  - 1. Bare treated pine for final finishing by Section 09 90 00 Painting
- 2.7 <u>WEATHER STRIP</u>

# CARVER POLICECARVER, MAFIBERGLASS-CLAD WOOD WINDOWS08

A. Weather strip at the frame is a hollow foamed material bent around 90 degree corner to allow for seamless corner joints. Color: Black

## 2.8 <u>ACCESSORIES</u>

A. Factory installed vinyl nailing fin / drip cap at head and side jambs.

#### 2.9 <u>TOLERANCES</u>

A. Installed as per manufacturer's instructions

## PART 3 - EXECUTION

#### 3.1 <u>INSTALLATION</u>

- A. Install windows in accordance with manufacturer's recommendations and approved shop drawings to achieve weathertight and freely operating installation.
- B. Maintain alignment with adjacent work. Secure assembly to framed openings, plumb and square, without distortion.
- C. Place insulation in shim spaces around unit perimeter to maintain continuity of building thermal barrier.
- D. Install sealant and related backing materials at perimeter of assembly
- E. Leave window units closed and locked.
- F. Install accessory items as required.
- G. Use finish nails to apply wood trim and moldings.

## 3.2 <u>FINAL CLEANING</u>

- A. Clean window frames and glass in accordance with Division 1 requirements.
- B. Remove labels and visible markings and adhesive residue according to manufacturer's instructions.

## 3.3 PROTECTING INSTALLED CONSTRUCTION

A. Protect windows from damage by chemicals, solvents, paint, or other construction operations that may cause damage.

END OF SECTION 08 54 00

# 08 71 00 - DOOR HARDWARE

# PART 1 - GENERAL

# 1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

#### 1.2 SUMMARY

- A. This Section includes items known commercially as finish or door hardware that are required for swing, sliding, and folding doors, except special types of unique hardware specified in the same Sections as the doors and door frames on which they are installed. Furnish and deliver all door hardware necessary for all doors, also hardware as specified herein and as enumerated in hardware sets and as indicated and required by actual conditions at the building. The hardware shall include the furnishing of all necessary screws, bolts, expansion shields, drop plates, and all other devices necessary for the proper application of the hardware.
  - B. ALL DOOR HARDWARE MUST BE FURNISHED BY SECTION 08 71 00 DOOR HARDWARE SUPPLIER.

# "CONTRACTS, Including Door Hardware, ISSUED TO ALUMINUM DOOR SUPPLIER" must stipulate aluminum door hardware must be purchased from SECTION 087100 HARDWARE SUPPLIER

- C. *Hardware Supplier:* Must employ an experienced *Architectural Hardware Consultant (AHC)* who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.
- D. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 8 Section 08 06 00 "SCHEDULE FOR OPENINGS".
  - 2. Division 8 Section 08 11 13
  - 3. Division 8 Section 08 14 16
- "FLUSH WOOD DOORS".

"COILING COUNTER DOORS".

"HOLLOW METAL DOORS AND FRAMES".

- 4. Division 8 Section 08 33 13
- 5. Division 8 Section 08 33 23 "OVERHEAD COILING DOORS".

6.	Division 8 Section 08 34 73.13	"METAL SOUND CONTROL DOOR and WINDOW ASSEMBLIES ".
7.	Division 8 Section 08 41 13	"ALUMINUM-FRAMED ENTRANCES AND
		STOREFRONTS".
8.	Division 8 Section 08 41 13.13	"SECURITY ALUMINUM-FRAMED ENTRANCES
		AND STOREFRONTS".
9.	Division 8 Section 08 71 13	"AUTOMATIC DOOR OPERATORS"
10.	Division 10 Section 10 22 13	"WIRE MESH PARTITIONS"
11.	Division 26	"ELECTRICAL".
12.	Division 28 00 00	"ELECTRONIC SECURITY SYSTEMS".

# 1.3 REFERENCES

A. Standards:

1. ANSI/BHMA, A156.1 (2013) - Butts & Hinges
2. ANSI/BHMA, A156.3 (2008) - Exit Devices
3. ANSI/BHMA, A156.4 (2008) - Door Controls - Closers
4. ANSI/BHMA, A156.5 (2010) - Auxiliary Locks and Associated Products
5. ANSI/BHMA, A156.6 (2010) - Architectural Door Trim
6. ANSI/BHMA, A156.7 (2009) - Template Hinge Dimensions
7. ANSI/BHMA, A156.8 (2010) - Door Controls - Overhead Stops and Holders
8. ANSI/BHMA, A156.13 (2012) - Mortise Locks & Latches, Series 1000
9. ANSI/BHMA, A156.16 (2008) - Auxiliary Hardware
10. ANSI/BHMA, A156.18 (2012) - Materials and Finishes
11. ANSI/BHMA, A156.21 (2009) - American National Standard for Thresholds
12. ANSI/BHMA, A156.22 (2012) - Door Gaskets and Edge Seal Systems
13. ANSI/BHMA, A156.25 (2007) - Electrified Locking Devices
14. ANSI/BHMA, A156.26 (2012) - Continuous Hinges
15. ANSI/BHMA, A156.28 (2007) - Recommended Practices for Keying System
16. ANSI/BHMA, A156.29 (2012) - American National Standard for Exit Locks,
Exit Alarms, Alarms for Exit Devices
17. ANSI/BHMA, A156.30 (2003) - American National Standard for High Securit
Cylinders
18. ANSI/BHMA, A156.36 (2010) - American National Standard for Auxiliary
Locks
19. ANSI/BHMA, A156.115 (2006) - Hardware Preparation in Steel Doors and
Steel Frames
20.NFPA 80 - Fire Doors and Windows
21. UL10C - Positive Pressure Fire Tests of Door Assemblies

22. AIA 232 2009 - General Conditions of the Contract for Construction, Construction Manager as Advisor Edition.

- B. Codes:
  - 1. Applicable state and local building codes.
  - 2. Connecticut. State Building Code IBC 2018
  - 3. NFPA 101 Life Safety code
  - 4. NFPA 105 Smoke and Draft Control Door Assemblies
  - 5. ICC / ANSI A117.1 Accessible and Usable Buildings and Facilities
  - 6. ADA Americans with Disabilities Act
- C. UL Underwriters Laboratories
  - 1. UL 10C Fire Tests of Door Assemblies
  - 2. UL 305 Panic Hardware
- D. DHI Door and Hardware Institute
  - 1. Sequence and Form and for the Hardware Schedule
  - 2. Recommended Locations for Builders Hardware

## 1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Section 1 Specification Sections.
- B. Product data including manufacturer's technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish of door hardware.
- C. Final hardware schedule must be coordinated with doors, frames, and related work to ensure proper size, thickness, hand function, and finish of door hardware. Conflicts between the SPECIFIED DOOR HARDWARE and the DOORS / FRAMES must be brought to the attention of the ARCHITECT prior to submitting HARDWARE SUBMITTAL to the ARCHITECT.

# D. HARDWARE SUPPLIER shall confirm specified LOCK FUNCTIONS with the OWNER at the KEYING MEETING.

1. **Final Hardware Schedule Content:** Based on hardware indicated, organize schedule into *"HARDWARE SETS"* indicating complete designation of every item required for each door or opening. Include the following information:

Type, style, function, size, and finish of each hardware item.

- a. Name and manufacturer of each item.
- b. Fastenings and other pertinent information.

c. Location of Hardware Set, cross-referenced to indication of Drawings both on floor plans, in door, and frame schedule.

d. Explanation of all abbreviations, symbols, and codes contained in schedule.

e. Mounting locations for hardware.

Door handles, pulls, latches, locks and other operating devices shall be installed 34 inches (864 mm) minimum and 48 inches (1219 mm) maximum above the finish floor. Locks used only for security purposes and not used for normal operation are permitted at any height.

Provide "DHI" Standard Mounting Locations in the Hardware Submittal.

- f. Door and frame sizes and materials.
- g. Keying information.

h. Name and phone number for the local manufacturer's representative for each product.

2. Submittal Sequence: submit final schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review to schedule.

3. Keying Schedule: After a keying meeting between representatives of the Owner, Architect, hardware supplier, and, if requested, the representative for the lock manufacturer, provide a keying schedule, listing the levels of keying, as well as an explanation of the key system's function, the key symbols used, and the door numbers controlled.

E. Samples: If requested by Architect, submit samples of each type of exposed hardware unit in finish indicated and tagged with full description for coordination with schedule. Submit samples prior to submission of final hardware schedule.

1. Samples will be returned to the supplier. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated in the Work, within limitations of keying coordination requirements.

- F. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- G. Wiring Diagrams: Upon final approval of the hardware schedule, submit wiring and riser diagrams as required for the complete and proper installation of all electrical, electromechanical, and electromagnetic products. Submittals must

represent that coordination has occurred with the security system submittals and shop drawings. Also, that shop drawings submitted and schedules developed have been specifically reviewed and coordinated for both physical equipment fitment and power requirements with the security system contractor approved shop drawings.

- H. "Hardware Schedule and Templates", Hardware schedules shall be created which reference specifically to the specified lock voltages and separately indicating whether the door is a "fail safe" or "fail secure" electrified lock arrangement.
- I. Electrified Hardware: Electrified Hardware to be used for security purposes must be UL Listed for Burglary Applications.
- J. At the completion of hardware installation, and prior to issuance of certificate of occupancy, prepare and submit the hardware inspection report to include the following:

1. Current and predictable problems of substantial nature in the performance of the hardware.

2. Hardware has been installed and adjusted in accordance with manufacturer's recommendations and instructions.

- K. At the completion of the project, provide Owner with two (2) copies of an Operation and Maintenance Manual. This manual shall consist of a hard cover (3) ring binder with the project name listed on the front. Included will be:
  - 1. A final copy of the approved and as built hardware schedule.
  - 2. A final copy of the approved keying schedule.
  - 3. Catalog cuts for each item used in the project.
  - 4. Parts list and numbers for each item used.
  - 5. Maintenance instructions for all items.
  - 6. Name, address and phone number of local representative for each item used.

# 1.5 QUALITY ASSURANCE

A. Substitutions: Products are to be those specified to ensure a uniform basis of acceptable materials. Requests for substitutions must be made in accordance with Section 1 requirements. If proposing a substitute to a specified item, indicate basis for substitution and savings to be made. Provide sample if requested. Certain products have been selected for their unique characteristics and particular project suitability. All Hardware is "Basis-of-Design" product specification as defined in Section 08 71 00. Model numbers (and Manufacturer's) listed in "Hardware Set Schedule" are "Basis-of-Design".

- Items specified, as "no substitution" shall be provided exactly as listed.
  Items listed with no substitute manufacturers listed have been requested by the Owner or Architect to match existing for continuity and/or future performance and maintenance standards or because there is no known equal product.
   If no other products are listed in a category, then "no substitution" is implied.
- B. Supplier Qualifications: A recognized architectural door hardware supplier, with warehousing facilities in the Project's vicinity, that has a record of successful inservice performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an experienced architectural hardware consultant (AHC) who is available to Owner, architect, and Contractor, at reasonable times during the course of the Work, for consultation.

1. Require supplier to meet with Owner to finalize keying requirements and to obtain final instructions in writing.

- C. A pre-installation meeting shall be held to instruct installers on the proper installation and adjustment of door hardware. A representative of each major hardware category, including, but not limited to, Locks, Exit Devices, & Closers, shall instruct the installers on the correct installation of their products. The manufacturers of the Door Hardware provided on this project shall certify to the Architect that the door hardware installer for this project has been trained in the proper installation procedures and is certified to install the door hardware.
- D. Fire-Rated Openings: Provide door hardware for fire-rated openings that complies with NFPA Standard No. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by UL, Intertek Testing Services, Warnock Hersey, Factory Mutual, or other testing and inspecting organization acceptable to authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.
- E. Accessible Hardware: Door Hardware; Handles, pulls, latches, locks and other operable parts on accessible doors shall have a shape that is easy to grasp with one hand and does not require tight grasping, pinching, or twisting of the wrist to operate. Such hardware shall 34 inches (865 mm) minimum and 48 inches (1220 mm) maximum above the floor or ground. Where sliding doors are in the fully open position, operating hardware shall be exposed and usable from both sides. EXCEPTION: Locks used only for security purposes and not used for normal operation are permitted in any location.
- F. Accessible Hardware: Door-Opening Force; Fire Doors shall have the minimum opening force allowable by the appropriate administrative authority. The maximum force for pushing open or pulling open doors other than fire doors shall be as follows:

- 1. Interior hinged door: 5.0 pounds
- 2. Sliding or folding door: 5.0 pounds

3. Fire Doors: Minimum opening force allowable by authorities having jurisdiction, but not greater than 10 lbf

These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position. The maximum force required to release the latch shall not exceed 15 lbf.

4. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.

5. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

# 1.6 PRODUCT HANDLING

- A. Tag each item or package separately with identification related to final hardware schedule, and include basic installation instructions with each item or package.
- B. Each item of hardware shall be individually packaged in manufacturer's original container.
- C. Receiving and storing of door hardware is responsibility of supplier. Prior to delivery of door hardware to the project, Hardware Supplier must sort and clearly mark with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.
- D. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.
- E. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).
- F. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

## <u>1.7</u> <u>MAINTENANCE</u>

A. Maintenance Tools and Instructions: Furnish two (2) complete sets of specialized tools and maintenance instructions as needed for Owner's continued

adjustment, maintenance, and removal and replacement of door hardware. Furnish two (2) extra screws or fasteners of each type size and of the same finish used in this project.

## 1.8 WARRANTY

- A. Provide manufacturer's Standard Warrantees.
- B. Starting date for all warranty periods to be date of substantial completion of the Project.
- C. No liability is to be assumed where damage or faulty operation is due to improper installation, improper use, or abuse.
- D. Products judged to be defective during the warranty period shall be replaced or repaired in accordance with the manufacturer's warranty, at no additional cost to the Owner.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Butts and Hinges:
    - a. Hager Companies
    - b. Bommer
    - c. Ives, Allegion
    - d. McKinney Hinge, Div of Assa Abloy.
    - e. PBB World Class Hinges
    - f. Stanley Hardware
  - 2. Continuous Hinges:
    - a. Hager Companies
    - b. Bommer
    - c. Ives, Allegion
    - d. McKinney Hinge, Div of Assa Abloy.
    - e. PBB World Class Hinges
    - f. Pemko
    - g. Select

- 3. Key Control System:
  - a. HPC
  - b. Lund, Inc.
  - c. Telkee Inc.
- 4. Cylinders and Locks:
  - a. DORMA Architectural Hardware, "ML9000" Series.
  - b. Best Access Systems, Div of Stanley Security Solutions, "45H" Series.

c. Corbin-Russwin Architectural Hardware, Div of Assa Abloy, "ML2000" Series.

- d. Sargent, Div of Assa Abloy "8200" Series.
- e. Schlage Lock, Allegion, "L" Series.
- 5. Electro-Mechanical Locks:
  - a. Alarm Lock
  - b. Best Lock
  - c. Locknetics, Allegion
  - d. Security Door Controls

6. Flush Bolts (automatic as required), used at pairs of doors not requiring Panic Release Hardware

- a. Hager Companies
- b. Glynn Johnson, Allegion.
- c. Ives, Allegion
- d. Rockwood Manufacturing
- e. Trimco Triangle Brass
- 7. Exit/Panic Devices (provide U.L. label at rated doors):
  - a. DORMA Architectural Hardware "9000" Series.
  - b. Corbin/Russwin, Div of Assa Abloy, "5000" Series.
  - c. Precision Hardware, a Div. of STANLEY Security Solutions, "2000 Series"
  - d. Sargent, Div of Assa Abloy, "80" Series.
  - e. Von Duprin, Allegion, "98/99" Series.
- 8. Push/Pull Units:
  - a. Hager Companies
  - b. Burns Manufacturing, Inc
  - c. Ives, Allegion
  - d. Rockwood, Mfr.
- 9. Overhead Surface Closers:

- a. DORMA Architectural Hardware "8900" Series.
- b. LCN, Allegion. "4000 (Heavy Duty Arms)" Series
- c. Norton, Div of Assa Abloy. "PR7500/PR7700" Series
- d. Sargent, Div of Assa Abloy, Inc., "351 (Heavy Duty Arms)" Series

10. Door Control Devices:

- a. DORMA Architectural Hardware.
- b. Burns Manufacturing, Inc
- c. Glynn Johnson, Allegion.
- d. MAG Security
- e. Rixson, Div of Assa Abloy
- f. Sargent, Div of Assa Abloy

11. Kick and Mop Plates:

- a. Hager Companies
- b. Burns Manufacturing, Inc.
- c. Ives, Allegion.
- d. Rockwood

12. Weather-stripping and Seals:

- a. Hager Companies
- b. National Guard Products.
- c. Pemko Manufacturing Co., Inc.
- d. Reese Enterprises, Inc.
- 13. Thresholds:
  - a. Hager Companies
  - b. National Guard Products.
  - c. Pemko Manufacturing Co., Inc.
  - d. Reese Enterprises, Inc.
- 14. Automatic Drop Seals:
  - a. Hager Companies
  - b. National Guard Products.
  - c. Pemko Manufacturing Co., Inc.
  - d. Reese Enterprises, Inc.

15. Smoke and Sound Stripping:

a. Hager Companies

- b. National Guard Products.
- c. Pemko Manufacturing Co., Inc.
- d. Reese Enterprises, Inc.

# 16. Astragals:

- a. Hager Companies
- b. National Guard Products.
- c. Pemko Manufacturing Co., Inc.
- d. Reese Enterprises, Inc.

# 17. Door Stops

- a. Hager Companies
- b. Burns Manufacturing, Inc
- c. Glynn Johnson, Allegion.
- d. H.B. Ives, Allegion
- e. Rockwood Manufacturing
- 18. Electrified Hinges
  - a. Hager Companies
  - b. Bommer
  - c. McKinney Hinge, Div of Assa Abloy
  - d. PBB World Class Hinges
  - e. Stanley Hardware
- **19. Electrified Power Transfers** 
  - a. DORMA Architectural Hardware.
  - b. Locknetics, Allegion
  - c. Precision Hardware.
  - d. Security Door Controls
  - e. Securitron, Div of Assa Abloy
  - f. Von-Duprin, Allegion

# 2.2 SCHEDULED HARDWARE

A. Requirements for each type of door hardware are indicated on the "Door Schedule", and in the Schedule at the end of this Section. Products are identified by using hardware designation numbers of the following:

1. Manufacturer's Product Designations: The product designation and name of one manufacturer are listed for each hardware type required for the purpose of establishing minimum requirements. Manufacturer and model numbers indicated in Hardware Sets constitute a "Basis-of-Design" product specification as defined in this Section.

# 2.3 MATERIALS AND FABRICATION

- A. Manufacturer's Name Plate: Do not use manufacturers' products that have manufacturer's name or trade name displayed in a visible location (omit removable nameplates) except in conjunction with required fire-rated labels and as otherwise acceptable to Architect.
  - 1. Manufacturer's identification will be permitted on rim of lock cylinders only.
- B. Base Metals: Product hardware units of basic metal and forming methods indicated, using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized), quality than specified for applicable hardware units by applicable ANSI/BHMA A156 series standards for each type of hardware item and with ANSI/BHMA A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods for those indicated, except as otherwise specified.
- C. Fasteners: Provide hardware manufactured to conform to published templates generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.
- D. Furnish screws for installation with each hardware item. Provide Phillips flathead screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive paint.
- E. Provide concealed fasteners. Provide tamper resistant fasteners when they cannot be concealed. Fasteners shall be of the same finish as the balance of the hardware. Where thru-bolts are used as a means of reinforcing the work, provide sleeves for each thru-bolt or use sex screw fasteners.

# 2.4 HINGES, BUTTS, AND CONTINUOUS HINGES

- A. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- B. Screws: Provide Phillips flat-head screws complying with the following requirements:

1. For metal doors and frames install machine screws into drilled and tapped holes.

2. For wood doors and frames install wood screws.

3. For fire-rated wood doors install  $\#12 \times \frac{1}{4}$  inch, threaded-to-the-head steel wood screws.

- 4. Finish screw heads to match surface of hinges or pivots.
- C. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
  - 1. Out-Swing Exterior Doors: Non-removable pins.
  - 2. Interior Doors: Non-rising pins.
  - 3. All "Card Reader Doors": Non-removable pins.
- D. Number of Hinges: Provide number of hinges indicated but not less than 3 hinges per door leaf for doors 90 inches of additional height.

1. Fire-Rated Doors: Not less than 3 hinges per door leaf for doors 86 inches or less in height with same rule for additional hinges.

- E. Size and weight of butts:
  - 1. See Hardware Sets for Details.
- F. Power Transfer Hinges

1. Power transfer hinges may be EPT or ETW types. Armored cable may be used only where EPT or ETW electrified hinges are not practical.

2. Furnish all power transfer hinges as 12 conductor units.

# 2.5 LOCK CYLINDERS AND KEYING

- A. Review the keying system with the Owner and provide new grandmaster or great grandmaster as required key system.
- B. HARDWARE SUPPLIER SHALL CONFIRM SPECIFIED LOCK FUNCTIONS WITH OWNER AT THE KEYING MEETING.
- C. Equip locks with manufacturer's 6-pin tumbler "interchangeable core" cylinder employing "RESTRICTED KEYWAY". Such cylinders have cores that are removable by the use of a special "control key". Deliver hardware to the contractor with temporary cores installed and keyed alike. Permanent cores are to be mastered keyed as directed by the owner. Deliver permanent cores and keys to the owner when notified by the owner in writing. Temporary cores and keys are to be returned to the hardware supplier by the contractor within 10 days of their replacement by permanent cores.

(Do Not Provide Extra Key Blanks if Restricted Keyway has been specified.)

1. Furnish 12 each "Temporary Change Keys" and 2 each "Temporary Core Control Keys".

2. Key Quantity: Furnish 3 change keys for each lock, 5 master keys for each master system,

and 5 grandmaster keys for each grandmaster system. Furnish 6 each "Core Control Keys".

Furnish 12 Temporary Change Keys and 2 Temporary Core Control Keys.

- 3. Furnish 12 each additional core for owner's stock.
- 4. Install "FINAL CORES" when instructed by Owner.
- 5. Deliver keys to Owner.
- D. Metals: Construct lock cylinder parts from brass or bronze, stainless steel, or nickel silver.
- E. Comply with Owner's instructions for master keying and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks.
- F. Key Material: Provide keys of nickel silver only.
- G. Final cores to be installed by the hardware supplier, installer must verify that all cylinders are working correctly.

# 2.6 KEY CONTROL SYSTEM

- A. Provide a key control system including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150 percent of the number of "Key Sets" required for the Project.
  - 1. Provide complete cross-index system set up by key control manufacturer, and place keys on markers and hooks in the cabinet as determined by the final key schedule.
- 2. Provide hinged-panel type cabinet for wall mounting.
- 3. Acceptable Manufacturers
  - a. Lund Equipment.
  - b. MMF Industries.
  - c. Telkee.

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# 2.7 LOCKS, LATCHES, AND BOLTS

A. Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set, unless otherwise indicated.

1. Provide flat lip strikes for locks with 3 pieces, anti-friction latchbolt as recommended by manufacturer.

2. Provide recess type top strikes for bolts locking into head frames, unless otherwise indicated.

3. Provide dust-proof strikes for foot bolts, except where special threshold construction provides non-recessed strike for bolt.

4. Provide roller type strikes where recommended by manufacturer of the latch and lock units.

5. Electrified locks, wherever possible, shall be "fail secure". Specified hardware must always allow exiting in the path of exiting travel from the secured room. Where "fail safe" doors are required to comply with life safety exiting code, insure that the fire alarm specifications call for an appropriate relay to kill power between the lock power supply and the electrified lock so that it must go to an unlocked condition.

- B. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the 2010 ADA Standards, ICC/ANSI A117.1.
  - 1. Comply with the following maximum opening-force requirements:
    - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
    - b. Folding Doors: 5 lbf applied parallel to door at latch.

c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction, but not greater than 10 lbf.

2. Comply with the following maximum closing speed requirements:

a. Adjust closers so that from an open position of 90 degrees, the time required to move the door to an open position of 12 degrees is to be 5 seconds minimum.

b. Adjust closers so that from an open position of 70 degrees, the time required to move the door to an open position of 3 inches from the latch is to be 3 seconds minimum.

- C. Mortise Locks:
  - 1. Mortise locks shall be certified as ANSI A156.13, Series 1000, Operational and Security Grade 1, and meets A117.1 Accessibility Code, and shall be manufactured from heavy gauge steel, containing components of steel with zinc dichromate plating

for corrosion resistance. Lock case shall be multi-function and field reversible for handling.

2. Locks are to have a standard 2-3/4" backset with a full <sup>3</sup>/<sub>4</sub>" throw 2-piece stainless steel mechanical anti-friction latch-bolt.

Lever trim shall be solid brass, bronze, or stainless steel, cast or forged in the design specified, with wrought roses and external Security requirement. Levers shall be thru-bolted to assure proper alignment, and shall have a 2-piece spindle. Lever trim on the secure side of doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.

- 3. Provide electrical options as scheduled.
  - a. All Openings scheduled to receive Electrified Hardware must include a Quick Connect Wiring Harness and Raceway in all Doors.
  - b. "Request to Exit", Electrified Lockset shall be provided with one internal SPDT switch which monitors the Lever Trim, as called for on the security system drawings.
  - c. "Latch bolt Monitoring", Electrified Lockset shall be provided with one internal SPDT switch which monitors the Lock Latch, as called for on the security system drawings.
  - d. Lock Power Supplies: It is imperative that the security contractor and hardware supplier coordinate the lock voltage requirements, fail safe/fail secure requirements, lock in-rush current requirements, whether locks are continuous duty or not and any other related issues. Power supplies to be furnished by Door Hardware Suppliers and installed by the Security or Electrical Contractor. Locate power supplies and battery backup in the access control mechanical space when wire run lengths permit. Where wire runs exceed manufacturer's written recommendations, coordinate the installation location with Construction Manager / General Contractor and Architect
  - e. Local Audible Alarms shall be furnished and installed by the Security Contractor.
  - f. Power transfer hinges may be "EPT" or "ETW" types. Armored cable may be used only where "EPT" or "ETW" electrified hinges are not practical.
  - g. Furnish all power transfer hinges as 12 conductor units.
- D. Exit Devices:
  - 1. Exit devices shall be touchpad type, fabricated of brass, bronze, stainless steel, or aluminum, plated.
  - 2. Touchpad shall extend a minimum of one half of the door width. End-cap shall be flush mounted, and will have two-point attachment to door. Nylon bearings and stainless-steel springs shall be used for long life and durability; compression or torsion springs will be used in devices, latches, and outside trims or controls.

- 3. Where panic and fire exit hardware is installed, panic and fire exit hardware shall meet CSFSC 1010.1.9.9 and 1010.1.10: (2) *A maximum unlatching force of 15 pounds*.
- 4. All devices to incorporate a security dead latching feature.
- 5. Mechanism case shall sit flush on the face of all flush doors, or spacers shall be furnished to fill gaps behind devices. Where glass trims or moldings projects off the face of the door, provide glass bead kits.
- 6. All non-fire-rated exit devices shall have cylinder dogging, unless noted otherwise in Hardware Sets.
- 7. Removable mullions shall be a steel tube, except at aluminum entrances, mullions to be aluminum. Where scheduled, mullion shall be of a type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
- 8. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Where scheduled, provide vandal-resistant levers that can easily be re-setting. Lever style will match the lever style of the locksets. Lever handles shall meet A117.1 Accessibility Code.
- 9. Where notation for knurling appears on door schedule, provide knurled outside lever.
- 10. Exit devices shall be UL listed panic exit hardware. All exit devices for fire rated openings shall be UL labeled fire exit hardware.
- 11. Furnish and Install "THRU BOLTS" on Aluminum, Hollow Metal, and Wood Doors.
- 12. Provide electrical options as scheduled.
  - a. All Openings scheduled to receive Electrified Hardware must include a Quick Connect Wiring Harness and Raceway in all Doors.
  - b. "Request to Exit / Touch Bar Monitor", Electrified Panic Hardware shall be provided with one internal SPDT switch which monitors the touch bar, as called for on the security system drawings.
  - c. "Latch bolt Monitoring", Electrified Panic Hardware shall be provided with one internal SPDT switch which monitors the latch bolt, as called for on the security system drawings.
  - d. Local Audible Alarms shall be furnished and installed by the Security Contractor.
  - e. Power transfer hinges may be "EPT" or "ETW" types. Armored cable may be used only where "EPT" or "ETW" electrified hinges are not practical.
    - f. Furnish all power transfer hinges as 12 conductor units.
- E. Where notation for knurling appears on door schedule, provide knurled outside lever.

# 2.8 CLOSERS AND DOOR CONTROL DEVICES.

## CARVER POLICE CARVER, MA

A. Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit depending on size of door, exposure to weather, and anticipated frequency of use.

1. Where parallel arms are indicated for closers, provide closer with Heavy Duty Arm.

Provide parallel arms for all overhead closers, except as otherwise indicated.
 Closers must operate at 180 degree opening where indicated on plans and door schedule.

4. Provide all necessary Drop Plate Brackets, Shims, and Angle Brackets, where required to complete installation of closers on doors and frames.

- B. Access-Free Manual Closers: Where manual closers are indicated for doors required to be accessible to the physically handicapped, provide adjustable units complying with ANSI A117.1 provisions for door opening force and closing speed.
- C. Coordinators: Provide Door Coordinators where required, including Parallel Arm Brackets. Verify bracket configuration with frame profile for each opening requiring door coordinator.

# 2.9 DOOR STOPS AND HOLDERS

A. It shall be the responsibility of the hardware supplier to provide door stops for all doors in accordance with the following requirements. Provide Door Stops as indicated in Hardware Sets.

# 2.10 DOOR TRIM UNITS

- A. Fasteners: Provide manufacturer's standard exposed fasteners for door trim units consisting of either machine screws or self-tapping screws.
- B. Fabricate protection plates not more than 2 inches less than door width on push side of door and by height indicated.
  - 1. Metal Plates: Stainless steel, 0.050 inch (U.S. 18 gage).

2. Provide UL Rated "KICK / ARMOR' Plates where detailed on UL Rated Openings.

# 2.11 THRESHOLDS, WEATHER-STRIPPING, SOUND STRIPPING AND SEALS

A. Furnish as scheduled and per architectural details. Match finish of other items as closely as possible. Provide only those units where resilient or flexible seal strip is easily replaceable and readily available.

# CARVER POLICE CARVER, MA

## 2.12 MISCELLANEOUS HARDWARE

- A. Furnish four (4) extra screws or fasteners of each type, used for the hinges, door closers, holders and protective plates of the same finish used in this project.
- B. Furnish two (2) additional adjusting wrenches for the door closers.

#### 2.13 HARDWARE FINISHES

- A. Match items to the manufacturer's standard color and texture finish for the latch and lock sets (or push-pull units if not latch or lock sets).
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
- C. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18, "Materials and Finishes", including coordination with the traditional U.S. finishes show by certain manufacturers for their products.

## PART 3 - EXECUTION

#### 3.1 EXAMINATION

A. Prior to installation of any hardware, examine all doors, frames, walls and related items for conditions that would prevent proper installation of door hardware. Correct all defects prior to proceeding with installation.

## 3.2 INSTALLATION

- A. All hardware to be installed by qualified tradesmen, skilled in the application of commercial grade hardware. For technical assistance if necessary, installers may contact the manufacturer's rep for the item in question.
- B. Electronic hardware shall be furnished and installed by qualified tradesmen, but shall be wired by the security system contractor. Door Hardware installer shall be present to complete final adjustments to door hardware, when security contractor completes electrical terminations.
- C. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute.

- D. Install each hardware item in compliance with the manufacturer's instructions and recommendations, using only the fasteners provided by the manufacturer.
- E. Do not install surface mounted items until finishes have been completed on the substrate. Protect all installed hardware during painting.
- F. Set units' level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- G. All operating parts shall move freely and smoothly without binding, sticking, or excessive clearance.

# 3.3 ADJUSTING, CLEANING, AND DEMONSTRATING

- A. Adjust and check each operating item of hardware and each door, to insure proper operation or function of every unit. Replace units, which cannot be adjusted to operate freely and smoothly.
- B. Where door hardware is installed more than one-month prior to acceptance or occupancy of a space or area, return to the installation during the week prior to acceptance or occupancy to perform a final check and adjustment of all hardware items in such space or area. Clean operating doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- C. Clean adjacent surfaces soiled by hardware installation.
- D. At the completion of "BALANCING" of all "AIR HANDLING SYSTEMS", prior to owner taking occupancy, 'Hardware Installer" will re-adjust all closer closing and latching cycles.
- E. Approximately six months after the Date of Substantial Completion, the installer shall perform the following:

 Examine and readjust each item of door hardware as necessary to ensure function of doors, door hardware, and electrified hardware.
 Consult with and instruct owners' personnel on recommend maintenance procedures.

3. Replace door hardware items that have deteriorated or failed due to faulty design, materials, or installation of door hardware units.

# 3.4 FIELD QUALITY CONTROL

A. Prior to Substantial Completion, the installer, accompanied by representatives of the manufacturers of latchsets and locksets, door closers, and exit devices, and of other major hardware suppliers, shall perform the following work.
- B. Examine (by representatives of the manufacturers) and re-adjust (by hardware installer) each item of door hardware as necessary to restore function of doors and hardware to comply with specified requirements.
- C. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures.
- D. Replace hardware items that have deteriorated or failed due to faulty design or materials (work to be performed by representatives of the manufacturers including removal and reinstallation).
- E. Replace hardware items that have deteriorated or failed due to incorrect installation (work to be performed by hardware installer including removal and reinstallation) of hardware units.
- F. Prepare a written report of current and predictable problems of substantial nature in the performance of the hardware.

# 3.5 PROTECTION

A. Provide for the proper protection of all items of hardware until the Owner accepts the project as complete. Damaged or disfigured hardware shall be replaced or repaired by the responsible party.

# 3.6 HARDWARE SCHEDULE

- A. General: Provide hardware for each door to comply with requirements of this Section, Door and Hardware Schedule Section 08 06 00", and the following Hardware Sets. The door hardware sets listed herein shall not be considered as a complete hardware schedule and shall only be considered as an indication of the hardware requirements desired by the Owner. It shall be this Contractor's responsibility to visit the site, examine the drawings and door schedule and provide all necessary hardware as shown. Such items shall be of same quality, quantity and type as that scheduled for similar doors or parts of the building used for similar purposes.
- B. Door and Hardware Schedule Section 08 06 00, "BULLETS", "SCHEDULE GENERAL NOTES" and "OPENING NOTES" shall be considered part of Section 08 71 00
- C. Conflicts between the SPECIFIED DOOR HARDWARE and the DOORS / FRAMES must be brought to the attention of the ARCHITECT prior to submitting HARDWARE SUBMITTAL to the ARCHITECT.

Hardware Set 001

780 - 112 HD - 83" - CLEAR - Concealed Leaf -

ED5200 - K157 - P12 - 630 - LHR - D200 - M52 (CD) -

Door Harness with "QC" Connectors to match Door

Weatherstripping - Aluminum Door Supplier Standard Door Bottom - Aluminum Door Supplier Standard

Cylinder - Mortise - 626 (Dogging)

CPS-7500 - 689 (At 90 Degrees) K1050 - 06" x 34" - 18 ga. - US32D

Power Supply by Security Section

Diagrams - Elevation and Riser

RETW-QC (12-Wire)

M91 - M92 - MELR

Cylinder - Rim - 626

172A - 6" x 1/2" x 36"

Card Reader by Section

Diagrams - Point To Point

Hardware

Roton

McKinney

Norton

Pemko

Security

Security

By MFR

By MFR

Rockwood

Corbin-Russwin

Section 087100

Section 087100

Section 084113

Section 084113

#### **Hardware Set** 001

- 1 Hinge, Continuous Geared
- Exit Device, Rim\_Key\_E.LP 1
- Door Harness 2
- 1 Cylinder, Mortise - Dogging
- Cylinder, Rim 1
- Closer, Overhead Parallel Arm 1
- **Kick Plate** 1
- Weatherstrip 1
- Door Bottom 1
- Threshold 1
- Power Supply 1
- Card Reader 1
- Diagrams 1
- Diagrams 1

1

1

#### Hardware Set 002

1 Hinge, Continuous Geared 780 - 112 HD - 83" - CLEAR - Concealed Leaf -Roton RETW-QC (12-Wire) Exit Device, Rim\_Key\_E.LP ED5200 - K157 - P12 - 630 - RHR - D200 - M52 (CD) -Corbin-Russwin 1 M91 - M92 - MELR Door Harness with "QC" Connectors to match Door 2 Door Harness McKinney Hardware 1 Cylinder, Mortise - Dogging Cylinder - Mortise - 626 (Dogging) Section 087100 Cylinder - Rim - 626 Cylinder, Rim Section 087100 CPS-7500 - 689 (At 90 Degrees) K1050 - 06" x 34" - 18 ga. - US32D Weatherstripping - Aluminum Door Supplier Standard Closer, Overhead Parallel Arm 1 Norton 1 Kick Plate Rockwood 1 Weatherstrip Section 084113 Door Bottom - Aluminum Door Supplier Standard Door Bottom Section 084113 1 172A - 6" x 1/2" x 36" Threshold Pemko Power Supply Power Supply by Security Section Security 1 Card Reader by Section Card Reader Security 1 Diagrams - Elevation and Riser Diagrams By MFR 1 By MFR Diagrams - Point To Point Diagrams 1

**DOOR HARDWARE** Last Edit - 09/18/2019

#### **Hardware Set** 003

- 1 Hinge, Continuous Geared
- Exit Device, Rim\_Key\_E.LP 1
- Door Harness 2
- 1 Cylinder, Mortise - Dogging
- Cylinder, Rim 1
- Closer, Overhead Parallel Arm 1
- **Kick Plate** 1
- Weatherstrip 1
- 1 Door Bottom
- Threshold 1
- Power Supply 1
- Diagrams 1
- Diagrams 1

### Heading Notes

"LOCKDOWN" Opening - No Card Reader

#### **Hardware Set** 004

- 1 Hinge, Continuous Geared
- Exit Device, Rim 1
- Closer, Overhead Parallel Arm 1
- 1 Kick Plate
- Weatherstrip 1
- Door Bottom 1
- Threshold 1

#### Hardware Set 011

- 1 Hinge, Continuous Geared
- Exit Device, Rim Key E.LP 1
- Door Harness 2
- Cylinder, Mortise Dogging 1
- 1 Cylinder, Rim
- 1 Closer, Overhead Parallel Arm
- Kick Plate 1
- Weatherstrip 1
- Door Bottom 1
- 1 Threshold
- 1 Power Supply
- Diagrams 1
- Diagrams 1

780 - 112 HD - 81.5" - CLEAR - Concealed Leaf -RETW-QC (12-Wire) ED5200 - K157 - P12 - 630 - RHR - W048 - D200 -M91 - M92 - MELR Door Harness with "QC" Connectors to match Door Hardware Cylinder - Mortise - 626 (Dogging) Cylinder - Rim - 626 CPS-7500 - 689 (At 90 Degrees) K1050 - 06" x 36" - 18 ga. - US32D Weatherstripping - Aluminum Door Supplier Standard Door Bottom - Aluminum Door Supplier Standard 172A - 6" x 1/2" x 38" Power Supply by Security Section Diagrams - Elevation and Riser

780 - 112 HD - 81.5" - CLEAR - Concealed Leaf

Weatherstripping - Aluminum Door Supplier Standard

Door Bottom - Aluminum Door Supplier Standard

ED5200 - EO - 630 - LHR - D200

172A - 6" x 1/2" x 38"

CPS-7500 - 689 (At 90 Degrees) K1050 - 06" x 36" - 18 ga. - US32D

- Diagrams Point To Point
- Corbin-Russwin McKinney Section 087100 Section 087100 Norton Rockwood Section 084113 Section 084113

Roton

Pemko

Security

By MFR

By MFR

Roton Corbin-Russwin Norton Rockwood Section 084113 Section 084113

Pemko

By MFR

780 - 112 HD - 81.5" - CLEAR - Concealed Leaf -Roton RETW-QC (12-Wire) ED5200 - K157 - P12 - 630 - RHR - W048 - D200 -Corbin-Russwin M91 - M92 - MELR Door Harness with "QC" Connectors to match Door McKinney Hardware Cylinder - Mortise - 626 (Dogging) Section 087100 Cylinder - Rim - 626 Section 087100 CPS-7500 - 689 (At 90 Degrees) K1050 - 06" x 36" - 18 ga. - US32D Norton Rockwood Weatherstripping - Aluminum Door Supplier Standard Section 084113 Door Bottom - Aluminum Door Supplier Standard Section 084113 172A - 6" x 1/2" x 38" Pemko Power Supply by Security Section Security **Diagrams - Elevation and Riser** By MFR Diagrams - Point To Point

# DOOR HARDWARE

#### **Hardware Set** 012

- 1 Hinge, Continuous Geared
- Push Bar 1
- 1 Closer, Overhead Parallel Arm
- 1 Kick Plate

1

Silencer, HM Dr. Frame 2

### Hardware Set 021

Hinge, Continuous Geared 780 - 224 HD - 83" - CLEAR - Concealed Leaf -1 RETW-QC (12-Wire) Mortar Box 430 1 **Electrically Unlocked** ML20906 x SEC - NSA - 626 - M17 - M91 - M92 - 24 Volt AC/DC Door Harness Door Harness with "QC" Connectors to match Door 2 Hardware Closer, Overhead Parallel Arm 1 CPS-7500 - 689 (At 90 Degrees) K1050 - 34" x 34" - 18 ga. - ŬS32D Armor Plate 1 Weatherstrip 316AS - 36" x 84" 1 Door Bottom Sweep 315CN x 36" 1 **Overhead Rain Drip** 346C x 40" 1 Threshold 195A x \_\_A (Fluted Plate) x 196A (Supp) x 195A x ( 1 Frm Depth + 1/2") - 1 Welded Unit x 36" W x 1/2" H Power Supply Power Supply by Security Section 1 Card Reader by Section 1 Card Reader Diagrams - Elevation and Riser Diagrams 1 Diagrams Diagrams - Point To Point 1

#### **Hardware Set** 022

1	Hinge, Continuous Geared	780 - 224 HD - 83" - CLEAR - Concealed Leaf - RETW-QC ( 12-Wire)	Roton
1	Mortar Box	430	Hager
1	Electrically Unlocked	ML20906 x SEC - NSA - 626 - M17 - M91 - M92 - 24 Volt AC/DC	Corbin-Russwii
2	Door Harness	Door Harness with "QC" Connectors to match Door Hardware	McKinney
1	Closer, Overhead Parallel Arm	CPS-7500 - 689 (At 90 Degrees)	Norton
1	Kick Plate	K1050 - 16" x 34" - 18 ga ŬS32D	Rockwood
1	Weatherstrip	316AS - 36" x 84"	Pemko
1	Door Bottom Sweep	315CN x 36"	Pemko
1	Overhead Rain Drip	346C x 40"	Pemko
1	Threshold	195A xA ( Fluted Plate) x 196A (Supp) x 195A x ( Frm Depth + 1/2") - 1 Welded Unit x 36" W x 1/2" H	Pemko
1	Power Supply	Power Supply by Security Section	Security
1	Card Reader	Card Reader by Section	Security
1	Diagrams	Diagrams - Elevation and Riser	By MFR
1	Diagrams	Diagrams - Point To Point	By MFR

780 - 224 HD - 83" - CLEAR - Concealed Leaf ED5200DB - P12 - 630 - LHR - D200 CLP-7500 - 689 (Set Stop Arm at 90 Degrees) K1050 - 06" x 34" - 18 ga. - US32D 608 - Gray

Roton Corbin-Russwin Norton Rockwood Rockwood

Roton

Hager Corbin-Russwin

**McKinney** 

Norton Rockwood Pemko Pemko Pemko Pemko

Security Security By MFR By MFR

n

780 - 224 HD - 83" - CLEAR - Concealed Leaf

195A x \_\_\_\_A (Fluted Plate) x 196A (Supp) x 195A x (

Frm Depth + 1/2") - 1 Welded Unit x 36" W x 1/2" H

780 - 112 HD - 83" - CLEAR - Concealed Leaf

780 - 112 HD - 83" - CLEAR - Concealed Leaf -

ED5470 - N9905 (Fail Secure) - 630 - RHR - M55

ED5470 - EO - 630 - LHR - M55 (LBR)

ML2055 - NSA - 626 - M17

RETW-QC (12-Wire) - RHR

316AS - 36" x 84"

315CN x 36"

346C x 40"

430

CPS-7500 - 689 (At 90 Degrees)

K1050 - 16" x 34" - 18 ga. - US32D

## Hardware Set 023

- 1 Hinge, Continuous Geared
- 1 Lockset, Classroom
- 1 Closer, Overhead Parallel Arm
- 1 Kick Plate
- 1 Weatherstrip
- 1 Door Bottom Sweep
- 1 Overhead Rain Drip
- 1 Threshold

### Hardware Set 031

- 1 Hinge, Continuous Geared
- 1 Hinge, Continuous Geared
- 1 Mortar Box
- 1 Exit Device, VR\_Surf.
- 1 Exit Device, VR\_Surf.\_Key
- 2 Door Harness
- 1 Cylinder, Rim
- 1 Closer, Overhead Parallel Arm

Electric Hinge, Ball Bearing

Closer, Overhead Parallel A

Silencer, HM Dr. Frame

**Electrically Unlocked** 

- 2 Kick Plate
- 1 Power Supply
- 1 Diagrams

1 1

1

2

1

1

3

1

1

1 1

1 Diagrams

# Hardware Set 041 2 Hinge, Ball Bearing

Mortar Box

Door Harness

Kick Plate

Power Supply

Card Reader

Diagrams

Diagrams

(LBR) - M92 (TBM)
Door Harness with "QC" Connectors to match Door Hardware
Cylinder - Rim - 626
rm CPS-7500 - 689 (At 90 Degrees)
K1050 - 16" x 35" - 18 ga. - US32D
Power Supply by Security Section
Diagrams - Elevation and Riser
Diagrams - Point To Point Roton Corbin-Russwin Norton Rockwood Pemko Pemko Pemko Pemko

Roton Roton

Hager Corbin-Russwin Corbin-Russwin

McKinney

Section 087100 Norton Rockwood Security By MFR By MFR

	BB1279 - 4.5 x 4.5 - US26D - NRP	Hager
	BB1279 - 4.5 x 4.5 - US26D - RETW-QC ( 12-Wire)	Hager
	430	Hager
	ML20906 x SEC - NSA - 626 - M17 - M91 - M92 - 24 Volt AC/DC	Corbin-Russwin
	Door Harness with "QC" Connectors to match Door Hardware	McKinney
rm	CPS-7500 - 689 (Max Swing is 110 Degrees)	Norton
	K1050 - 16" x 34" - 18 ga US32D	Rockwood
	608 - Gray	Rockwood
	Power Supply by Security Section	Security
	Card Reader by Section	Security
	Diagrams - Elevation and Riser	By MFR
	Diagrams - Point To Point	By MFR

Hager

Hager

Hager

**McKinney** 

Rockwood

Rockwood

Security

Security

By MFR

By MFR

Norton

Corbin-Russwin

#### **Hardware Set** 042

- 2 Hinge, Ball Bearing
- Electric Hinge, Ball Bearing 1
- 1 Mortar Box
- Electrically Unlocked 1

### 2 Door Harness

- Closer, Overhead Parallel Arm 1
- Kick Plate 1
- Silencer, HM Dr. Frame 3
- Power Supply 1
- Card Reader 1
- 1 Diagrams
- 1 Diagrams

1

1

1

1

1

#### Hardware Set 043

BB1279 - 4.5 x 4.5 - US26D - NRP BB1279 - 4.5 x 4.5 - US26D - RETW-QC (12-Wire) 430 ML20906 x SEC - NSA - 626 - M17 - M91 - M92 - 24 Volt AC/DC
Door Harness with "QC" Connectors to match Door Hardware CPS-7500 - 689 (Max Swing is 110 Degrees) K1050 - 16" x 34" - 18 ga US32D 608 - Gray
Power Supply by Security Section Card Reader by Section Diagrams - Elevation and Riser Diagrams - Point To Point

2 Hinge, Ball Bearing BB1279 - 4.5 x 4.5 - US26D - NRP Hager Electric Hinge, Ball Bearing BB1279 - 4.5 x 4.5 - US26D - RETW-QC (12-Wire) Hager Mortar Box 430 Hager Electrically Unlocked ML20906 x SEC - NSA - 626 - M17 - M91 - M92 - 24 Corbin-Russwin Volt AC/DC 2 Door Harness Door Harness with "QC" Connectors to match Door McKinney Hardware Closer, Overhead Parallel Arm CPS-7500 - 689 (Max Swing is 110 Degrees) Norton K1050 - 34" x 34" - 18 ga. - US32D Armor Plate Rockwood 3 Silencer, HM Dr. Frame 608 - Gray Rockwood 1 Power Supply Power Supply by Security Section Security Card Reader by Section 1 Card Reader Security **Diagrams - Elevation and Riser** 1 Diagrams Bv MFR Diagrams - Point To Point 1 Diagrams By MFR

#### Hardware Set 044

2	Hinge, Ball Bearing	BB1279 - 4.5 x 4.5 - US26D	Hager
1	Electric Hinge, Ball Bearing	BB1279 - 4.5 x 4.5 - US26D - RETW-QC ( 12-Wire)	Hager
1	Mortar Box	430	Hager
1	Electrically Unlocked	ML20906 x SEC - NSA - 626 - M17 - M91 - M92 - 24 Volt AC/DC	Corbin-Russwin
2	Door Harness	Door Harness with "QC" Connectors to match Door Hardware	McKinney
1	Closer, Overhead Parallel Arm	CPS-7500 - 689 (Max Swing is 90 Degrees) - (Install Push Side)	Norton
1	Armor Plate	K1050 - 34" x 34" - 18 ga US32D	Rockwood
3	Silencer, HM Dr. Frame	608 - Gray	Rockwood
1	Power Supply	Power Supply by Security Section	Security
1	Card Reader	Card Reader by Section	Security
1	Diagrams	Diagrams - Elevation and Riser	By MFR
1	Diagrams	Diagrams - Point To Point	By MFR

#### **Hardware Set** 045

- 2 Hinge, Ball Bearing
- Electric Hinge, Ball Bearing 1
- Mortar Box 1
- 1 Electrically Unlocked

### 2 Door Harness

- Closer, Overhead Regular Arm 1
- **Kick Plate** 1
- Stop, Hinge 1
- Silencer, HM Dr. Frame 3
- Power Supply 1
- Card Reader 1
- Diagrams 1
- 1 Diagrams

#### **Hardware Set** 046

2	Hinde	Ball	Bearing
~	r migo,	Duii	Dearing

- 1 Electric Hinge, Ball Bearing BB1279 - 4.5 x 4.5 - US26D - RETW-QC (12-Wire) Hager 1 Mortar Box 430 Hager 1 Electrically Unlocked ML20906 x SEC - NSA - 626 - M17 - M91 - M92 - 24 Volt AC/DC Door Harness Door Harness with "QC" Connectors to match Door McKinney Hardware Closer, Overhead Regular Arm 7500 - 689 Norton Kick Plate K1050 - 16" x 34" - 18 ga. - US32D Rockwood Stop, Wall 409 - US26D Rockwood 3 Silencer, HM Dr. Frame 608 - Grav Rockwood 1 Power Supply Power Supply by Security Section Security Card Reader by Section 1 Card Reader Security **Diagrams - Elevation and Riser** By MFR 1 Diagrams
- 1 Diagrams

2

1

1

1

#### Hardware Set 047

- 2 Hinge, Ball Bearing
- 1 Electric Hinge, Ball Bearing
- Mortar Box 1
- 1 **Electrically Unlocked**
- 2 Door Harness
- Closer, Overhead Parallel Arm 1
- 1 Kick Plate
- 1 Stop, Wall
- 3 Silencer, HM Dr. Frame
- 1 Power Supply
- 1 Card Reader
- 1 Diagrams
- 1 Diagrams

- BB1279 4.5 x 4.5 US26D Hager Hager BB1279 - 4.5 x 4.5 - US26D - RETW-QC (12-Wire) 430 Hager ML20906 x SEC - NSA - 626 - M17 - M91 - M92 - 24 Corbin-Russwin Volt AC/DC Door Harness with "QC" Connectors to match Door McKinney Hardware 7500 - 689 Norton K1050 - 16" x 34" - 18 ga. - US32D Rockwood 1513 - 619 Don-Jo 608 - Gray Rockwood Power Supply by Security Section Security Card Reader by Section Security Diagrams - Elevation and Riser By MFR By MFR Diagrams - Point To Point
- BB1279 4.5 x 4.5 US26D Hager Corbin-Russwin Diagrams - Point To Point By MFR
- BB1279 4.5 x 4.5 US26D NRP Hager BB1279 - 4.5 x 4.5 - US26D - RETW-QC (12-Wire) Hager Hager 430 ML20906 x SEC - NSA - 626 - M17 - M91 - M92 - 24 Corbin-Russwin Volt AC/DC Door Harness with "QC" Connectors to match Door McKinney Hardware PR7500 - 689 Norton K1050 - 16" x 34" - 18 ga. - US32D Rockwood 409 - US26D Rockwood 608 - Gray Rockwood Power Supply by Security Section Security Security Card Reader by Section Diagrams - Elevation and Riser By MFR Diagrams - Point To Point By MFR

#### **Hardware Set** 048 BB1279 - 4.5 x 4.5 - US26D - NRP 2 Hinge, Ball Bearing Hager Hager Electric Hinge, Ball Bearing BB1279 - 4.5 x 4.5 - US26D - RETW-QC (12-Wire) 1 Mortar Box 430 Hager 1 1 Electrically Unlocked ML20906 x SEC - NSA - 626 - M17 - M91 - M92 - 24 Corbin-Russwin Volt AC/DC Door Harness with "QC" Connectors to match Door McKinney 2 Door Harness Hardware Closer, Overhead Parallel Arm PR7500 - 689 Norton 1 K1050 - 34" x 34" - 18 ga. - US32D Armor Plate Rockwood 1 Stop, Wall 409 - US26D Rockwood 1 Silencer, HM Dr. Frame 608 - Gray Rockwood 3 Power Supply Power Supply by Security Section Security 1 Card Reader Card Reader by Section Security 1 1 Diagrams Diagrams - Elevation and Riser By MFR 1 Diagrams Diagrams - Point To Point By MFR **Hardware Set** 051 1 Lock, Gate GL1-FLM Securitron 1 Power Supply Power Supply by Security Section Security 1 Card Reader Card Reader by Section Security Hardware Set 052 1 Cylinder Cylinder - 626 { Verify Type Required } Section 087100 Hardware Set 053 1 Cylinder Cylinder - 626 { Verify Type Required } Section 087100 Hardware Set 061 2 Hinge, Ball Bearing BB1279 - 4.5 x 4.5 - US26D - NRP Hager 1 Electric Hinge, Ball Bearing BB1279 - 4.5 x 4.5 - US26D - RETW-QC (12-Wire) Hager 1 Mortar Box 430 Hager 1 Electrically Locked ML20932 x SAF - NSA - 626 - M17 - 24 Volt AC/DC Corbin-Russwin 2 Door Harness Door Harness with "QC" Connectors to match Door McKinney

Hardware 1 Closer, Overhead Parallel Arm CLP-7500 - 689 (Set Stop Arm at 90 Degrees) Norton Armor Plate K1050 - 34" x 34" - 18 ga. - US32D 1 Rockwood S88D ( Smoke Gasket ) - 36" x 84" 1 Smoke Gasket Pemko 1 Power Supply Power Supply by Security Section Security 1 Card Reader Card Reader by Section Security **Diagrams - Elevation and Riser** 1 Diagrams By MFR 1 Diagrams Diagrams - Point To Point By MFR

BB1279 - 4.5 x 4.5 - US26D - RETW-QC (12-Wire)

ML20932 x SEC - NSA - LHR - 626 - M17 - M91 - 24

Door Harness with "QC" Connectors to match Door

BB1279 - 4.5 x 4.5 - US26D - NRP

K1050 - 16" x 34" - 18 ga. - US32D

430

Volt AC/DC

Hardware

608 - Gray

608 - Gray

BB1279 - 4.5 x 4.5 - US26D - NRP

9ADJ-336 - Stop Only - (33-1/16" - 38" Door) - 689

ML2055 - NSA - 626 - M17

PR7500 - 689

Hager Hager

Hager

McKinney

Rockwood

Norton

Corbin-Russwin

#### **Hardware Set** 062

- 2 Hinge, Ball Bearing
- Electric Hinge, Ball Bearing 1
- Mortar Box 1
- 1 Electrically Unlocked

### 2 Door Harness

- Closer, Overhead Parallel Arm 1
- **Kick Plate** 1
- Stop, Wall 1
- Silencer, HM Dr. Frame 3
- Power Supply 1
- Card Reader 1
- Diagrams 1
- 1 Diagrams

### **Hardware Set** 063

- 2 Hinge, Ball Bearing
- Electric Hinge, Ball Bearing 1 Mortar Box 1
- 1 Electrically Unlocked
- Door Harness 2
- Closer, Overhead Regular Arm 1
- Armor Plate 1
- Stop, Wall 1
- 3 Silencer, HM Dr. Frame
- Power Supply 1
- 1 Card Reader
- 1 Diagrams
- 1 Diagrams

#### Hardware Set 201

- 3 Hinge, Ball Bearing
- 1 Lockset, Classroom
- Stop, Overhead Conc. 1
- 3 Silencer, HM Dr. Frame

#### **Hardware Set** 202

- 3 Hinge, Ball Bearing
- Lockset, Classroom 1
- Stop, Overhead Surf. 1
- Silencer, HM Dr. Frame 3

- 409 US26D Rockwood 608 - Gray Rockwood Power Supply by Security Section Security Card Reader by Section Security Diagrams - Elevation and Riser By MFR By MFR Diagrams - Point To Point BB1279 - 4.5 x 4.5 - US26D Hager
- BB1279 4.5 x 4.5 US26D RETW-QC (12-Wire) Hager 430 Hager ML20932 x SEC - NSA - LHR - 626 - M17 - M91 - 24 Corbin-Russwin Volt AC/DC Door Harness with "QC" Connectors to match Door McKinney Hardware 7500 - 689 Norton K1050 - 34" x 34" - 18 ga. - US32D Rockwood 409 - US26D Rockwood 608 - Grav Rockwood Power Supply by Security Section Security Card Reader by Section Security **Diagrams - Elevation and Riser** By MFR Diagrams - Point To Point By MFR
- BB1279 4.5 x 4.5 US26D NRP Hager ML2055 - NSA - 626 - M17
- 1ADJ-336 Stop Only (33-1/16" 38" Door) 689
- Corbin-Russwin Rixson Rockwood
  - Hager Corbin-Russwin Rixson Rockwood

# DOOR HARDWARE

## 08 71 00-30

Hardware Set 203	
<ul><li>3 Hinge, Ball Bearing</li><li>1 Lockset, Classroom</li></ul>	BB1279 - 4.5 x 4.5 - US26D - NRP ML2055 - NSA - 626 - M17
1 Stop, Overhead - Surf.	9ADJ-336 x 5458 LH - Stop Only - Door) - 689
3 Silencer, HM Dr. Frame	608 - Gray
Hardware Set 204	
3 Hinge, Ball Bearing	BB1279 - 4.5 x 4.5 - US26D - NRP
1 Lockset, Classroom	ML2055 - NSA - 626 - M17
1 Stop, Wall	409 - US26D
3 Silencer, HM Dr. Frame	608 - Gray

#### **Hardware Set** 205

### 3 Hinge, Ball Bearing BB1279 - 4.5 x 4.5 - US26D - NRP 1 Lockset, Classroom ML2055 - NSA - 626 - M17 PR7500 - 689 - 180 Degree Swing

- 1 Closer, Overhead Parallel Arm
- 1 Kick Plate
- 3 Silencer, HM Dr. Frame

#### Hardware Set 206

## 3 Hinge, Ball Bearing

- 1 Lockset, Classroom
- 1 Closer, Track Arm
- Kick Plate 1
- 3 Silencer, HM Dr. Frame

#### Hardware Set 211

6	Hinge, Ball Bearing	BB1279 - 4.5 x 4.5 - US26D - NRP
1	Lockset, Classroom	ML2055 - NSA - 626 - M17
2	Bolt, Flush	555 - US26D
1	Dust Proof Strike	570 - US26D
2	Holder/Stop, Overhead - Surf.	9ADJ-326 - Hold Open - (33-1/16" - 38' Door) - 689
1	Astragal, Overlapping	357SP x 84" (Apply to inside face of LHR In-Active
2	Silencer, HM Dr. Frame	608 - Gray

608 - Gray

608 - Gray

### Hager Corbin-Russwin Norton Rockwood Rockwood

Hager

Rixson

Hager

Hager

Norton

Rockwood

Rockwood

Rockwood

Corbin-Russwin

Corbin-Russwin Rockwood Rockwood

Corbin-Russwin

Hager Corbin-Russwin Rockwood Rockwood Rixson Pemko Rockwood

### Hardware Set 301

- 3 Hinge, Ball Bearing
- 1 Lockset, Entrance/Office
- 1 Stop, Overhead Surf.
- 3 Silencer, HM Dr. Frame

BB1279 - 4.5 x 4.5 - US26D ML2051 - NSA - 626 - M17 9ADJ-336 - Stop Only - (33-1/16" - 38" Door) - 689 608 - Gray

Hager Corbin-Russwin Rixson Rockwood

608 - Gray

K1050 - 16" x 34" - 18 ga. - US32D

BB1279 - 4.5 x 4.5 - US26D - NRP

K1050 - 16" x 34" - 18 ga. - US32D

ML2055 - NSA - 626 - M17

7500ST - 689 - Pull Side

#### **Hardware Set** 302

- 3 Hinge, Ball Bearing
- Lockset, Entrance/Office 1
- Stop, Wall 1
- 3 Silencer, HM Dr. Frame

#### Hardware Set 401

- 3 Hinge, Ball Bearing
- 1 Lockset, Storeroom/Closet
- 1 Stop, Wall
- 3 Silencer, HM Dr. Frame

#### Hardware Set 402

### 3 Hinge, Ball Bearing

- 1 Lockset, Storeroom/Closet
- 1 Closer, Overhead Regular Arm
- 1 Kick Plate
- 1 Stop, Hinge
- Silencer, HM Dr. Frame 3

### **Hardware Set** 411

- 3 Hinge, Ball Bearing
- Lockset, Storeroom/Closet 1
- Closer, Overhead Regular Arm 1
- 1 Kick Plate
- 3 Silencer, HM Dr. Frame

#### Hardware Set 412

3	Hinge, Ball Bearing	BB1279 - 4.5 x 4.5 - US26D - NRP
1	Lockset, Storeroom/Closet	ML2057 - NSA - 626 - M17 - M21 (KLO)
1	Closer, Overhead Parallel Arm	PR7500 - 689 - 180 Degree Swing
1	Smoke Gasket	S88D (Smoke Gasket) - 36" x 84"

### Hardware Set 413

### BB1279 - 4.5 x 4.5 - US26D - NRP 3 Hinge, Ball Bearing 1 Lockset, Storeroom/Closet ML2057 - NSA - 626 - M17 - M21 (KLO) 1 Closer, Overhead Parallel Arm PR7500 - 689 - 180 Degree Swing 1 Smoke Gasket S88D ( Smoke Gasket ) - 36" x 84"

### Hardware Set 501

1

3

3 Hinge, Ball Bearing BB1279 - 4.5 x 4.5 - US26D 1 Latchset, Passage ML2010 - NSA - 626 - M17 Stop, Overhead - Conc. 1ADJ-336 - Stop Only - (33-1/16" - 38" Door) - 689 Silencer, HM Dr. Frame 608 - Gray

Hager Corbin-Russwin Rockwood Rockwood

Hager Corbin-Russwin Norton Rockwood Don-Jo Rockwood

Hager Corbin-Russwin Norton Rockwood Rockwood

Hager Corbin-Russwin Norton Pemko

Hager Corbin-Russwin Norton Pemko

Hager Corbin-Russwin Rixson Rockwood

BB1279 - 4.5 x 4.5 - US26D

ML2051 - NSA - 626 - M17

BB1279 - 4.5 x 4.5 - US26D

ML2057 - NSA - 626 - M17

BB1279 - 4.5 x 4.5 - US26D

ML2057 - NSA - 626 - M17

BB1279 - 4.5 x 4.5 - US26D

ML2057 - NSA - 626 - M17 - M21 (KLO)

K1050 - 16" x 34" - 18 ga. - US32D

K1050 - 16" x 34" - 18 ga. - US32D

409 - US26D

409 - US26D

608 - Gray

7500 - 689

1513 - 619

608 - Gray

7500 - 689

608 - Gray

608 - Gray

# DOOR HARDWARE

## 08 71 00-32

#### **Hardware Set** 502

- 3 Hinge, Ball Bearing
- Latchset, Passage 1
- 1 Stop, Overhead - Surf.
- 3 Silencer, HM Dr. Frame

#### Hardware Set 503

- 3 Hinge, Ball Bearing
- 1 Latchset, Passage
- 1 Stop, Overhead Surf.
- 3 Silencer, HM Dr. Frame

#### Hardware Set 504

## 3 Hinge, Ball Bearing

## 1 Latchset, Passage

- 1 Kick Plate
- 1 Stop, Wall
- 3 Silencer, HM Dr. Frame

#### **Hardware Set** 505

- 3 Hinge, Ball Bearing Latchset, Passage 1
- Kick Plate 1
- Stop, Wall 1
- 3 Silencer, HM Dr. Frame

### Hardware Set 601

3	Hinge, Ball Bearing	BB1279 - 4.5 x 4.5 - US26D	Hager
1	Lockset, Privacy	ML2060 - NSA - M34 - 626 - M17 - M19V ( Occupancy	Corbin-Russwin
		Indicator)	
1	Closer, Overhead Regular Arm	7500 - 689	Norton
1	Mop Plate	K1050 - 04" x 35" - 18 ga US32D (Pull Side of Door)	Rockwood
1	Kick Plate	K1050 - 16" x 34" - 18 ga US32D	Rockwood
1	Stop, Hinge	1513 - 619	Don-Jo
3	Silencer, HM Dr. Frame	608 - Gray	Rockwood

#### **Hardware Set** 602

3	Hinge, Ball Bearing	BB1279 - 4.5 x 4.5 - US26D	Hager
1	Lockset, Privacy	ML2060 - NSA - M34 - 626 - M17 - M19V ( Occupancy	Corbin-Russwin
		Indicator)	
1	Closer, Overhead Parallel Arm	CLP-7500 - 689 (Set Stop Arm at 90 Degrees)	Norton
1	Kick Plate	K1050 - 16" x 34" - 18 ga US32D	Rockwood
3	Silencer, HM Dr. Frame	608 - Gray	Rockwood

9ADJ-336 - Stop Only - (33-1/16" - 38" Door) - 689

BB1279 - 4.5 x 4.5 - US26D

ML2010 - NSA - 626 - M17

BB1279 - 4.5 x 4.5 - US26D

ML2010 - NSA - 626 - M17

BB1279 - 4.5 x 4.5 - US26D

ML2010 - NSA - 626 - M17

K1050 - 16" x 34" - 18 ga. - US32D

K1050 - 16" x 34" - 18 ga. - US32D

608 - Gray

409 - US26D

409 - US26D

608 - Gray

608 - Gray

Hager Corbin-Russwin Rixson Rockwood

Hager Corbin-Russwin Rixson Rockwood

Hager Corbin-Russwin Rockwood Rockwood Rockwood

Hager Corbin-Russwin Rockwood Rockwood Rockwood

## Hardware Set 603

3	Hinge, Ball Bearing	BB1279 - 4.5 x 4.5 - US26D	Hager
1	Lockset, Privacy	ML2060 - NSA - M34 - 626 - M17 - M19V ( Occupancy Indicator )	Corbin-Russwin
1	Closer, Overhead Regular Arm	7500 - 689	Norton
1	Mop Plate	K1050 - 04" x 35" - 18 ga US32D (Pull Side of Door)	Rockwood
1	Kick Plate	K1050 - 16" x 34" - 18 ga US32D	Rockwood
1	Stop, Wall	409 - US26D	Rockwood
3	Silencer, HM Dr. Frame	608 - Gray	Rockwood

## Hardware Set 701

3	Hinge, Ball Bearing	BB1279 - 4.5 x 4.5 - US26D	Hager
1	Push Plate	70C - 4" x 16" - US32D	Rockwood
1	Pull Plate	BF-107 - 70C - 4" x 16" - US32D	Rockwood
1	Closer, Overhead Parallel Arm	PR7500 - 689	Norton
1	Armor Plate	K1050 - 34" x 34" - 18 ga US32D	Rockwood
1	Stop, Wall	409 - US26D	Rockwood
3	Silencer, HM Dr. Frame	608 - Gray	Rockwood

END OF SECTION 08 71 00

## Wednesday, October 2, 2019

											0	PE	NINGS SCHEDULE		
OPENING NUMBER	SHEET NUMBER	PANIC RELEASE HARDWARE	AUTOMATIC CLOSING	ELECT. MAG. DOOR RELEASE	PUSH / PULL (Interior Oenpings)	"U" HANDLE / LEVER HANDLE	MOP, KICK, & ARMOR PLATES	TACTILE WARNING	ACCESSIBLE THRESHOLD	ELECTRICAL / SECURITY	HARDWARE SET NO.	•	NEW WORK	BULLETIN - REVISION NUMBER	

## DRAWING NO: A-1.1

### **OPENING NOTES**

100A	A-1.1	•	•	•		•	•			031	ER_PULL_(EL Only), CL01, SW1	
100B	A-1.1		•	٠			٠			004	CL11, NDEH, SW1	
101A	A-1.1	•	•	٠		•	٠		•	003	AC_PR.ER.MLR 2, E1, AL, CL11, SW1	
102A	A-1.1		•	٠		•	٠			602	CL01, SW1	
103A	A-1.1		•			•				211	DS2, OALR, SW1	
104A	A-1.1		•	٠		٠	٠		٠	045	AC_EU.06.4PU, E1, DS8, SW1	
105A	A-1.1		•	•		•	٠			602	CL01, SW1	
106A	A-1.1	•	•	•		•	٠		٠	011	AC_PR.ER.MLR 2, E1, CL01, SW1	
106B	A-1.1		•	•		•	٠		٠	041	AC_EU.06.4PL, E1, , BRO, CL01, SW2	
108A	A-1.1		•	•		•	٠			205	SW3	
109A	A-1.1		•	•		•	٠			205	SW3	
109B	A-1.1		•	•		٠	٠		٠	042	AC_EU.06.4PL, E1, CL01, SW1	
110A	A-1.1		•	•		٠	٠		٠	047	AC_EU.06.4PL, E1,	
111A	A-1.1		•	•		٠	•		•	062	AC_EU.EU.SE, E1	
112A	A-1.1		•	•		٠	•			601	SW2	
113A	A-1.1		•			٠				503	DS1, SW1	
114A	A-1.1		•	•		٠	•		•	046	AC_EU.06.4PU, E1	
116A	A-1.1		•	•		٠	٠			504		
118A	A-1.1		•	•		•	•		•	021	AC_EU.06.4PL, E1, CL11, SW1	
118B	A-1.1									NHR		
120A	A-1.1		•			•				501	SW1	
					· · ·							

## Wednesday, October 2, 2019

NEW WORK         NEW WORK         NEW WORK           Name         Nam         Name         Name	
121A       A.1.1       •       •       206       CL21, SW1         122A       A.1.1       •       •       •       063       AC_EU.EU.SE, E1         122B       A.1.1       •       •       •       061       AC_EU.EU.SE, E1         125A       A.1.1       •       •       •       022       AC_EU.EU.SA, E1, CL01, SW1         125B       A.1.1       •       •       •       022       AC_EU.06.4PL, E1, CL11, SW1         125C       A.1.1       •       •       •       413       SW3         127A       A.1.1       •       •       •       412       SW3         128A       A.1.1       •       •       •       412       SW3         128A       A.1.1       •       •       •       412       SW3         128A       A.1.1       •       •       •       442       SW3         128A       A.1.1       •       •       •       044       AC_EU.06.4PU, E1, CL02, SW1         129A       A.1.1       •       •       •       043       AC_EU.06.4PL, E1, CL02, SW1         133A       A.1.1       •       •       •       043       AC_EU.06	OPENING NUMBER
21, SW1 EU.EU.SE, E1 EU.EU.SA, E1, CL01, SW1 EU.06.4PL, E1, CL11, SW1 3 3 3 EU.06.4PU, E1, CL02, SW1 EU.06.4PL, E1, CL02, SW1 EU.06.4PL, E1, CL02, SW1 1, SW1 5, SW1 PR.ER.MLR 2, E1, AL, CL11, SW1 D1, DT1, SW1 EU.06.4PU, E1 3, SW1 3, SW1 1, SW1 3, SW1 1, SW1	SHEET NUMBER PANIC RELEASE H POSITIVE LATCHIN AUTOMATIC CLOSI ELECT. MAG. DOOI PUSH / PULL (Interi PUSH / PULL (Interi PUSH / PULL (Interi PUSH / PULL (Interi TACTILE WARNING ACCESSIBLE THRE ELECTRICAL / SE HARDWARE SET I
206       CL21, SW1         0       063       AC_EU.EU.SE, E1         0       061       AC_EU.EU.SA, E1, CL01, SW1         0       022       AC_EU.06.4PL, E1, CL11, SW1         NHR       NHR         •       413       SW3         •       413       SW3         •       414       SW3         •       412       SW3         •       044       AC_EU.06.4PU, E1, CL02, SW1         •       044       AC_EU.06.4PL, E1, CL02, SW1         •       043       AC_EU.06.4PL, E1, CL02, SW1         •       203       DS3, SW1         •       204       204         •       204       204         •       012       CL01, DT1, SW1         •       012       CL01, DT1, SW1         •       046       AC_EU.06.4PU, E1         •       046       AC_EU.06.4PU,	
1.1       •       •       •       063       AC_EUEUSE, E1         1.1       •       •       •       061       AC_EUEUSA, E1, CL01, SW1         1.1       •       •       •       022       AC_EU.64PL, E1, CL11, SW1         1.1       •       •       •       022       AC_EU.64PL, E1, CL11, SW1         1.1       •       •       •       022       AC_EU.64PL, E1, CL11, SW1         1.1       •       •       •       413       SW3         1.1       •       •       •       413       SW3         1.1       •       •       •       412       SW3         1.1       •       •       •       412       SW3         1.1       •       •       •       414       SW3         1.1       •       •       •       •       412       SW3         1.1       •       •       •       •       044       AC_EU.06.4PL, E1, CL02, SW1         1.1       •       •       •       •       043       AC_EU.06.4PL, E1, CL02, SW1         1.1       •       •       •       043       AC_EU.06.4PL, E1, CL02, SW1         1.1 <t< td=""><td>A-1</td></t<>	A-1
A       A       Image: Constraint of the constraint o	
5A       A-1.1       •       •       •       022       AC_EU.06.4PL, E1, CL11, SW1         5B       A-1.1       •       •       NHR       NHR         5C       A-1.1       •       •       413       SW3         7A       A-1.1       •       •       413       SW3         7A       A-1.1       •       •       412       SW3         8A       A-1.1       •       •       •       414       SW3         8A       A-1.1       •       •       •       414       SW3         8A       A-1.1       •       •       •       414       SW3         8A       A-1.1       •       •       •       044       AC_EU.06.4PL, E1, CL02, SW1         9A       A-1.1       •       •       •       048       AC_EU.06.4PL, E1, CL02, SW1         2A       A-1.1       •       •       •       043       AC_EU.06.4PL, E1, CL02, SW1         2A       A-1.1       •       •       •       043       AC_EU.06.4PL, E1, CL02, SW1         3A       A-1.1       •       •       •       043       AC_EU.06.4PL, E1, CL02, SW1         3A       A-1.1	2B
2535       A-1.1       Image: Constraint of the const	25A
250       A-1.1       Image: Constraint of the constread of the constraint of the constraint of the constra	25B
22A       A.1.1       • </td <td>250</td>	250
121A       A.1.1       Image: Constraint of the constrelating the constraint of the constraint of the const	20A
129A       A-1.1       •<	128A
130A       A-1.1       •       •       •       043       AC_EU.06.4PL, E1, CL02, SW1         132A       A-1.1       •       •       1301       DS1, SW1         133A       A-1.1       •       •       1301       DS1, SW1         133A       A-1.1       •       •       1000       DS1, SW1         134A       A-1.1       •       •       1000       DS3, SW1         135A       A-1.1       •       •       1000       DS5, SW1         137A       A-1.1       •       •       1000       AC_PR.ER.MLR 2, E1, AL, CL11, SW1         138A       A-1.1       •       •       •       002       AC_PR.ER.MLR 2, E1, AL, CL11, SW1         139A       A-1.1       •       •       •       002       AC_PR.ER.MLR 2, E1, AL, CL11, SW1         139A       A-1.1       •       •       •       002       AC_PR.ER.MLR 2, E1, AL, CL11, SW1         139A       A-1.1       •       •       •       002       AC_PR.ER.MLR 2, E1, AL, CL11, SW1         139A       A-1.1       •       •       •       002       AC_PR.ER.MLR 2, E1, AL, CL11, SW1         139A       A-1.1       •       •       •       00	129A
$132A$ A-1.1       •       • $301$ DS1, SW1 $133A$ A-1.1       •       • $203$ DS3, SW1 $134A$ A-1.1       •       • $203$ DS3, SW1 $134A$ A-1.1       •       • $204$ • $135A$ A-1.1       •       • $201$ DS5, SW1 $137A$ A-1.1       •       • $603$ • $138A$ A-1.1       •       • $603$ • $138A$ A-1.1       •       • $002$ AC_PR.ER.MLR 2, E1, AL, CL11, SW1 $139A$ A-1.1       •       •       • $012$ CL01, DT1, SW1 $140A$ A-1.1       •       •       • $046$ AC_EU.06.4PU, E1 $141A$ A-1.1       •       •       • $402$ DS8, SW1 $142A$ A-1.1       •       • $203$ DS3, SW1 $142B$ A-1.1       •       • $202$ DS1, SW1	130A
133A       A-1.1       •       •       203       DS3, SW1         134A       A-1.1       •       •       204       •         135A       A-1.1       •       •       201       DS5, SW1         135A       A-1.1       •       •       603       •         137A       A-1.1       •       •       •       603         138A       A-1.1       •       •       •       002       AC_PR.ER.MLR 2, E1, AL, CL11, SW1         139A       A-1.1       •       •       •       012       CL01, DT1, SW1         140A       A-1.1       •       •       •       •       046       AC_EU.06.4PU, E1         141A       A-1.1       •       •       •       023       DS3, SW1         142A       A-1.1       •       •       •       203       DS3, SW1         142B       A-1.1       •       •       202       DS1, SW1	132A
134A       A-1.1       Image: Constraint of the const	133A
135A       A-1.1       •       •       201       DS5, SW1       137A         137A       A-1.1       •       •       •       603       103         138A       A-1.1       •       •       •       002       AC_PR.ER.MLR 2, E1, AL, CL11, SW1         139A       A-1.1       •       •       •       012       CL01, DT1, SW1         140A       A-1.1       •       •       •       046       AC_EU.06.4PU, E1         141A       A-1.1       •       •       •       402       DS8, SW1         142A       A-1.1       •       •       •       203       DS3, SW1         142B       A-1.1       •       •       •       202       DS1, SW1	134A
137A       A-1.1       •       •       •       603         138A       A-1.1       •       •       •       002       AC_PR.ER.MLR 2, E1, AL, CL11, SW1         139A       A-1.1       •       •       •       012       CL01, DT1, SW1         140A       A-1.1       •       •       •       046       AC_EU.06.4PU, E1         141A       A-1.1       •       •       •       402       DS8, SW1         142A       A-1.1       •       •       203       DS3, SW1         142B       A-1.1       •       •       202       DS1, SW1	135A
138A       A-1.1       •       •       •       002       AC_PR.ER.MLR 2, E1, AL, CL11, SW1         139A       A-1.1       •       •       012       CL01, DT1, SW1         140A       A-1.1       •       •       •       046       AC_EU.06.4PU, E1         141A       A-1.1       •       •       •       0402       DS8, SW1         142A       A-1.1       •       •       •       203       DS3, SW1         142B       A-1.1       •       •       •       202       DS1, SW1	137A
139A       A-1.1       •       •       012       CL01, DT1, SW1         140A       A-1.1       •       •       •       046       AC_EU.06.4PU, E1         141A       A-1.1       •       •       •       402       DS8, SW1         142A       A-1.1       •       •       •       203       DS3, SW1         142B       A-1.1       •       •       202       DS1, SW1	138A
140A       A-1.1       •       •       •       046       AC_EU.06.4PU, E1         141A       A-1.1       •       •       •       402       DS8, SW1         142A       A-1.1       •       •       203       DS3, SW1         142B       A-1.1       •       •       202       DS1, SW1	139A
141A     A-1.1     •     •     402     DS8, SW1       142A     A-1.1     •     •     203     DS3, SW1       142B     A-1.1     •     •     202     DS1, SW1	140A
142A         A-1.1         •         •         203         DS3, SW1           142B         A-1.1         •         •         202         DS1, SW1	141A
142B A-1.1 • • 202 DS1, SW1	142A
	142B

DOOR SCHEDULE

## Wednesday, October 2, 2019

												0	PENINGS SCHEDULE	
													NEW WORK	
OPENING NUMBER	SHEET NUMBER	PANIC RELEASE HARDWARE	POSITIVE LATCHING	AUTOMATIC CLOSING	ELECT. MAG. DOOR RELEASE	PUSH / PULL (Interior Oenpings)	"U" HANDLE / LEVER HANDLE	MOP, KICK, & ARMOR PLATES	TACTILE WARNING	ACCESSIBLE THRESHOLD	ELECTRICAL / SECURITY	HARDWARE SET NO.		BULLETIN - REVISION NUMBER
1// Δ	Δ_1 1	П									Π	502	DS1 SW2	
1450	A-1.1						•					401	501, 502	
145A	A-1.1											502	DS1_SW2	
1407	Δ_1.1						•					302	D01, 5W2	
1494	A-1 1		•				•					204		
150A	A-1 1						Ē				•	051	AC F2 WMP	
151A	A-1.1		•	•			•	•			•	046	AC EU.06.4PU. E1	
152A	A-1.1	•	•	•			•	•			•	001	AC PR.ER.MLR 2, E1, AL, CL11, SW1	
153A	A-1.1		•	•			•	•				603		
154A	A-1.1	1	•	•	+	+	•	•			•	046	AC_EU.06.4PU, E1	
157A	A-1.1		•	•		+	•	•	-			602	CL01, SW1	
158A	A-1.1		•	•		-	•	•				602	CL01, SW1	
160A	A-1.1		•	•			•	•			•	046	AC_EU.06.4PU, E1	
160B	A-1.1			•		•		•	1		l	701		
161A	A-1.1		•				•					204		
162A	A-1.1		•				•					302		
163A	A-1.1		•				•					401		
164A	A-1.1	1	•	•			•	•				505		
DRAW	ING NO	0:		A-'	1.2								OPENING NOTES	
0001	A 1 2	П									11	411	0144	

### Wednesday, October 2, 2019

												(	DP	PENINGS SCHEDULE
					ш	gs)	щ	s						● NEW WORK
OPENING NUMBER	SHEET NUMBER	PANIC RELEASE HARDWARE	POSITIVE LATCHING	AUTOMATIC CLOSING	ELECT. MAG. DOOR RELEAS	PUSH / PULL (Interior Oenpin	"U" HANDLE / LEVER HANDL	MOP, KICK, & ARMOR PLATE	TACTILE WARNING	ACCESSIBLE THRESHOLD	ELECTRICAL / SECURITY	UABDWADE SET NO		BULLETIN - REVISION NUMB

B01A	A-1.3	٠	•		•	•			023	CL11, SW1	
B03A	A-1.3							•	052	AC, E3, WMP	
B04A	A-1.3	٠	•		•	٠			023	CL11, SW1	
B04B	A-1.3								NHR		
B06A	A-1.3							•	053	AC, E2, WMP	
B07A	A-1.3							•	053	AC, E2, WMP	

## SCHEDULE GENERAL NOTES

. CONSTRUCTION MANAGER / GENERAL CONTRACTOR:

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"NO EXCEPTIONS"

ALL DOOR HARDWARE MUST BE FURNISHED BY SECTION 087100 DOOR HARDWARE SUPPLIER. "CONTRACTS, Including Door Hardware, ISSUED TO ALUMINUM DOOR SUPPLIER" must stipulate aluminum door hardware must be purchased from SECTION 087100 HARDWARE SUPPLIER.

"NO EXCEPTIONS"

CONSTRUCTION MANAGER / GENERAL CONTRACTOR / HARDWARE SUPPLER:

Shall coordinate an inspection, with all manufacturer's representatives to confirm that all hardware has been installed and adjusted properly;

See "Specification Section - 08 71 00 - 3.2 - INSTALLATION

HARDWARE SUPPLIER:

Must employ an experienced Architectural Hardware Consultant (AHC) who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.

CONFLICTS between the SPECIFIED DOOR HARDWARE and the DOORS / FRAMES must be brought to the attention of the ARCHITECT prior to submitting HARDWARE SUBMITTAL to

										0	PENINGS SCHEDULE	
											NEW WORK	
OPENING NUMBER	SHEET NUMBER	PANIC RELEASE HARDWARE	ELECT. MAG. DOOR RELEASE	PUSH / PULL (Interior Oenpings)	"u" handle / lever handle	MOP, KICK, & ARMOR PLATES	TACTILE WARNING	ACCESSIBLE THRESHOLD	ELECTRICAL / SECURITY	HARDWARE SET NO.	BULLETIN - REVISION NUMBER	

### the ARCHITECT.

HARDWARE SUPPLIER must schedule a pre - installation meeting to instruct installers on proper installation and adjustment of the Locks, Exit Devices, and Closers. A manufacturers' representative of each major hardware category shall be present to complete the instructions, and then certify to the Architect that the door hardware installer has been trained in the proper installation procedures and is certified to install the finish hardware.

DOOR HARDWARE INSTALLATION: All door hardware shall be installed according to manufactures' instructions.

This includes following the template required to complete the intended operation of the door hardware, and all fastener holes required shall be drilled and tapped to the correct size as detailed in the template. Template Hardware Installation so that Door will be able to swing a Minimum of 90 degrees. Doors swinging less than 90 Degrees will be reinstalled to meet ADA requirements.

All "DOOR HARDWARE FASTENERS" used during installation must be original hardware manufacturer's supplied fasteners. The use of drywall screws or non "OEM" self tapping screws will be rejected, reinstallation of hardware will be required. Fastener holes in doors and frames from the use of improper hardware fasteners will not be acceptable, doors and frames will be replaced at no cost to the owner.

HARDWARE SUPPLIER shall confirm specified LOCK FUNCTIONS with the OWNER at the KEYING MEETING.

### CONTINUOUS HINGES on ALUMINUM DOORS

Verify with Aluminum Door Supplier Hinge Model Selections for compatibility with Aluminum Head and Jamb Profiles.

- All "LOCKS" shall be of the same Manufacturer.
- All "EXIT DEVICES" shall be of the same Manufacturer.

All "DOOR CLOSERS" shall be of the same Manufacturer unless specified as no substitution.

(Provide All Necessary Hardware To Complete Installation of Closers on Aluminum and Hollow Metal Frames)

All Aluminum Sills to be continuous, exterior Sills set in Sealant Typical.

Exterior HM Frames and Doors shall be Galvanized and Insulated.

Provide Blocking in walls for all Door Hardware (i.e., but not limited to: Door Closers, Wall & Overhead Stops)

### Wednesday, October 2, 2019

											0	PE	NINGS SCHEDULE	I		
OPENING NUMBER	SHEET NUMBER	PANIC RELEASE HARDWARE	POSITIVE LATCHING AUTOMATIC CLOSING	ELECT. MAG. DOOR RELEASE	PUSH / PULL (Interior Oenpings)	"U" HANDLE / LEVER HANDLE	MOP, KICK, & ARMOR PLATES	TACTILE WARNING	ACCESSIBLE THRESHOLD	ELECTRICAL / SECURITY	HARDWARE SET NO.	•	NEW WORK		<b>BULLETIN - REVISION NUMBER</b>	

Provide Blocking for Door Closers in Wood Doors ( USE THRU BOLTS WHEN INSTALLING DOOR CLOSERS )

DOOR PROTECTION PLATES: "MOP PLATES" Install on PULL SIDE od Door. "KICKPLATES" Install on "PUSH SIDE" of Door. "ARMOR PLATES" Install on "PUSH SIDE" of Door.

TACTILE WARNING: Hazardous Areas may include, but NOT limited to: Custodial Spaces, Shops, Storage, Boiler Rooms, Trash Rooms, Basement, Finishing Rooms, Mechanical Rooms, Labs and Prep Rooms, Electrical Transfer Vaults, and Art Rooms.

GLAZING TYPES - See Drawing A8.01

HARDWARE / ELECTRICAL / SECURITY

CONDUIT & WIRING:

1. Install all conduits where required for electrified door hardware prior to applying in Grouting Solid or Spray Foam Solid in Door Frame.

2. All Conduits required for Power and Control Wiring, and Power Wiring, to be furnished and installed by Electrical Contractor.

3. All Low Voltage Access Control Wiring and Terminations are furnished and installed by the Access Control Contractor.

4. Controls and Control Wiring (provide 16 ga. Wire unless noted otherwise) of Electrified Devices, Transfer Hinges, and Power Supplies to be provided by Security Contractor.

DOOR & FRAMES:

Door Frame Supplier must coordinate Door Contact Frame Prep with Security Contractor.
 Door and Frame Suppliers must prep doors and frames to accommodate all electrified hardware, including all required conduits in doors and frames, when prepping doors and frames for door hardware.

HARDWARE:

### Wednesday, October 2, 2019

					OPENINGS SCHEDULE	
DPENING NUMBER	SHEET NUMBER	PANIC RELEASE HARDWARE POSITIVE LATCHING	ELECT. MAG. DOOR RELEASE USH / PULL (Interior Oenpings) " HANDI F / I EVER HANDI F	NOP, KICK, & ARMOR PLATES ACTILE WARNING	NEW WORK      NEW WORK      NEW WORK      Revision Number	
5	0,					

1. Hardware supplier must provide, Wiring Diagrams - Elevation and Riser & Point to Point, to Electrical Contractor.

2. Electromagnetic Door Release (Magnetic Door Holders) to be furnished by Section 08 71 00 and Installed by Electrical Contractor.

ACCESS CONTROL READERS:

1. TREADERS" by Access Control / Security Contractor.

## **OPENING NOTES**

### GENERAL DOOR NOTES:

- "A" All Doors Exiting 50 or More Persons shall have Panic Hardware.
- "B" All Door Hardware shall be Accessible to Persons with Disabilities. Hardware shall comply with ADA Standards.
- "C" Closers shall open a minimum of 175 Degrees, where 180 Degree swing is shown as such on Floor Plans and Door Schedule.
- "D" Where (\*) occurs in the "DEGREE OF SWING REQUIREMENTS" column, refer to the "OPENING NOTES" column for swing requirements at each leaf.
- "E" Where (\*) occurs in the "HEAD", "JAMB", or "SILL" detail column, refer to the "OPENING NOTES" column for "DETAILS".
- "F" Provide UL Rated KICK / ARMOR PLATES where detailed on UL Rated Openings.
- "G" Refer to Mechanical Series Drawing for all "Door Undercuts"

AC

ACCESS CONTROLLED OPENINGS: Opening hardware will include some form of mechanical or electrical access control. "AC" by "READER" "AC / AC" by "READER / READER"

"AC" / KP" by "READER / KEYPAD"

### Wednesday, October 2, 2019

											0	PENINGS SCHEDULE		
												NEW WORK		
OPENING NUMBER	SHEET NUMBER	PANIC RELEASE HARDWARE	POSITIVE LATCHING	AUTOMATIC CLOSING FI FCT MAG DOOR RFI FASF	PUSH / PULL (Interior Oenpings)	"U" HANDLE / LEVER HANDLE	MOP, KICK, & ARMOR PLATES	TACTILE WARNING	ACCESSIBLE THRESHOLD	ELECTRICAL / SECURITY	HARDWARE SET NO.		<b>BULLETIN - REVISION NUMBER</b>	

AL

### "ALUMINUM DOOR HARDWARE"

"EXTERIOR" - Minimum of 2" Thick Doors, coordinate with manufacture. "INTERIOR" - 1-3/4" Thiick Doors All door hardware with the exception of "Perimeter Weatherstripping and Meeting Styles" shall be Supplied by "SECTION 08 71 00". (NO EXCEPTIONS).

ALL DOOR HARDWARE MUST BE FIELD installer BY TRAINED DOOR HARDWARE installers. (NO EXCEPTIONS).

Aluminum Door Hardware shall not be furnished to the Aluminum Door Manufacturer for installation by Door Manufacturer. Weatherstripping, Door Bottoms, and Meeting Styles shall be Supplied and installer by the Aluminum Door Supplied. Aluminum Door Supplied must verify with Section 08 71 00 for compatibility with the Aluminum Door & Frame profiles. Changes required to Complete the installation will be Completed at no additional charge to the Owner. Aluminum Door Manufacturer must provide sufficient Reinforcing for all door hardware, and not limited to; Hinges, Locks, Exit Devices, Closers, and Door Pulls. Provide All necessary Auxiliary Hardware required to Complete the door Closer installation including but not limited to Drop Plate Brackets, OEM Fasteners, etc. Where "SMOKE GASKETS" are specified, Section 08 71 00 shall provide and install. Where "ELECTRICAL Terminations" are required, Manufacturers' Representative will be present during electrical terminations.

Manufacturers' Representative will instruct installers or will make any final adjustments required to Complete the smooth operation of the Door(s) Hardware.

BRO	Bullet Resistant Opening is required.
CL01	Provide Parallel Arm Closer with Integral Heavy Duty Stop Arm.
CL02	Provide Parallel Arm Closer with Integral Heavy Duty Stop Arm, (Install "PUSH SIDE" of Door).
CL11	Provide Parallel Arm Closer with Integral Heavy Duty Integral Cush Stop Arm.

## Wednesday, October 2, 2019

	OPENINGS SCHEDULE
	OPENING NUMBER SHEET NUMBER PANIC RELEASE HARDWARE POSITIVE LATCHING AUTOMATIC CLOSING ELECT. MAG. DOOR RELEASE PUSH / PULL (Interior Oenpings) "U" HANDLE / LEVER HANDLE MOP, KICK, & ARMOR PLATES "U" HANDLE / LEVER HANDLE MOP, KICK, & ARMOR PLATES TACTILE WARNING ACCESSIBLE THRESHOLD ELECTRICAL / SECURITY HARDWARE SET NO. BULLETIN - REVISION NUMBER
CL21	Provide Track Arm Closer (Pull Side Install)
DS1	Provide Overhead Positive Stop, install "PUSH SIDE".
DS2	Provide Overhead Positive Stop and Hold Open, install "PUSH SIDE".
DS3	Provide Overhead Positive Stop, install "PULL SIDE".
DS5	Template Hardware Installation of Concealed Overhead Stop to Recommend Degree of Swing (90-120), See Door Schedule. Adjust for maximum obtainable swing.
DS8	Hinge Stop
OT1	Dummy Trim and Ball Catch
E2	"E2" - Provided Electric Latch. Card Reader by Security Section
E3	"E3" - Provided Latch and Power supply. Card Reader by Security Section

EU.06.4PL

### Wednesday, October 2, 2019

											0	PE	NINGS SCHEDU	ILE		
												•	NEW WORK			
OPENING NUMBER	SHEET NUMBER	PANIC RELEASE HARDWARE	POSITIVE LATCHING	ELECT. MAG. DOOR RELEASE	PUSH / PULL (Interior Oenpings)	"U" HANDLE / LEVER HANDLE	MOP, KICK, & ARMOR PLATES	TACTILE WARNING	ACCESSIBLE THRESHOLD	ELECTRICAL / SECURITY	HARDWARE SET NO.				BULLETIN - REVISION NUMBER	

"EU06.4PL" MORTISE LOCK "ELECTRICALLY CONTROLLED TRIM" - "FAIL SECURE operation" "LATCHBOLT MONITOR" "REQUEST TO EXIT SWITCH" "CARD Reader" installer on the PULL Side of the Opening.

System to have "FAIL SECURE operation" :

Section 08 71 00 to provide Electrically Locked Trim, provide Integral Latchbolt Monitor and Request to Exit Function. Section 08 71 00 to provide (10 RETW) Wire Power Transfer Hinge, and Power Supply (See Hardware Sets for PS Requirements).

Latchbolt by Grip out side only when lock is energized. Outside Grip locked when lock is not energized. Latchbolt by key outside when lock is not energized. Auxiliary latch deadlocks Latchbolt Inside Grip always FREE.

EU.06.4PU

### Wednesday, October 2, 2019

											0	PE	NINGS SCHEDUI	E	
												•	NEW WORK		
OPENING NUMBER	SHEET NUMBER	PANIC RELEASE HARDWARE	POSITIVE LATCHING	ELECT. MAG. DOOR RELEASE	PUSH / PULL (Interior Oenpings)	"U" HANDLE / LEVER HANDLE	MOP, KICK, & ARMOR PLATES	TACTILE WARNING	ACCESSIBLE THRESHOLD	ELECTRICAL / SECURITY	HARDWARE SET NO.				BULLETIN - REVISION NUMBER

"EU06.4PL" MORTISE LOCK "ELECTRICALLY CONTROLLED TRIM" - "FAIL SECURE operation" "LATCHBOLT MONITOR" "REQUEST TO EXIT SWITCH" "CARD Reader" installer on the PUSH Side of the Opening.

System to have "FAIL SECURE operation" :

Section 08 71 00 to provide Electrically Locked Trim, provide Integral Latchbolt Monitor and Request to Exit Function. Section 08 71 00 to provide (10 RETW) Wire Power Transfer Hinge, and Power Supply (See Hardware Sets for PS Requirements).

Latchbolt by Grip out side only when lock is energized. Outside Grip locked when lock is not energized. Latchbolt by key outside when lock is not energized. Auxiliary latch deadlocks Latchbolt Inside Grip always FREE.

### Wednesday, October 2, 2019

											0	PE	NINGS SCHEDULE	
												•	NEW WORK	
OPENING NUMBER	SHEET NUMBER	PANIC RELEASE HARDWARE	POSITIVE LATCHING AUTOMATIC CLOSING	ELECT. MAG. DOOR RELEASE	PUSH / PULL (Interior Oenpings)	"U" HANDLE / LEVER HANDLE	MOP, KICK, & ARMOR PLATES	TACTILE WARNING	ACCESSIBLE THRESHOLD	ELECTRICAL / SECURITY	HARDWARE SET NO.			BULLETIN - REVISION NUMBER

EU.EU.SA NOTICE: This Lock Configuration Must Be Approved By The Local "AHJ"

"EU.EU.SA" Electrically Controlled Trims, Fail Safe - Card Reader x Card Reader Electrically Controlled Trims Each Side - Key x Key Latch Monitor Card Rerader installes on both sides of the opening.

System to have "FAIL SAFE operation" : Section 08 71 00 to provide Electrically Locked Trims Section 08 71 00 to provide (10 RETW) Wire Power Transfer Hinge, and Power Supply (See Hardware Sets for PS Requirements).

Latchbolt by Grip either side, unless both grips are locked by energizing lock. Latchbolt by key inside and / or outside when lock is energized. Auxiliary latch deadlocks Latchbolt.

## Wednesday, October 2, 2019

	OPENING NUMBER	SHEET NUMBER	PANIC RELEASE HARDWARE	POSITIVE LATCHING	AUTOMATIC CLOSING ELECT. MAG. DOOR RELEASE	PUSH / PULL (Interior Oenpings)	"U" HANDLE / LEVER HANDLE	MOP, KICK, & ARMOR PLATES	TACTILE WARNING	ACCESSIRI F THRESHOLD			HARDWARE SET NO.	• NEW WORK	<b>BULLETIN - REVISION NUMBER</b>	
EU.EU.SE	NOTICE: T "EU.EU.SE" Electrically Latch Monit Card Rerad System to H Section 08 Section 08 Latchbolt b Both Grips Latchbolt b Auxiliary lat	his Lock Electric Controllo or er instal nave "FA 71 00 to 71 00 to	Con ally ( ed Tr les o ) pro ) pro ther vhen side :	figur Contri rims n bo ECUI vide vide side lock and , s Lat	ation Folled Each th sid RE op Electri (10 R (10 R only is no or of chbol	Mus Trir Side es c erat cicall ETV whe t en- utsic t.	ns, F ns, F f th ion" y Lo /) W n lo ergiz le w	e Ap Fail Gey 5 e op : ocke Vire ck is zed.	pro Sec x Ke benii Pow s en i loc	vec sure ey ng. rim ver ner <u>c</u> ck is	d By e - C is Tra gized s no	Th Caro nsf d. t e	ne Lc d Re fer H	ocal "AHJ" ader x Card Reader inge, and Power Supply (See Hardware Sets for PS jized.	Requ	Jirements).
NDEH	No Exterior	Hardwa	re "E	XIT	ONLY	'II										
OALR	"OALR" OV	ERLAPP	ING	ASTE	AGAI	_ In	stall	on	"LH	IR"	Ins	ide	Ina	ctive Leaf		
PR.ER.MLR 2	"PR.EV.MLR Electric Mot Bolt Monito	2" "PU orized L r (Latch)	LL x atch ) Mo	NIG Retr nitor	HT LA action Touc	TCH 1 Pa 2hba	l FU nic I r Mo	NCT Rele	TON ase or S	v" " Ha Swit	'LEF ardw tch (	T F /ar (Re	HANE e. eque	D REVERSE" st to Exit Function),and Trim Monitor Switch		

Section 08 71 00 to provide ONE(1) each (10 RETW) Wire Power Transfer Hinge, and Power Supply (See Hardware Sets for PS Requirements).

SW1 "SW1" DEGREE SWING (90) - Template Hardware (Door Closers / Overhead Stops) Installation to Specified Degree of Swing (90), See Door Schedule.

### Wednesday, October 2, 2019

OPENINGS SCHEDULE													
NUMBER	MBER	EASE HARDWARE	C CLOSING	G. DOOR RELEASE	LL (Interior Oenpings)	e / Lever Handle	, & ARMOR PLATES	ARNING	LE THRESHOLD	AL / SECURITY	E SET NO.	NEW WORK	
OPENING	SHEET NU	PANIC REI	AUTOMAT	ELECT. M/	DUSH / PU	"U" HANDL	MOP, KICH	TACTILE V	ACCESSIB	ELECTRIC	HARDWAF	BULLETIN	

SW2 "SW2" DEGREE SWING (110 - 120) - Template Hardware (Door Closers / Overhead Stops) Installation to Specified Degree of Swing (110 - 120), See Door Schedule.

SW3 "SW3" DEGREE SWING (180) - Door must be able to swing 180 degrees. Template Hardware installation for 180 Degree swing operation. (175 Degrees where limited by field conditions or hardware specified)

# SECTION 08 71 13 – AUTOMATIC DOOR OPERATORS

## PART 1 - GENERAL

## 1.1 <u>RELATED DOCUMENTS</u>

 A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

# 1.2 <u>SUMMARY</u>

A. This section includes the furnishing and installing low-energy automatic door operators at door openings **101A** and **106A** as indicated on the drawings and specified herein.

## 1.3 <u>RELATED SECTIONS</u>

- A. Related Sections: Other specification sections which directly relate to the work of this Section include, but are not limited to, the following:
  - 1. Section 08 41 13 "Aluminum Entrances & Storefront" for aluminum doors to receive automatic door operators.
  - 2. Section 08 70 00 "Door Hardware" for additional hardware requirements of aluminum door and frame installations.
  - 3. Electrical connections for powered operators and controls are specified in Division 26.

# 1.4 <u>SUBMITTALS</u>

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for automatic door operators, including activation and safety devices. Include operating characteristics, electrical characteristics, and furnished accessories.
- B. Shop Drawings: For automatic door operators. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Indicate required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Include locations and elevations of entrances showing activation and safety devices.
  - 3. Wiring Diagrams: For power, signal, and activation- and safety-device wiring.
  - 4. Include plans, elevations, sections, details, and attachments to other work for guide rails.

- C. Samples: For each exposed product and for each color and texture specified, manufacturer's standard in size.
- D. Qualification Data: For qualified Installer.

### 1.5 QUALITY ASSURANCE

- Installer Qualifications: Manufacturer's authorized representative who is trained A. and approved for installation and maintenance of units required for this Project.
- Β. Certified Inspector Qualifications: Certified by the AAADM.
- С. Source Limitations: Obtain automatic door operators, including activation and safety devices, from single source from single manufacturer.
- Electrical Components, Devices, and Accessories: Listed and labeled as defined D. in NFPA 70, by a testing agency, and marked for intended location and application.
- E. Exit-Door Requirements: Comply with requirements of authorities having jurisdiction for doors with automatic door operators serving as a component of a required means of egress.

### 1.6 COORDINATION

- A. Templates: Obtain and distribute, to the parties involved, templates for doors, frames, operators, and other work specified to be factory prepared and reinforced for installing automatic door operators. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing automatic door operators to comply with indicated requirements.
- Electrical System Roughing-in: Coordinate layout and installation of automatic Β. door operators, including activation and safety devices, with connections to power supplies and to access-control system.

### 1.7 WARRANTEE

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of automatic door operators that fail in materials or workmanship within specified warranty period.
- Β. Failures include, but are not limited to, the following
  - Faulty or sporadic operation of automatic door operator, including 1. activation and safety devices.

- 2. Deterioration of metals, metal finishes, and other materials beyond normal weathering or use.
- C. Warranty Period: One (1) year from date of Substantial Completion

# 1.8 <u>MAINTENANCE SERVICE</u>

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of automatic door operator Installer. Include quarterly planned and preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

# PART 2 - PRODUCTS

# 2.1 <u>MANUFACTURERS</u>

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Series 6000 Norton, an ASSA ABLOY Group company or an approved comparable product by one of the following:
  - 1. Besam Automated Entrance Systems, Inc.; an ASSA ABLOY Group company.
  - 2. DORMA Architectural Hardware.
  - 3. DORMA Automatics.
  - 4. Horton Automatics; a division of Overhead Door Corporation.
  - 5. KM Systems, Inc.
  - 6. LCN Closers; an Ingersoll-Rand company.
  - 7. Nabco Entrances, Inc.
  - 8. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
  - 9. Stanley Access Technologies; Division of The Stanley Works

# 2.2 <u>MATERIALS</u>

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated, complying with standards indicated below:
  - 1. Sheet: ASTM B 209 (ASTM B 209M).
  - 2. Extrusions: ASTM B 221 (ASTM B 221M).
- B. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials

# 2.3 <u>AUTOMATIC DOOR OPERATORS, GENERAL</u>

A. General: Provide operators of size recommended by manufacturer for door size,

weight, and movement; for condition of exposure; for long-term, maintenancefree operation under normal traffic load for type of occupancy indicated; and complying with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation and safety devices.

- B. Electrohydraulic Operating System: Self-contained, low-pressure unit; with separate cylinders for power and checking, connections for power and activationand safety-device wiring, and manual operation including spring closing when power is off.
- C. Hinges: See Division 08 Section "Door Hardware" for type of hinge for each door that door operator shall accommodate.
- D. Cover for Surface-Mounted Operators: Fabricated from 0.125-inch thick extruded or formed aluminum; continuous over full width of door opening including door jambs; with enclosed end caps, provision for maintenance access, and fasteners concealed when door is in closed position.
- E. Brackets and Reinforcements: Manufacturer's standard, fabricated from aluminum with nonstaining, nonferrous shims for aligning system components.

# 2.4 LOW-ENERGY DOOR OPERATORS

- A. Model: Norton Series 6000 low energy automatic door operator (Basis of Design)
- B. Performance Requirements:
  - 1. Opening Force if Power Fails: Not more than 15 Ibf required to release latch if provided, not more than 30 Ibf required to manually set door in motion, and not more than 15 lbf required to fully open door.
  - 2. Entrapment-Prevention Force: Not more than 15 lbf required to prevent stopped door from closing or opening.
- C. Configuration: Operator to control single swinging doors as indicated on the drawings and specified below:
  - 1. Traffic Pattern: One way.
  - 2. Pairs of Doors: Independent operation
- D. Automatic Operator: Electro-hydraulic, non-handed operator, powered by 1/6 hp motor. Spring shall be adjustable to compensate for different manual push forces required on varying door widths.
- E. Door Operation:
  - 1. Opening Cycle: The adjustable speed operator hydraulically powers the drive shaft which maintains constant engagement throughout the opening cycle. Operator shall allow manual door operation with operational forces of 15 lbf maximum to fully open the door applied at 1" from the latch edge

of the door.

- 2. Hold Open: The operator shall stop and hold the door open at the selected door opening angle for an adjustable period of time.
- 3. Closing Cycle: Closing shall be provided by means of spring
- 4. Hydraulic Bypass: Operator to include standard hydraulic bypass (relief valve) which automatically prevents motor overload if the door is restricted during the opening cycle.
- F. Stack Pressure Compensation: Operator is designed to counteract most wind and/or interior stack pressures without an additional power assist mechanism.
- G. Electronic Controls: Solid state integrated circuit controls the operation and switching of the swing power operator. The electronic control provides low voltage power supply for all means of actuation. The controls include time delay (5 to 30 seconds) for normal cycle.
- H. Operator Interface:
  - 1. Safety Sensor Integration for overhead presence safety device and door mounted reactivation safety sensors.

# 2.5 ACTIVATION AND SAFETY DEVICES

- A. General: Provide activation and safety devices in accordance with BHMA standards, for condition of exposure and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated. Coordinate activation and safety devices with door operation and door operator mechanisms.
- B. Presence Sensors: Self-contained, active-infrared scanner units; adjustable to provide detection field sizes and functions required by BHMA A156.10. Sensors shall remain active at all times.
- C. Push-Plate Switch: Momentary-contact door control switch with flat push-plate actuator with contrasting-colored, engraved message.
- D. Interior Configuration: Square push plate with 4-by-4-inch junction box.
- E. Mounting: Recess mounted in wall where indicated on the drawings.
- F. Exterior Configuration: Square push plate with 4-by-4-inch junction box in stainless steel bollard. Recess mounted in wall where indicated on the drawings.
- G. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

## 2.6 <u>FABRICATION</u>

- A. Factory fabricate automatic door operators to comply with indicated standards.
- B. Fabricate exterior components to drain water passing joints and condensation and moisture occurring or migrating within operator enclosure to the exterior.
- C. Form aluminum shapes before finishing.
- D. Use concealed fasteners to greatest extent possible. Where exposed fasteners are required, use countersunk Phillips flat-head machine screws, finished to match operator.
- E. Provide metal cladding, completely cladding visible surfaces before shipment to Project site. Fabricate cladding with concealed fasteners and connection devices, with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion, and with allowance for thermal expansion at exterior doors.

# 2.7 <u>ACCESSORIES</u>

- A. Signage: As required by cited BHMA standard for the type of operator.
- B. Application Process: Door manufacturer's standard process.
- C. Provide sign materials with instructions for field application when operators are installed.

# 2.8 <u>GENERAL FINISH REQUIREMENTS</u>

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

# 2.9 <u>ALUMINUM FINISHES</u>

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010mm or

thicker.

# PART 3 - EXECUTION

# 3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame preparation and reinforcements, and other conditions affecting performance of automatic door operators.
- B. Examine roughing-in for electrical systems to verify actual locations of power connections before automatic door operator installation.
- C. Examine roughing-in for compressed-air piping systems to verify actual locations of piping connections before automatic door operator installation.
- D. Verify that full-height finger guards are installed at each door with pivot hinges where door has a clearance at hinge side greater than 1/4 inch (6 mm) and less than 3/4 inch (19 mm) with door in any position.
- E. Proceed with installation only after unsatisfactory conditions have been corrected

# 3.2 INSTALLATION

- A. General: Install complete automatic door operators according to manufacturer's written instructions, including activation and safety devices, control wiring, and remote power units if any; connection to the building's power supply; and signage.
- B. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion.
- C. Install operators true in alignment with established lines and door geometry without warp or rack. Anchor securely in place.
- D. Power Door Operator Installation Standard: BHMA A156.10.
- E. Low-Energy Door Operator Installation Standard: BHMA A156.19.

# 3.3 FIELD QUALITY CONTROL

- A. Inspection: Construction Manager will engage a certified inspector to test and inspect automatic door operators and prepare test and inspection reports.
- B. Certified inspector shall test and inspect each automatic door operator to determine compliance of installed systems with applicable BHMA standards.

- C. Inspection Report: Certified inspector shall submit report in writing to Architect and Contractor within 24 hours after inspection.
- D. Work will be considered defective if it does not pass tests and inspections.

# 3.4 <u>ADJUSTING</u>

- A. Adjust automatic door operators to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.
- B. Adjust operators on exterior doors for weathertight closure.
- C. After completing installation of exposed, factory-finished automatic door operators, inspect exposed finishes on doors and operators. Repair damaged finish to match original finish.
- D. Readjust automatic door operators after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).
- E. Occupancy Adjustment: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions.

END OF SECTION 08 71 13

# SECTION 08 80 00 – GLASS AND GLAZING

## PART 1 - GENERAL

## 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

# 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing and installing glazing for the following products, including those specified in other Sections, where glazing requirements are specified by reference to this Section:
  - 1. Insulated and non-insulated tempered glazing within aluminum entrances and sidelights.
  - 2. Vision lites within wood and hollow metal doors and frames
  - 3. Glazing of hollow metal frames
  - 4. Mirrored wall surfaces over vanities within Locker Rooms (2) (Base Bid) and Physical Training B01 (Alternate No. 1)
  - 5. Impact resistant glazing within hollow metal frames within **Prisoner Processing 122**
- B. Related Sections: The following sections contain requirements that relate to this Section.
  - 1. Section 01 23 00 "Alternates" for work affecting this section.
  - 2. Section 08 11 13 "Standard Steel Doors and Frames" for glazed hollow metal doors and frames.
  - 3. Section 08 14 00 "Flush Wood Doors" for glazed wood doors.
  - 4. Section 08 41 13 "Aluminum Entrances", for glazed aluminum doors, side lights, transom lights, insulated metal panels, and storefront framing.
  - 5. Section 08 54 00 "Fiberglass Clad Wood Windows" for factory glazed exterior window units.
  - 6. Section 10 28 00 "Toilet Accessories", for factory glass mirrors in frames.
  - 7. Section 13070 "Bullet Resistant Protection" for factory glazed bullet resistant transaction windows and hinged bullet resistant window panels with glazing.
  - 8. Section 11 19 00 "Detention Equipment" for factory glazed detention swing doors.

## 1.3 SYSTEM PERFORMANCE REQUIREMENTS
#### CARVER POLICE CARVER, MA

- A. General: Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (where applicable), without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; and other defects in construction.
- B. Glass Design: Glass thickness indicated on Drawings are for detailing only. Confirm glass thickness by analyzing Project loads and in-service conditions. Provide glass lites for the various size openings in the thickness and strengths (annealed or heat-treated) to meet or exceed the following criteria:
  - 1. Minimum glass thickness of lites, whether composed of annealed or heattreated glass, are selected so the worst-case probability of failure does not exceed the following:
    - 8 lites per 1000 for lites set vertically or not over 15 degrees off vertical and under wind action. Determine minimum thickness of monolithic annealed glass according to ASTM E 1300. For other than monolithic annealed glass, determine thickness per glass manufacturer's standard method of analysis including applying adjustment factors to ASTM E 1300 based on type of glass.
- C. Normal thermal movement results from the following maximum change (range) in ambient and surface temperatures acting on glass-framing members and glazing components. Base engineering calculation on materials, actual surface temperatures due to both solar heat gain and nighttime sky heat loss.
  - 1. Temperature Change (Range): 120 deg F (67 deg C) ambient; 180 deg F (100 deg C), material surfaces.

#### 1.5 <u>SUBMITTALS</u>

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each glass product and glazing material

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

## 1.7 <u>WARRANTY</u>

A. General: Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and

will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

- B. Manufacturer's Warranty on Insulating Glass: Submit written warranty signed by manufacturer of insulating glass agreeing to furnish replacements for insulating glass units that deteriorate, f.o.b. point of manufacture, freight allowed Project site, within specified warranty period indicated below. Warranty covers only deterioration due to normal conditions of use and not to handling, installing, protecting, and maintaining practices contrary to glass manufacturer's published instructions.
  - 1. Warranty Period: Manufacturer's standard but not less than 10 years after date of Substantial Completion.

#### PART 2 - PRODUCTS

#### 2.1 <u>MANUFACTURERS</u>

A. Products: Subject to compliance with requirements, provide one of the products specified.

#### 2.2 INSULATED GLASS UNITS

- A. Sealed Insulating Glass Units: Pre-assembled units consisting of organically sealed lites of glass separated by dehydrated air spaces complying with ASTM E 774 and with other requirements indicated.
  - 1. Products: Subject to compliance with requirements, provide pre-assembled insulated glass units by the following:
    - a. PPG Industries, Inc., or approved equal
- B. Configuration: Provide pre-assembled insulated glass units in the following configurations:
  - 1. Glass to be 1 inch overall insulating units, designated **Type IT**, consisting of the following:
    - a. Indoor Lite: Clear "transparent" float glass, tempered
    - b. Outdoor Lite: Clear "transparent" float glass, tempered, sputter coated
    - c. Coating: "Solarban" 60 Solar control Low-E (sputtered) as manufactured by PPG Industries, Inc.
    - d. Location: Second surface (2)
  - 2. Air spacers are to be continuous, one piece, tin plated steel.
  - 3. All units shall carry a ten (10) year warranty against seal failure.
- C. Performance Criteria:
  - 1. Glass to be PPG Industries, Inc. Solarban 60 Solar Control Low-E Glass, or equal.
    - a. Shading Coefficient: 0.44

- b. Solar Heat Gain Coefficient: 0.37
- c. Visible Light Transmission: 69%d. U-Value: 0.29
- e. Outdoor Visible Light Reflectance: 12%
- D. Aluminum entrance systems indicated for <u>interior installations</u> to be glazed with **Type T**, 1/4 inch tempered glazing, clear.

#### 2.3 <u>TEMPERED FLOAT GLASS</u>

- A. Uncoated, Clear, Heat-Treated Float Glass: ASTM C 1048, Condition A (uncoated surfaces), Type I (transparent glass, flat), Class 1 (clear), quality q3 (glazing select), kind as indicated below.
  - 1. Kind FT (fully tempered), <sup>1</sup>/<sub>4</sub> inch thickness, designated as **Type T**.
  - 2. Products: Subject to compliance with requirements, provide heat treated glass units by the following:
    - a. Viracon, Inc.
    - b. Guardian.

#### 2.4 IMPACT RESISTANT GLAZING

- A. Impact resistant, containment glazing, polycarbonate sheet as indicated below.
  - 1. Makrolon CG750 polycarbonate sheet, 0.750 inch thickness, designated as **Type D**. Provide hard-coat on both sides of glazing.
  - 2. Color: Clear (A00)
  - 3. Warranty: Seven (7) year limited warranty against breakage, yellowing, and hazing.
  - 4. Meets ASTM F 1233 Class III, Level A ballistics
  - 5. Products: Subject to compliance with requirements, provide impact resistant polycarbonate sheet by the following:
    - a. Makrolon CG750 sheet, Bayer Material Science
    - b. equal product meeting performance characteristics, impact resistance, and mar resistance.

#### 2.5 <u>MIRRORS</u>

- A. Mirror: provide <sup>1</sup>/<sub>4</sub> inch thick tempered mirrored float glass, meeting ASTM 1036-85, with stainless steel edge molding, designated as **Type M.** 
  - Mirrors to be installed at full width vanities within Male and Female Locker Rooms (Base Bid) and wall surface within Physical Training B01 (Alternate No. 1) as indicated on Contract Documents.
  - 2. Products: Subject to compliance with requirements, provide mirrored glass units by the following:
    - a. LOF
    - b. Guardian
    - c. PPG

#### 2.6 ELASTOMERIC GLAZING SEALANTS

A. General: Provide products of type indicated, complying with the following requirements:

- 1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
- 2. Suitability: Comply with sealant and glass manufacturer's recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.
- B. Elastomeric Glazing Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with ASTM C 920 requirements.
  - 1. Exterior Glazing Sealant G.E. Silpruf.
  - 2. Interior Glazing Sealant Pecora M242.

#### 2.7 <u>GLAZING TAPES</u>

- A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent, nonstaining and nonmigrating in contact with nonporous surfaces, with or without spacer rod as recommended by tape and glass manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with AAMA 800 for products indicated below:
  - 1. AAMA 804.1.
  - 2. AAMA 806.1.
  - 3. AAMA 807.1.
- B. Expanded Cellular Glazing Tape: Closed-cell, polyvinyl chloride foam tape, factory coated with adhesive on both surfaces, packaged on rolls with release liner protecting adhesive, and complying with AAMA 800 for product 810.5.

#### 2.8 <u>MISCELLANEOUS GLAZING MATERIALS</u>

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

- C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85 plus or minus 5.
- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side-walking).
- F. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonextruding, nonoutgassing, strips of closed-cell plastic foam of density, size, and shape to control sealant depth and otherwise contribute to produce optimum sealant performance.

#### 2.9 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.

#### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine glass framing, with glazier present, for compliance with the following:
  - 1. Manufacturing and installation tolerances, including those for size, squareness, offsets at corners.
  - 2. Presence and functioning of weep system.
  - 3. Minimum required face or edge clearances.
  - 4. Effective sealing between joints of glass-framing members.
- B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

#### 3.2 <u>PREPARATION</u>

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

#### 3.3 <u>GLAZING, GENERAL</u>

A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.

- B. Protect glass from edge damage during handling and installation as follows:
  - 1. Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer's label.
  - 2. Remove damaged glass from Project site and legally dispose of off site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by pre-construction sealant-substrate testing.
- D. Install elastomeric setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass sizes larger than 50 united inches (length plus height) as follows:
  - 1. Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets and glazing tapes are used that have demonstrated .ability to maintain required face clearances and comply with system performance requirements.
  - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- G. Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

## 3.4 <u>TAPE GLAZING</u>

- A. Position tapes on fixed stops so that when compressed by glass their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously but not in one continuous length. Do not stretch tapes to make them fit opening.

- C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each lite is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

#### 3.5 PROTECTION AND CLEANING

- A. Protect exterior glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.
- E. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

END OF SECTION 08 80 00

#### SECTION 08 91 19 - LOUVERS AND VENTS

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. Furnish and install drainable, fixed extruded louvers, bird screens and attachment brackets as shown on the drawings, as specified, and as needed for a complete and proper installation.
  - 1. 7" thick, aluminum storm resistant louvers in exterior wall construction as indicated on the drawings.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 01 23 00 "Alternates" for work affection this section.
  - 2. Section 07 92 00 "Joint Sealants" for sealants installed in perimeter joints between louver frames and adjoining construction.
  - 3. Division 23 Section for ductwork connected to metal wall louvers.

#### 1.3 <u>DEFINITIONS</u>

 A. Louver Terminology: Refer to Air Movement and Control Association (AMCA) 501 for definitions of terms for metal louvers not otherwise defined in this Section or in referenced standards.

#### 1.4 <u>SUBMITTALS</u>

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified.
- C. Shop drawings of louver units and accessories. Include plans, elevations, sections, and details showing profiles, angles, and spacing of louver blades; unit dimensions related to wall openings and construction; free areas for each size indicated; profiles of frames at jambs, heads, and sills; and anchorage details and locations.

- D. Samples for initial selection in the form of manufacturer's color charts showing the full range of colors available for units with factory-applied color finishes.
- E. Product test reports evidencing compliance of units with performance requirements indicated.
- F. Product certificates signed by louver manufacturers certifying that their products comply with the specified requirements and are licensed to bear the AMCA seal based on tests made according to AMCA 500 and complying with the AMCA Certified Ratings Program.
- G. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience.

#### 1.5 QUALITY ASSURANCE

- A. Single-Source Responsibility: Obtain louvers and vents from one source and by a single manufacturer where alike in one or more respects regarding type, design, and factory-applied color finish.
- B. Performance Requirements: Provide AMCA and BSRIA test data as required to confirm that the louvers have the specified air and water performance characteristics.
- C. SMACNA Standard: Comply with SMACNA "Architectural Sheet Metal Manual" recommendations for fabrication, construction details, and installation procedures.
- D. Structural Requirements: Design all materials to withstand wind and snow loads as required by the applicable building code. Maximum allowable deflection for the louver structural members to be l/180 or 0.75 inch, whichever is less. Maximum allowable deflection for the louver blades to be l/120 or 0.50 inch across the weak axis, whichever is less.

#### 1.6 PROJECT CONDITIONS

- A. Field Measurements: Check actual louver openings by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
  - 1. Where field measurements cannot be made without delaying the Work, guarantee opening dimensions and proceed with fabricating louvers without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to guaranteed dimensions.

#### PART 2 - PRODUCTS

#### 2.1 <u>MANUFACTURERS</u>

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Louvers:
    - a. Arrow United Industries
    - b. Construction Specialties, Inc.
    - c. Ruskin Mfg., Tomkins Industries, Inc.
  - B. For the purpose of establishing performance criteria the Contract Drawings and specifications have been based on Construction Specialties, Inc., Cranford, NJ

#### 2.2 <u>MATERIALS</u>

- A. Aluminum Extrusions: ASTM B 211, Alloy 6063-T5 or T-52.
- B. Fasteners: Of same basic metal and alloy as fastened metal or 300 series stainless steel, unless otherwise indicated. Do not use metals that are corrosive or incompatible with joined materials.
  - 1. Use types and sizes to suit unit installation conditions.
  - 2. Use Phillips flat-head screws for exposed fasteners, unless otherwise indicated.
- C. Anchors and Inserts: Of type, size, and material required for type of loading and installation indicated. Use nonferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or expansion bolt devices for drilled-in-place anchors.

#### 2.3 FABRICATION, GENERAL

- A. Provide C/S louver models, bird screens, structural supports and accessories as specified and/or shown on the drawings. Materials, sizes, depths, arrangements and material thickness to be as indicated or as required for optimal performance with respect to strength; durability; and uniform appearance.
- B. Louvers to be mechanically assembled using stainless steel or aluminum fasteners.
- C. Include supports, anchorage, and accessories required for complete assembly.

#### 2.4 EXTERIOR WALL LOUVERS

- A. 7" Deep Storm Resistant Fixed Horizontal Louver Model RS-7315
  - Material: Heads, sills, jambs and mullions to be one-piece structural aluminum members with integral caulking slot and retaining beads. Architectural Line Drainable Sightproof Storm Resistant Fixed-Blade designed to collect and drain water to exterior at sill by means of multiple

gutters in blades and channels in jambs and mullions. Louvers to be supplied with 4" high by full depth sill flashings formed from minimum 0.050" thick aluminum. Sill flashings to have welded side panels. Louvers and sill flashings to be installed in accordance with the manufacturer's recommended procedures to ensure complete water integrity performance of the louver system. Material thickness to be as follows: Heads, sills, jambs and mullions: 0.081". Fixed blades: 0.063".

2. AMCA Performance: A 4' x 4' unit shall conform to the following:

Free Area	7.58 sq. ft.
Intake Pressure drop at 900 fpm free area velocity	0.257 in. H <sub>2</sub> O
Exhaust pressure drop at 900 fpm free area velocity	0.257 in. H <sub>2</sub> O

3. Wind Driven Rain Performance: AMCA certified and licensed to bear the AMCA seal. The louver test was based on a 39.370"(1.00m) x 39.370" (1.00 m) core area. Unit tested at a rainfall rate of 3.0 inches per hour (75 mm/hr) and with a wind directed to the face of the louver at a velocity 29.1-mph (13 m/s). The test data shall show the water penetration effectiveness rating at each corresponding ventilation rate.

Core Ventilation Rate	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	
(m/s):									
Core Ventilation Rate	0	98	196	294	392	491	588	685	
(ft/min):									
Free Area Ventilation	0	171	360	555	737	919	1086	1279	
Rate (ft/min):									
Rating effectiveness:	А	В	В	С	С	С	С	С	
Effectiveness Rating:	A =	A = 1 to $B =$		B = 0.989		C = 0.949		D = 0.80 to	
	0.99		to 0.95		to 0.80		0		

## 2.5 FINISHES FOR EXTERIOR WALL LOUVERS

- A. General: Comply with NAAMM "Metal Finishes Manual" for finish designations and application recommendations, except as otherwise indicated. Apply finishes in factory. Protect finishes on exposed surfaces prior to shipment. Remove scratches and blemishes from exposed surfaces that will be visible after completing finishing process. Provide color as indicated or, if not otherwise indicated, as selected by architect.
- B. Three Coat Fluorocarbon Coating: Louvers to be finished with a minimum 1.4 mil thick full strength 70% resin, 3 coat Fluoropolymer system.
- C. All aluminum shall be thoroughly cleaned, etched and given a chromated conversion pre-treatment before application of the Kynar/Hylar coating. The coating shall consist of a primer, a high metallic color coat and a clear PVF2

topcoat. It shall receive a bake cycle of 17 minutes at 4500F. All finishing procedures shall be one continuous operation in the plant of the manufacturer.

D. Manufacturer to furnish an extended 20 limited warranty for the Kynar/Hylar coating. This limited warranty shall begin on the date of material shipment.

#### 2.6 INSECT SCREENS

- A. All exterior wall louvers to be furnished with mill finish insect screens.
- B. Screens to be 18 x 16 aluminum mesh 0.011" diameter wire insect screens secured within 0.055" thick extruded aluminum frames. Frames to have mitered corners and corner locks.

#### PART 3 - EXECUTION

#### 3.1 <u>PREPARATION</u>

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages. Coordinate delivery of such items to Project site.

#### 3.2 INSTALLATION

- A. Comply with manufacturer's instructions and recommendations for installation of the work.
- B. Verify dimensions of supporting structure at the site by accurate field measurements so that the work will be accurately designed, fabricated and fitted to the structure.
- C. Anchor louvers to the building substructure as indicated on architectural drawings.
- D. Erection Tolerances:
  - 1. Maximum variation from plane or location shown on the approved shop drawings: 1/8" per 12 feet of length, but not exceeding 1/2" in any total building length or portion thereof (non-cumulative).
  - 2. Maximum offset from true alignment between two members abutting end to end, edge-to-edge in line or separated by less than 3": 1/16" (shop or field joints). This limiting condition shall prevail under both load and no load conditions.
- E. Cut and trim component parts during erection only with the approval of the manufacturer or fabricator, and in accordance with his recommendations. Restore finish completely. Remove and replace members where cutting and trimming has impaired the strength or appearance of the assembly.

- F. Do not erect warped, bowed, deformed or otherwise damaged or defaced members. Remove and replace any members damaged in the erection process as directed.
- G. Set units level, plumb and true to line, with uniform joints.

#### 3.3 ADJUSTING AND PROTECTION

- A. Protect louvers and vents from damage of any kind during construction period including use of temporary protective coverings where needed and approved by louver manufacturer. Remove protective covering at time of Substantial Completion.
- B. Restore louvers and vents damaged during installation and construction period, so that no evidence remains of correction work. If results of restoration are unsuccessful, as judged by Architect, remove damaged units and replace with new units.
  - 1. Clean and touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

#### 3.4 <u>CLEANING</u>

- A. Immediately clean exposed surfaces of louvers and vents that are not protected by temporary covering to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Rinse surfaces thoroughly and dry.

END OF SECTION 08 91 19

#### SECTION 09 21 00 - GYPSUM BOARD ASSEMBLIES

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

 A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes the following:
  - 1. Non-load-bearing interior and exterior steel framing members for gypsum board and sheathing board assemblies.
  - 2. Gypsum board assemblies attached to steel framing.
  - 3. Moisture, Mold, and Mildew-resistant gypsum backing board installed with gypsum board assemblies.
  - 4. Cementitious fiber-mat reinforced sheathing located at all tiled wall areas.
  - 5. Shaft wall sheathing at fire rated conditions as indicated.
  - 6. Sound attenuation blankets in interior partitions as indicated.
  - 7. Engineered design drawings for the exterior metal stud wall framing.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 01 23 00 "Alternates" for work affection this section.
  - 2. Section 06 10 00 "Rough Carpentry" for the following:
    - a. Wood blocking and furring.
    - b. Installation of nail base panel with plywood and plywood products for exterior siding.
  - 3. Section 07 84 00 "Firestopping" for firestopping systems and fire-resistive rated joint sealants.
  - 4. Section 09 30 00 "Tile" for locations receiving ceramic tile.

#### 1.3 <u>DEFINITIONS</u>

A. Gypsum Board Construction Terminology: Refer to ASTM C I 1 and GA-505 for definitions of terms related to gypsum board assemblies not defined in this Section or in other referenced standards.

#### 1.4 <u>ASSEMBLY PERFORMANCE REQUIREMENTS</u>

A. Sound Transmission Characteristics: For gypsum board assemblies indicated to have STC ratings, provide materials and construction identical to those of assemblies whose STC ratings were determined per ASTM E 90 and classified per ASTM E 413 by a qualified independent testing agency.

#### 1.5 <u>SUBMITTALS</u>

- A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
- B. Submit design drawings for the exterior metal stud backup wall framing bearing the seal of a Professional Structural Engineer licensed in the State of Massachusetts.
- C. Product data for each type of product specified.
- D. Product certificates signed by manufacturers of gypsum board assembly components certifying that their products comply with specified requirements.

#### 1.6 **QUALITY ASSURANCE**

- A. Fire-Test-Response Characteristics: Where fire-rated gypsum board assemblies are indicated, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 1 19 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
  - 1. Fire Resistance Ratings: As indicated by reference to GA File Numbers in GA-600 "Fire Resistance Design Manual" or to design designations in UL "Fire Resistance Directory".
- B. Single-Source Responsibility for Steel Framing: obtain steel framing members for gypsum board assemblies from a single manufacturer.
- C. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.
- D. Single-Source Responsibility for Finishing Materials: obtain finishing materials from either the same manufacturer that supplies gypsum board and other panel products or from a manufacturer acceptable to gypsum board manufacturer.
- E. Testing: Materials and construction are subject to testing and inspection by the Owner's agent. Work or materials failing to meet the requirements of the Contract Documents and submitted design drawings will be subject to removal and replacement at no expense to the Owner.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.
- B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion,

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construction traffic, and other causes. Neatly stack gypsum panels flat to prevent sagging.

C. Handle gypsum board to prevent damage to edges, ends, and surfaces. Do not bend or otherwise damage metal corner beads and trim.

#### 1.8 **PROJECT CONDITIONS**

- A. Environmental Conditions, General: Establish and maintain environmental conditions for applying and finishing gypsum board to comply with ASTM C 840 and with gypsum board manufacturer's recommendations.
- B. Room Temperatures: For non-adhesive attachment of gypsum board to framing, maintain not less than 40 deg F (4 deg C). For adhesive attachment and finishing of gypsum board, maintain not less than 50 deg F (10 deg C) for 48 hours prior to application and continuously after until dry. Do not exceed 95 deg F (35 deg C) when using temporary heat sources.
- C. Ventilation: Ventilate building spaces, as required, for drying joint treatment materials. Avoid drafts during hot dry weather to prevent finishing materials from drying too rapidly.

#### PART2 - PRODUCTS

## 2.1 <u>MANUFACTURERS</u>

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Steel Framing and Furring:
    - a. Marino Industries Corp.
    - b. Unimast Inc.
    - c. or equal
  - 2. Grid Suspension Assemblies:
    - a. Chicago metallic Corp.
    - b. National Rolling Mills Co.
    - c. USG Interiors, Inc.
  - 3. Gypsum Board and Related Products:
    - a. Georgia-Pacific Corp.
    - b. Gold Bond Building Products Div., National Gypsum Co.
    - c. United States Gypsum Co.
  - 4. Shaft wall assemblies:
    - a. G-P Gypsum Corp.
    - b. National Gypsum

#### 2.2 STEEL FRAMING COMPONENTS FOR SUSPENDED AND FURRED CEILINGS

- A. General: Provide components of sizes indicated but not less than that required to comply with ASTM C 754 for conditions indicated.
- B. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E II 90 conducted by a qualified testing agency.
- C. Wire for Hangers and Ties: ASTM A 641, Class I zinc coating, soft temper.
- D. Hanger Rods: Mild steel and zinc-coated or protected with rust-inhibitive paint.
- E. Angle-Type Hangers: Angles with legs not less than 7/8 inch wide, formed from 0.0635-inch-thick galvanized steel sheet complying with ASTM A 446 Coating Designation G90, with bolted connections and 5/16-inch-diameter bolts.
- F. Channels: Cold-rolled steel, 0.05980-inch-minimum thickness of base (uncoated) metal and 7/16-inch-wide flanges, and as follows:
  - 1. Carrying Channels: 2 inches deep, 590 lb per I 000 feet, unless otherwise indicated.
  - 2. Carrying Channels: 1-1/2 inch deep, 475 lb per 1000 feet, unless otherwise indicated.
  - 3. Furring Channels: 3/4 inch deep, 300 lb per 1000 feet, unless otherwise indicated.
  - 4. Finish: Rust-inhibitive paint, unless otherwise indicated.
  - 5. Finish: G-60 hot-dip galvanized coating per ASTM A 525 for framing for exterior soffits and where indicated.
- G. Steel Studs for Furring Channels: ASTM C 645, with flange edges bent back 90 deg and doubled over to form 3/16-inch minimum lip (return), minimum thickness of base (uncoated) metal and minimum depth as follows:
  - 1. Thickness: 0.0329 inch, unless otherwise indicated.
  - 2. Protective Coating: Manufacturer's standard corrosion-resistant coating.
  - 3. Protective Coating: G40 hot-dip galvanized coating per ASTM A 525 for framing for exterior soffits and ceiling suspension members in areas within 10 feet of exterior walls.
- H. Steel Resilient Furring Channels: Manufacturer's standard product designed to reduce sound transmission, fabricated from steel sheet complying with ASTM A 525 or ASTM A 568 to form 7/8-inch-deep channel of the following configuration:
- I. Double-Leg Configuration: Hat-shaped channel, with 1-1/2-inch-wide face connected to flanges by double slotted or expanded metal legs (webs).

1. Grid Suspension System for Interior Ceilings: ASTM C 645, manufacturer's standard direct-hung grid suspension system composed of main beams and cross furring members that interlock to form a modular supporting network.

#### 2.3 STEEL FRAMING FOR INTERIOR WALLS AND PARTITIONS

- A. General: Provide steel framing members complying with the following requirements:
  - 1. Component Sizes and Spacings: As indicated but not less than that required to comply with ASTM C 754 under the following maximum deflection and lateral loading conditions:
    - a. Maximum Deflection: L/240 at 5 lbf per sq. ft.
    - b. Protective Coating: Manufacturers standard corrosion-resistant coating.
    - c. Protective Coating: G40 hot-dip galvanized coating per ASTM A 525 for framing members attached to and within 10 feet of exterior walls.
  - B. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 deg and doubled over to form 3/16-inch-wide minimum lip (return) and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
    - 1. Thickness: 0.0179 inch, for less than 6 inch depth unless otherwise indicated.
    - 2. Thickness: 0.0329 inch for 6 inch and greater depth.
    - 3. Depth: As indicated.
- C. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.

#### 2.4 STEEL FRAMING FOR EXTERIOR WALLS

- A. Exterior Framing Screws: # 12, hex-washer head, Teks/5, zinc coated.
- B. System Components: Manufacturers, standard non-load-bearing steel studs, 6" & 8", deep of type and shape as indicated. With each type of metal framing required, provide manufacturer's standard, steel runners (tracks), blocking, lintels, clip angles, shoes, reinforcements, fasteners, and accessories for applications indicated, as needed to provide a complete metal framing system.
  - 1. Design Criteria:
    - a. Stud selection is dependent upon the unbraced height of stud, measured from bottom track to top of top track. Maximum allowable height for each type and gauge of stud is based upon maximum deflection of L/600, or 3/8", whichever is less, with

only bare stud acting to resist, and the studs spaced at sixteen (16) inch (maximum) centers. Furnish multiple studs at the jambs of openings to maintain the same criteria. Stud wall opening headers are required to carry weight of stud wall above as well as horizontal wind load.

#### b. Design Criteria:

- a. Basic wind speed (V\_ult) = 147mph
- b. Nominal wind speed (V\_asd) = 114mph
- c. Risk Categoy: IV
- d. Wind Exposure Category: B
- e. Internal Pressure Coefficient (GC\_pi) = +/-0.18
- f. Design wind pressure (walls) = 42.1psf
- c. Reduction of wind design loads for deflection calculation is not permitted.
- d. Overhead door jamb framing to be included in the design criteria for exterior walls. Overhead door jamb framing to be designed for the <u>full door area wind load</u>.
- C. Materials and Finishes:
  - 1. For 16-gage and heavier units, fabricate metal framing components of structural quality steel sheet with a minimum yield point of 40,000 psi; ASTM A 446, A 570, or A 611.
  - 2. For 18-gage and lighter units, fabricate metal framing components of commercial quality steel sheet with a minimum yield point of 33,000 psi; ASTM A 446, A 570, or A 611.
  - 3. Provide galvanized finish to metal framing components complying with ASTM A 525 for minimum G 60 coating.
  - 4. Provide prime-coated finish with one coat of shop-applied red-oxide, zinc chromate, or other similar rust-inhibitive primer.
    - a. Finish of installation accessories to match that of main framing components, unless otherwise indicated.
  - 5. Fasteners: Provide nuts, bolts, washers, screws, and other fasteners with corrosion-resistant plated finish.
  - 6. Electrodes for Welding: Comply with AWS Code and as recommended by stud manufacturer.
  - 7. Galvanizing Repair: Where galvanized surfaces are damaged, prepare surfaces and repair in accordance with procedures specified in ASTM A780.

## 2.5 <u>GYPSUM BOARD PRODUCTS</u>

- A. General: Provide gypsum board of types indicated in maximum lengths available to minimize end-to-end butt joints.
  - 1. Thickness: Provide gypsum board in thickness indicated or, if not otherwise indicated, in 5/8 inch thickness to comply with ASTM C 840 for application system and support spacing indicated.

- B. Moisture, Mold, and Mildew Resistant Gypsum Board: ASTM C 1396 or ASTM C 630, manufactured with additives to enhance the water resistance and fire resistance of the core; surfaced with moisture/mold/mildew resistant paper on front, back and long tapered edges, and Type X 5/8" minimum thickness:
  - 1. Minimum Performance Properties
    - a. Mold and Mildew Resistance: (ASTM D 3273) Minimum panel score of 10 or greater.
    - b. Moisture Resistance: (ASTM C 473) shall not have surface absorption of not more than 5% of weight.
    - c. Surface Burning Characteristics: (ASTM E 84) Flame spread of 15 and smoke development of 0.
  - 2. Approved Products:
    - a. XP Wallboard, National Gypsum Company
    - b. Mold Tough, United States Gypsum Co.
    - c. Dens Armor Plus, Georgia Pacific
  - 3. To be utilized at <u>all installations where ceramic tile **is not** indicated for <u>final wall finish</u>.</u>
- C. Cementitious Fiber-Mat Reinforced Sheathing: ASTM C 1325; ANSI A118.9; Cementitious backer and as follows:
  - 1. Thickness: 5/8 inch thick.
  - 2. Size: 48 by 96 inches.
  - 3. Products: Subject to compliance with requirements, provide one of the following products where proprietary gypsum wallboard is indicated:
    - a. DUROCK Brand Cement Board by United States Gypsum Company.
    - b. PermaBase® BRAND Cement Board, National Gypsum Company.
    - c. approved equal.
  - 4. To be utilized at <u>all installations where ceramic tile</u> is indicated for final <u>wall finish</u>.
- D. Mold and Moisture Resistant Gypsum Shaft Wall Panel:
  - 1. Core: Fire resistance rated, mold resistant gypsum core
  - 2. Surface Paper: 100% recycled content, moisture and mold resistant paper on front, back, and long edges
  - 3. Long Edges: Beveled
  - 4. Overall Thickness: 1 inch
  - 5. Panel complies with Type X requirements of ASTM C 1396 Standard Specification for Gypsum Board.
  - 6. Mold/Mildew Resistance: 10 when tested in accordance with ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
  - 7. Products: Subject to compliance with requirements, provide one of the following products where proprietary gypsum wallboard is indicated:
    - a. Gold Bond® BRAND 1" Fire-Shield® Shaftliner XP, or equal.

8. To be utilized at <u>all fire rated gypsum board construction indicated as shaft</u> <u>wall construction on the drawings</u>. Refer to wall types for other conditions requiring fire rated shaft wall installations.

#### 2.6 TRIM ACCESSORIES

- A. Accessories for Interior Installation: Corner beads, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:
  - 1. Material: Formed metal, with metal complying with the following requirement:
    - a. Sheet steel zinc-coated by hot-dip process.
  - 2. Shapes indicated below by reference to Fig. I designations in ASTM C1047:
    - a. Cornerbead on outside corners, unless otherwise indicated.
    - b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim unless otherwise indicated.
    - c. U-bead with face and back flanges; face flange formed to be left without application of joint compound. Use U-bead where indicated.
    - d. One-piece control joint formed with V-shaped slot, with removable strip covering slot opening.

#### 2.7 JOINT TREATMENT MATERIALS

- A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.
- B. Joint Tape for Gypsum Board: Paper reinforcing tape, unless otherwise indicated.
- C. Drying-Type Joint Compounds for Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.
  - 1. Ready-Mixed Formulation: Factory-mixed product.
  - 2. All-purpose compound formulated for both taping and topping compounds.

#### 2.8 <u>MISCELLANEOUS MATERIALS</u>

- A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.
- B. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot grouting hollow metal door frames.

- C. Fastening Adhesive for Metal: Special adhesive recommended for laminating gypsum panels to steel framing.
- D. Steel drill screws complying with ASTM C 1002 for the following applications:
  - 1. Fastening gypsum board to steel members less than 0.03 inch thick.
  - 2. Fastening gypsum board to gypsum board.
- E. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0. 1 1/2 inch thick.
- F. Sound Attenuation Blankets: Unfaced mineral-fiber blanket insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing):
  - 1. Mineral-Fiber Type: Fibers manufactured from glass.
  - 2. Owens Corning, Sound Attenuation Batt Insulation, 3-1/2 inches thick, 16 inches wide, or equal.

## PART 3 - EXECUTION

#### 3.1 EXAMINATION

A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing with Installer present for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

#### 3.2 **PREPARATION**

A. Ceiling Anchorages: Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

#### 3.3 INSTALLING STEEL FRAMING, GENERAL

- A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking, and bracing at termination's in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with "Gypsum Construction Handbook" published by United States Gypsum Co.

- C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement. Comply with details shown on Drawings.
  - 1. Where building structure abuts ceiling perimeter or penetrates ceiling.
  - 2. Where partition framing and wall furring abut structure except at floor.
    - a. Provide slip- or cushioned-type joints as detailed to attain lateral support and avoid axial loading.
- D. Do not bridge building expansion and control joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.
- E. All steel frame wall assemblies including gypsum board and sound attenuation blankets, are to extent to underside of structure above. All voids at mechanical, electrical, fire protection, or plumbing to be filled solid.

#### 3.4 INSTALLING STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS

- A. Suspend ceiling hangers from building structural members and as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacing that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
  - 3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  - 4. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eyescrews, or other devices and fasteners that are secure and appropriate for structure as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or fail due to -age, corrosion, or elevated temperatures.
  - 5. Do not support ceilings directly from permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
  - 6. Do not attach hangers to steel deck tabs.
  - 7. Do not attach hangers to steel roof deck. Attach hangers to structural members.

- 8. Do not connect or suspend steel framing from ducts, pipes or conduit.
- B. Sway-brace suspended steel framing with hangers used for support.
- C. Install suspended steel framing components in sizes and at spacing indicated but not less than that required by the referenced steel framing installation standard.
  - 1. Wire Hangers: 0.1620-inch (8-gage) diameter, 4 feet O.C.
  - 2. Carrying Channels (Main Runners): 1-1/2 inch, 4 feet O.C.
  - 3 Rigid Furring Channels (Furring Members): 16 inches O.C.
- D. Installation Tolerances: Install steel framing components for suspended ceilings so that cross-furring members or grid suspension members are level to within 1/8 inch in 12 feet as measured both lengthwise on each member and transversely between parallel members.
- E. Wire-tie or clip furring members to main runners and to other structural supports as indicated.
- F. Grid Suspension System: Attach perimeter wall track or angle where grid suspension system meets vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

#### 3.5 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

- A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.
- B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch from the plane formed by the faces of adjacent framing.
- C. Extend partition framing full height to structural supports or substrates above suspended ceilings. Cut studs 1/2 inch short of full height. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
  - 1. For STC-rated and fire-resistive-rated partitions requiring partitions to extend to the underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.
- D. Install steel studs and furring in sizes and at spacing indicated but not less than that required by the referenced steel framing installation standard to comply with maximum deflection and minimum loading requirements specified:
  - 1. Single Layer Construction: Space studs at 16 inches o.c., or as indicated on drawings.

- E. Install steel studs so that flanges point in the same direction and so that leading edges or ends of each gypsum board can be attached to open (unsupported) edges of stud flanges first.
- F. Frame door openings to comply with details indicated, with GA-219, and with applicable published recommendations of gypsum board manufacturer. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
- G. Extend vertical jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
- H. Frame openings other than door openings to comply with details indicated or, if none indicated, in same manner as required for door openings. Install framing below sills of openings to match framing required above door heads.

## 3.6 INSTALLATION OF STEEL FRAMING FOR EXTERIOR WALLS

- A. General: Install metal framing systems in accordance with manufacturers printed or written instructions and recommendations.
- B. Runner Tracks: Install continuous tracks sized to match studs. Align tracks accurately to layout at base and tops of studs. Secure tracks as recommended by stud manufacturer for type of construction involved, except do not exceed 24 inches o.c. spacing for nail or power-driven fasteners or 16 inches o.c., for other types of attachment. Provide fasteners at corners and ends of tracks.
- C. Installation of Wall Studs: Secure studs to top and bottom runner tracks by either welding or screw fastening at both inside and outside flanges.
  - 1. Space studs at 16" o.c., or as otherwise indicated on drawings.
- D. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
- E. Where stud system abuts structural columns or walls, including masonry walls, anchor ends of stiffeners to supporting structure.
- F. Install supplementary framing, blocking, and bracing in metal framing system wherever walls or partitions are indicated to support fixtures, equipment, services, casework, heavy trim and furnishings, and similar work requiring attachment to the wall or partition. Where type of supplementary support is not otherwise indicated, comply with stud manufacturer's recommendations and industry standards in each case, considering weight or loading resulting from item supported.

#### CARVER POLICE CARVER, MA

- G. Frame wall openings larger than 2 feet square with double stud at each jamb of frame except where more than two are either shown or indicated in manufacturer's instructions. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with stud shoes or by welding, and space jack studs same as full-height studs of wall. Secure stud system wall opening frame in manner indicated.
- H. Frame both sides of expansion and control joints with separate studs; do not bridge the joint with components of stud system.
- I. Erection Tolerances: Bolt or weld wall panels (at both horizontal and vertical junctures) to produce flush, even, true-to-line joints.
  - 1. Maximum variation in plane and true position between prefabricated assemblies should not exceed 1/16 inch.

#### 3.7 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

- A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.
- B. Install sound attenuation blankets in all required interior partitions prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
- C. Install ceiling board panels across framing to minimize the number of abutting end joints and avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install wall/partition board panels to minimize the number of abutting end joints or avoid them entirely. Stagger abutting end joints not less than one framing member in alternate courses of board. At high walls, install panels horizontally with end abutting joints over studs and staggered.
- E. Locate both edge or end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Position adjoining panels so that tapered edges abut tapered edges, and field-cut edges abut field-cut edges and ends. Do not place tapered edges against cut edges or ends. Stagger vertical joints over different studs on opposite sides of partitions. Avoid joints at corners of framed openings where possible.
- F. Attach gypsum panels to steel studs so that the leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- G. Attach gypsum panels to framing provided at openings and cutouts.

- H. Form control joints and expansion joints at locations indicated and as detailed, with space between edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.
- I. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chase walls that are braced internally.
  - 1. Except where concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
  - 2. Fit gypsum panels around ducts, pipes, and conduits.
- J. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors, as detailed. Provide 1/4-inch-to-1/2-inch-wide spaces at these locations and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- K. Seal construction at perimeters, behind control and expansion joints, openings, and penetrations with a continuous bead of acoustical sealant including a bead at both faces of the partitions. Comply with ASTM C 919 and manufacturer's recommendations for location of edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings.
- L. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.

#### 3.8 <u>GYPSUM BOARD APPLICATION METHODS</u>

- A. Single-Layer Application: Install gypsum wallboard panels as follows:
  - 1. On ceilings, apply gypsum panels prior to wall/partition board application to the greatest extent possible and at right angles to framing, unless otherwise indicated.
  - 2. On partitions/walls 10 feet or less in height, apply gypsum panels vertically (parallel to framing), unless otherwise indicated, and provide panel lengths that will minimize end joints.
  - 3. On partitions walls greater than 10 feet in height, apply gypsum panels horizontally (perpendicular to framing), unless parallel application is required for fire-resistive-rated assemblies. Use maximum-length panels to minimize end joints.
- B. Wall Tile Substrates: For substrates indicated to receive thin-set ceramic tile and similar rigid applied wall finishes, comply with the following:
  - 1. Install water resistant gypsum board to comply with ANSI Al 08.1 1.
- C. Single-Layer Fastening Methods: Apply gypsum panels to supports as follows: 1. Fasten with screws.

- Levels of Gypsum Board Finish: Provide the following levels of gypsum board D. finish per GA-214.
  - Level 1 for ceiling plenum areas, concealed areas, and where indicated, 1. unless a higher level of finish is required for fire-resistive-rated assemblies and sound-rated assemblies.
  - Level 4 for gypsum board surfaces unless otherwise indicated. 2.
  - 3. Level 5 for gypsum board surfaces at all ceilings and false work.
- E. For level 4 gypsum board finish, embed tape in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to

**INSTALLING TRIM ACCESSORIES** 

A. General: For trim accessories with back flanges, fasten to framing with the same fasteners used to fasten gypsum board. otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.

GYPSUM BOARD ASSEMBLIES

- B. Install corner beads at external corners.
- C. Install edge trim where edge of gypsum panels would otherwise be exposed or semi-exposed. Provide edge trim type with face flange formed to receive joint compound except where other types are indicated.
  - Install LC-bead where gypsum panels are tightly abutted to other 1. construction and back flange can be attached to framing or supporting substrate.
  - 2. Install U-bead where indicated.
- D. Install control joints and reveal joints at locations indicated, and where not indicated according to ASTM C 840, and in locations approved by Architect for visual effect.

#### 3.10FINISHING GYPSUM BOARD ASSEMBLIES

- General: Apply joint treatment at gypsum board joints (both directions); flanges A. of corner bead, edge trim, and control joints; penetrations; fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration and levels of gypsum board finish indicated.
- B. Prefill open joints, rounded or beveled edges, and damaged areas using settingtype joint compound.
- C. Apply joint tape over gypsum board joints except those with trim accessories having concealed face flanges not requiring taping to prevent cracks from developing in joint treatment at flange edges.

3.9

produce a surf ace free of visual defects and ready for decoration. Use the following joint compound combination:

- 1. Embedding and First Coat: Ready-mixed, drying-type, all-purpose or taping compound.
- 2. Fill (Second) Coat: Ready-mixed, drying-type, all-purpose or topping compound.
- 3. Finish (Third) Coat: Ready-mixed, drying-type, all-purpose or topping compound.
- F. Where level 5 gypsum board finish is indicated, apply joint compound combination specified for level 4 plus a thin, uniform skim coat of joint compound over entire surface. Use joint compound specified for the finish (third coat) or a product specially formulated for this purpose and acceptable to gypsum board manufacturer. Produce surfaces free of tool marks and ridges ready for decoration of type indicated.
- G. Where level 1 gypsum board finish is indicated, apply joint compound specified for embedding coat.
- H. Finish water-resistant gypsum backing board forming base for ceramic tile to comply with ASTM C 840 and board manufacturer's directions for treatment of joints behind tile.

#### 3.11 CLEANING AND PROTECTION

- A. Promptly remove any residual joint compound from adjacent surfaces.
- B. Provide final protection and maintain conditions, in a manner suitable to Installer that ensures gypsum board assemblies remain without damage or deterioration at time of Substantial Completion.
- C. Protect gypsum sheathing that will be left exposed to weather for more than one month as follows:
  - 1. Protect cutouts, corners, and joints in the sheathing by filling with a flexible sealant or by applying sheathing tape recommended by sheathing manufacturer at the time sheathing is applied.

END OF SECTION 09 21 00

#### **CERAMIC TILE**

#### SECTION 09 30 00 - CERAMIC TILE

#### (FILED SUB BID REQUIRED)

#### PART 1 - GENERAL

#### 1.1 TIME, MANNER AND REQUIREMENTS FOR FILING SUB-BIDS

- A. Sub-Bids shall be submitted in accordance with the provisions of General Laws, Chapter 149, Section 44A, inclusive, as amended.
- B. Sub-Bids for work under this Section shall be received electronically, until 2:00
   p.m. on Tuesday, October 29, 2019, at which time and place all Trade Contractor Bids shall be duly recorded.
- C. This project is being Electronically Bid (E-Bid). All bids shall be submitted online at <u>www.Projectdog.com</u>. Hard copy bids will not be accepted by the Awarding Authority. E-Bid tutorials and instructions are available within the specifications and online at <u>www.Projectdog.com</u>. For assistance, call Projectdog, Inc at (978)499-9014, M-F 8:30AM-5PM.
  - a. All required bid forms must be submitted in **PDF** format only. The bidder must complete all required signatures either digitally (using Adobe Acrobat) or manually (print, sign and scan as a PDF file).
  - b. Bid Bonds issued by a surety company shall be submitted on the E-Bid page. Bid bonds in the form of cash or check shall be completed and delivered as outlined on the Bid Bond Affidavit form.
  - c. The bidder must enter bid price on the E-Bid form as a whole dollar value only with no punctuation. Sums shall be expressed in both words and figures on the bid form. Note: The E-Bid form will automatically match the word value to the numeric figure entered by the bidder.
  - d. Bidders may save, submit or modify an E-Bid at any time prior to bid close. Once submitted, a bid cannot be edited. To modify a bid the bidder must retract the bid, make any necessary changes, and then submit the bid again. Upon submitting or retracting the bidder will receive a convenience email for informational purposes only. Bidders are encouraged to contact Projectdog, Inc at (978) 499-9014, M-F 8:30AM-5PM, if an email is not received.
  - e. If a bid is submitted prior to an Addendum being issued, the bidder will receive an automated email for informational purposes only. The bidder must review the addendum, retract the bid, acknowledge all addenda, and submit the bid again. If a bidder fails to acknowledge addenda their bid may be rejected by the Awarding Authority.

# CARVER POLICE CERAMIC TILE 09 30 00-2

- f. Timely submission of an E-Bid shall be the full responsibility of the Bidder. The server clock is the time of record. It is the bidder's responsibility to review and confirm online that a bid has been submitted and/or retracted and that the bid is 100% true, complete and accurate. All bidders are required to review their submitted E-Bid via the "View My Bid Package" link.
- D. Sub-Bids filed with the Awarding Authority shall be accompanied by a Bid Deposit in the form of a certified check or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to the "**Town of Carver**". A bid bond shall be:
  - 1. In a form satisfactory to the Awarding Authority.
  - 2. With a surety company qualified to do business in the Commonwealth and satisfactory to the Awarding Authority.
  - 3. Conditioned upon the faithful performance by the principal of the agreements contained in the Bid. The amount of such bid deposit shall be five percent (5%) of the value of the Bid.
- E. Sub-Bids for work under this Section shall be for the complete work required as specified and as shown on the drawings.
- F. Sub-Bidders are directed to the Instructions to Bidders, and to the requirements that all bidders visit the site to determine the scope of work required under this Section.
- G. Sub-Bidders must comply with all provisions of Division 1, General Requirements, in the same manner as the General Contractor.

## 1.2 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

## 1.3 <u>SUMMARY</u>

- A. This Section includes furnishing and installing the following at locations indicated on the drawings:
  - 1. Ceramic tile and all accessories as specified herein.
  - 2. Porcelain tile and all accessories as specified herein.
  - 3. Marble thresholds

- B. Related Sections:
  - 1. Division 1 Section "Selective Demolition" for removing existing finishes.
  - 2. Division 3 Section "Cast-in-Place Concrete" for monolithic slab finishes specified for tile substrates.
  - 3. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.
  - 4. Division 9 Section "Gypsum Board".
  - 5. Other Division 9 floor finishes related to this section but not the work of this section

#### 1.4 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Samples for Initial Selection: For each type of tile and grout indicated. Include Samples of accessories involving color selection. Submit color samples illustrating full color range of each type tile.
- D. Samples for Verification:
  - 1. Full-size units of each type and composition of tile and for each color and finish required.
  - 2. Full-size units of each type of trim and accessory for each color and finish required.
  - 3. Trim: Submit sample of each type and color.
  - 4. Transition and Edge Protection Profiles: Submit sample of each type and color.
  - 5. Full-profile sample of stone thresholds in 6-inch (150-mm) lengths.
- E. Qualification Data: For qualified Installer.
- F. Manufacturer's Certificates:
  - 1. Product certificates should be signed by product manufacturer to verify that products meet or exceed specified requirements.
  - 2. For each shipment, type and composition of tile provide a Master Grade Certificate signed by the manufacturer and the installer certifying that products meet or exceed the specified requirements of ANSI A137.1.
- G. Material Test Reports: For each tile-setting and -grouting product.

- H. Manufacturer's instructions.
- I. Submit maintenance data: Include routine maintenance and stain-removal methods, cleaning instructions and recommended schedules to owner in an organized format.
- J. Submit proof of liability and workman's compensation insurance in amounts to be determined by the owner, bonding documentation, or other assurances as may be requested by the owner.
- K. Submit items noted as Optional or Additional as a separate price from other costs.
- L. Provide a guaranteed maximum price which is based upon a walk-thru survey of conditions.
- M. Provide technical data for code and fire safety to the owner as required by all authorities with jurisdiction.
- N. Submit to owner all warrantees and guarantees in writing as noted in specification.
- O. Provide an additional cost for 5% shelf stock to the owner, and indicate the approximate space required to store this material.
- P. Proposal shall include statements or documentation clearly indicating that costs submitted are for products and materials meeting all requirements and specifications contained herein, and that there will be no substitution from the bid product and the installed product.

#### 1.4 <u>QUALITY ASSURANCE</u>

- A. Maintain one copy each of all Referenced standards and specifications on site. Include the TCA Handbook, ANSI A108 Series, ANSI A118 Series ANSI A136.1 and ANSI A137.1 and others as specified under paragraph References.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum ten (10) years' experience.
- C. Source Limitations for Tile: Obtain tile of each type and color or finish and accessories under 09 30 13, including leveling and patching compounds, and adhesives, from one source or producer.
  - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

CARVER POLICH CARVER, MA	CERAMIC TILE	<u>09 30 00-5</u>
2.	Source Limitations for Setting and Grouting Materials: Of of a uniform quality for each mortar, adhesive, and grout cone manufacturer and each aggregate from one source or r	btain ingredients component from producer.
3.	Obtain Crack isolation membrane from a single manufacture membrane from same manufacturer as setting material or f manufacturer approved by setting material manufacturer to compatibility.	rer. Obtain From ensure
D. Source speci	the Limitations for Other Products: Obtain each of the follow fied in this Section from a single manufacturer for each products	ing products uct:

Deliver and store packaged materials in original containers with seals unbroken

and labels intact until time of use. Comply with requirements in ANSI A137.1 for

Store tile and cementitious materials on elevated platforms, under cover, and in a

Store liquid materials in unopened containers and protected from contamination,

Store tile, adhesives and accessories in the spaces where they will be installed for

Store aggregates where grading and other required characteristics can be

dampness, freezing or overheating in accordance with manufacturer's

Broken, cracked, chipped, stained, or damaged tile will be rejected.

Waterproof membrane.

maintained and contamination can be avoided.

at least 48 hours before beginning installation.

Joint sealants.

labeling sealed tile packages.

dry location.

instructions.

DELIVERY, STORAGE, AND HANDLING

1. 2.

1.5

A.

B.

C.

D.

E.

F.

G.

**CERAMIC TILE** 

- other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile
- H. Ceramic Tile contractor is to coordinate shipping schedules with the ceramic manufacturer and verify the installation schedule with the owner and the interior designer.

Materials are to be stored, handled, and installed following manufacturer's recommended procedures. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of

- I. Ceramic Tile is to be delivered from manufacturer to the installer.
- J. Verify all passages, elevator cab sizes and other restrictions.

K. Provide safe, insured storage of goods and materials free of charge prior to scheduled installation date and for up to 30 days after that date if schedules have been unavoidably delayed. The owner may provide notice of schedule revisions in order to minimize storage time.

#### 1.6 **PROJECT CONDITIONS**

- A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.
- B. Do not install adhesives in an unventilated environment
- C. Maintain ambient and substrate temperature of 50 degrees F (10 degrees C) during installation of mortar materials.
- D. Comply with requirements of referenced standards and recommendations of material manufacturers for environmental conditions before, during, and after installation.
- E. It is the contractor's responsibility to protect installed tile if other trades have to re-enter the work area.
- F. Verify all conditions at site. Field measure all work, offsets, door locations and undercuts, fixed equipment and other items.
- G. Notify in writing, the owner and the interior designer of any differing or unusual field conditions which in any way alter or conflict with the delivery, removal, installation, or final appearance or performance of Ceramic Tile specified herein. The same notification in writing holds for any aspect or implication of the specifications, drawings or schedules herein which does not make for proper ceramic tile installation.
- H. Coordinate with owner's facility or maintenance staff on closing or otherwise shutting off return air grills, or turning off HVAC fans to work areas especially during heavy dust generating phases.
- I. All adhesives, solvents, etc. used shall be non-volatile and shall not produce volatile off-gasses or Volatile Organic Compounds (VOC's); neither will any products contain formaldehydes in any form. Any exception requires the written permission for use from the owner. Provide owner with MSDS (Material Safety Data Sheet).
- J. Work areas, storage spaces, preparation areas, and tools and materials shall be left in a neat and orderly fashion at the end of each work period.
- K. Neither the owner nor the interior designer shall be responsible for lost or damage of worker's tools or property, or for workman's safety.
- L. Debris shall be disposed of daily and any approved volatile materials will be stored only in an owner designated area.
- M. Storage areas, accesses, parking and other accommodations will be in places designated by the owner.

# 1.7 EXTRA MATERIALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
  - 2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated
- B. Deliver extra materials to Owner's designated storage location.

# 1.8 <u>WARRANTEE</u>

- A. Contractor shall unconditionally guarantee in writing to provide a complete installation free of defects and satisfactory to the owner and the interior designer. The guarantee shall include a provision stating that the contractor is responsible for correcting all defects occurring on the job for a period of one year after completion of the installation. This written guarantee must be included in the proposal.
- B. Ceramic Tile shall be installed clean and neatly, free of soil or other defects that affect Ceramic Tile appearance, occupant safety, or performance of any mechanisms, doors or fixed equipment.
- C. The contractor shall be responsible for restoring to its original condition and at no cost to the owner or the interior designer any damages done by the contractor, his workmen, or as the result of his workmen's inappropriate or negligent actions.
- D. The owner and the interior designer shall inspect installation in progress as well as upon completion. A list of defects, if any, shall be made and the contractor shall make amendments within 30 days.
- E. Installed materials for this section shall have a written warrantee for a minimum of ten years or the terms of the manufacturer's warrantee, (whichever is greater) from the date of installation. Provide the owner with extended warrantee information.
- F. Ensure materials are boxed and identified by manufacturer, type, and color.

# PART 2 - PRODUCTS

# 2.1 <u>TILE PRODUCTS</u>

- A. Colorbody Porcelain Floor Tile (PFT-01)(PTB-01):
  - 1. Manufacturer: Daltile, Web: www.daltile.com
  - 2. Product: Forest Park
  - 3. Moisture Absorption: < 0.5%
  - 4. Size and Shape: 9" x 36"
  - 5. Colors: See Finish Key on F-0.1
  - 6. Thickness: 3/8 inch
  - 7. Finish: Matte
  - 8. Grout Color: See Finish Key on F-0.1
  - 9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:
    - a. Base Cove (PTB-01): Cove Base S-36C9T, 6"x12"
- B. Colorbody Porcelain Floor Tile (PFT-02):
  - 1. Manufacturer: Daltile, Web: www.daltile.com
  - 2. Product: Assemble
  - 3. Moisture Absorption: < 0.5%
  - 4. Size and Shape: 12" x 24"
  - 5. Colors: See Finish Key on F-0.1
  - 6. Thickness: 3/8 inch
  - 7. Finish: Matte
  - 8. Grout Color: See Finish Key on F-0.
- C. Porcelain Floor Tile (PFT-03)(PFT-04)(PTB-04A)(PTB-04B):
  - 1. Manufacturer: Daltile, Web: www.daltile.com
  - 2. Product: Keystones
  - 3. Moisture Absorption: < 0.5%
  - 4. Size and Shape: 2" x 2" Mosaic
  - 5. Colors: See Finish Key on F-0.1
  - 6. Thickness: 1/4 inch
  - 7. Finish: Matte
  - 8. Grout Color: See Finish Key on F-0.1
  - 9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:
    - a. Base Cove (PTB-04A): Build-up Base MB-5A
    - b. Base Cove (PTB-04B): Build-up Cove Base MB-5B
    - c. Internal Corners: Cove, module size
    - d. Internal Corners: Field-butted square corners. For coved base and cap, use angle pieces designed to fit with stretcher shapes.

# CERAMIC TILE

- D. Glazed Ceramic Wall Tile (CWT-01)(CWT-02)(CWT-03):
  - 1. Manufacturer: Daltile, Web: www.daltile.com
  - 2. Product: Color Wheel Collection Classic
  - 3. Moisture Absorption: < 20%
  - 4. Size and Shape: 3" x 6"
  - 5. Colors: See Finish Key on F-0.1
  - 6. Thickness: 5/16 inch
  - 7. Finish: Matte
  - 8. Grout Color: See Finish Key on F-0.1
  - 9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:
- E. Glazed Ceramic Wall Tile (CWT-04)
  - 1. Manufacturer: Creative Materials Corporation, Web: www.creativematerialscorp.com
  - 2. Product: Slide Colors
  - 3. Moisture Absorption: <16%
  - 4. Size and Shape: 4" x 12"
  - 5. Colors: See Finish Key on F-0.1
  - 6. Thickness: 7 mm
  - 7. Finish: Glossy
  - 8. Grout Color: See Finish Key on F-0.1
  - 9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:
- F. Glazed Ceramic Wall Tile (CWT-05)
  - 1. Manufacturer: Daltile, Web: www.daltile.com
  - 2. Product: Stone Radiance
  - 3. Moisture Absorption: < 5%
  - 4. Size and Shape: 5/8 Random Mosaic (mesh mounted on a 12"x12" sheet)
  - 5. Colors: See Finish Key on F-0.1
  - 6. Thickness: 5/16"
  - 7. Finish:
  - 8. Grout Color: See Finish Key on F-0.1
  - 9. Trim Units: Coordinated with sizes of coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:

# 2.2 <u>THRESHOLDS</u>

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
  - 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match

# CERAMIC TILE

top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.

- B. Marble Thresholds: ASTM C 503, with a minimum abrasion resistance of [10] [12] per ASTM C 1353 or ASTM C 241 and with honed finish.
  - 1. Description: See Finish Key on F-0.1.

# 2.3 <u>SETTING MATERIALS</u>

- A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Boiardi Products; a QEP company.
    - b. Bonsal American; an Oldcastle company.
    - c. Bostik, Inc.
    - d. C-Cure.
    - e. Custom Building Products.
    - f. Jamo Inc.
    - g. Laticrete International, Inc.
    - h. MAPEI Corporation.
    - i. Mer-Kote Products, Inc.
    - j. Southern Grouts & Mortars, Inc.
    - k. Summitville Tiles, Inc.
    - 1. TEC; a subsidiary of H. B. Fuller Company.
  - 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
  - 3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.

# 2.4 <u>GROUT MATERIALS</u>

- A. Epoxy Grout: ANSI A118.6.
- 1. Basis-of-Design Product: Mapei Ultracolor Plus FA (nontoxic, non-flammable, non-hazardous during storage, mixed, application and when cured.) Subject to compliance with requirements, provide product as scheduled or comparable product by one of the following:
  - a. Boiardi Products; a QEP company.
  - b. Bonsal American; an Oldcastle company.
  - c. Bostik, Inc.
  - d. C-Cure.
  - e. Custom Building Products.
  - f. Jamo Inc.

- g. Laticrete International, Inc.
- h. Southern Grouts & Mortars, Inc.
- i. Summitville Tiles, Inc.
- j. TEC; a subsidiary of H. B. Fuller Company.

# 2.5 <u>MISCELLANEOUS MATERIALS</u>

- A. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.
- B. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Bonsal American; an Oldcastle company; Grout Sealer.
    - b. Bostik, Inc.; CeramaSeal Magic Seal.
    - c. C-Cure; Penetrating Sealer 978.
    - d. Custom Building Products; [Surfaceguard] [Grout and Tile] [Grout] Sealer.
    - e. Jamo Inc.; [Matte Finish] [Penetrating] Sealer.
    - f. MAPEI Corporation; KER [003, Silicone Spray Sealer for Cementitious Tile Grout] [004, Keraseal Penetrating Sealer for Unglazed Grout and Tile].

## 2.6 MIXING MORTARS AND GROUT

- A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
- B. Add materials, water, and additives in accurate proportions.
- C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

#### PART 3 - EXECUTION

- 3.1 <u>GENERAL</u>
  - A. Contractor is to furnish all materials, labor, tools, equipment, services and other incidentals required to perform work as listed and as noted on plans, including installation of new product with all necessary wall tile accessories

## 3.2 <u>EXAMINATION</u>

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
  - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
  - 2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
  - 3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.3 <u>PREPARATION</u>

- A. Install cementitious backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of dryset mortar to a feather edge.
- B. Clean and maintain substrate in condition required by setting material manufacturer.
- C. Prepare surfaces in strict accordance with instructions of manufacturer whose setting materials or additives are being used. Do not seal substrate unless required by manufacturer. Prime substrate when required by manufacturer.
- D. Wet down or wash dry, dusty surfaces and remove excess water immediately prior to application of tiles.
- E. Acid Based Cleaners: Use not permitted.
- F. Scarify concrete substrates with blast track equipment if necessary to completely remove curing compounds or other substances that would interfere with proper bond of setting materials.

#### 3.4 <u>TILE INSTALLATION</u>

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area unless otherwise indicated on drawings. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
  - 1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
  - 2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
  - 3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
  - 1. Glazed Wall Tile: 1/16 inch (1.6 mm).
  - 2. Colorbody Porcelain Tile: 1/8" inch, 3/16" inch when large rectangular sizes are used in a staggered brick-joint pattern where the overlap does not exceed 33%.
- F. Form internal angles square and external angles bullnosed.
- G. Install ceramic accessories rigidly in prepared openings.
- H. Install non-ceramic trim in accordance with manufacturer's instructions.

- I.Grout Sealer: Apply grout sealer to grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.
- J. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.
- K. Sound tile after setting. Replace hollow sounding units.

# 3.5 <u>CLEANING AND PROTECTING</u>

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
  - 1. Remove latex-portland cement grout residue from tile as soon as possible.
  - 2. Clean excess mortar from surface with water as work progresses. Perform cleaning while mortar is fresh and before it hardens on surfaces.
  - 3. Sponge and wash tile diagonally across joints. Polish with clean dry cloth
  - 4. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
  - 5. Before final inspection, remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. Where temporary use of new floors is unavoidable, supply large, flat boards or plywood panels for walkways over kraft paper.
- C. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls.
- D. Contractor shall take every precaution to protect existing finishes from damage during removal and installation of Ceramic Tile.
- E. Contractor shall protect owner's furniture and equipment (if present) from dust and damage during installation of Ceramic Tile
- F. Provide adequate ventilation and other safeguards to protect the health and comfort of occupants during installation of Ceramic Tile.
- G. Protect items not scheduled to be moved or replaced during installation by covering with a non-porous drop cloth adhered with a residue free adhesive to furniture and equipment.

- H. Any items moved shall be replaced in original position or a location indicated by owner at the end of each work period.
- I. Protect work so that it will be without any evidence of damage or use at time of acceptance.
- J. Ceramic Tile shall be vacuumed clean, no visible adhesive residue will be tolerated.
- K. All waste produced as part of this work shall be removed from the site and disposed of in a manner consistent with the requirements of the owner or any regulatory agency having jurisdiction, or in an environmentally responsible manner.

## 3.6 <u>INSPECTION</u>

- A. Ceramic Tile installation will be inspected after 5 days and any buckles or bubbles removed.
- B. Cracking or chipping occurring 4-5 days after completed installation shall be removed and replaced by following the manufacturer's recommended procedures.

### END OF SECTION 09 30 00

## SECTION 09 40 00 – INDUSTRIAL FLOOR SYSTEMS

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing and installing the following where indicated on the drawings:
  - 1. High-performance resinous flooring systems and all accessories as specified herein.

## 1.3 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product Data: For each type of product indicated.
- C. Installer Certificates for Qualification: Signed by manufacturer certifying that installers comply with specified requirements.
- D. Material Certificates: For each resinous flooring component, from manufacturer.
- E. Material Test Reports: For each resinous flooring system.
- F. Maintenance Data: For maintenance manuals.
- G. Samples: Submit one sample of coating, indicating coating applied on horizontal surfaces. Sample shall illustrate transition from Resinous Flooring system. Provide sample which is a true representation of proposed field applied finish; not laboratory applied finish. Provide minimum 12 feet by 4 feet field sample color and texture for owner approval as a mock up at location designated by General Contractor for review and written approval prior to installation of any other areas.
- H. Product Schedule: For resinous flooring.

## 1.4 **QUALITY ASSURANCE**

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of flooring systems required for this Project.

- 1. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
- 2. Installer Letter of Certification: Installer to provide letter stating that they have been in business for at least 10 years and listing 5 projects in the last 2 years of similar scope. For each project provide: project name, location, date of installation, contact information, size of project, and manufacturer of materials with system information.
- B. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.
- C. Pre-installation Conference: Conduct conference at Project site before work and mockups begin.
- D. Mockups: Apply mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution. Do not cover up mockup area.
  - 1. Apply full-thickness mockups on 16 square foot floor area selected by Architect.
  - 2. Simulate finished lighting conditions for Architect's review of mockups.
  - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
  - 4. Mockup shall demonstrate desired slip resistance for review and approval by General Contractor prior to installing project areas.

# 1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.
  - 1. Maintain containers in clean condition, free of foreign materials and residue.
  - 2. Remove rags and waste from storage areas daily.

# 1.6 **PROJECT CONDITIONS**

- A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.
- B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.
- C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application unless manufacturer recommends a longer period.

# PART 2 - PRODUCTS

# 2.1 <u>MANUFACTURERS</u>

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. The Sherwin-Williams Company
  - 2. General Polymers Brand

## 2.2 MATERIALS (RES-01)(RES-02)(RES-03)

- A. The 1/16" 1/8" Self-Leveling Epoxy Slurry System consists of 3579 Standard Primer / Binder as the primer, 3561 Epoxy Resin Glaze as the binder resin, 5350 Trafficote Filler, 5310 Dry Silica Sand for slurry and 5310-8 Dry Silica Sand (20-40 mesh) (or other aggregate for 1/8" Skid-Inhibiting System Only). Select seal coat: 3505 Stipple Epoxy Floor Coating, 3745 Self-Leveling Epoxy, or 4638 HS Polyurethane Floor Enamel. Additive: H&C Sharkgrip Slip Resistant Additive.
- B. VOC Content of Resinous Flooring: Provide resinous flooring systems, for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24)].
  1. Resinous Flooring: 100 g/L.

## 2.3 <u>HIGH PERFORMANCE RESINOUS FLOORING</u>

- A. Resinous Flooring: Abrasion-, impact- and chemical-resistant, high-performance, resin-based, monolithic floor surfacing designed to produce a seamless floor.
- B. System Characteristics (RES-01)(RES-02):
  - 1. Color and Pattern: Slurry 1/16" Smooth, Parchment (62), Charcoal (53)
  - 2. Wearing Surface: Smooth with H&C Sharkgrip Additive
- C. System Characteristics (RES-03):
  - 1. Color and Pattern: Slurry 1/8" Non-Skid, Parchment (62)
  - 2. Wearing Surface: Textured or Slip Resistant

# PART 3 - EXECUTION

# 3.1 PREPARATION

A. Inspection: Prior to commencing Work, thoroughly examine all underlying and adjoining work, surfaces and conditions upon which Work is in any way dependent for perfect results. Report all conditions which affect Work. No "waiver of responsibility" for incomplete, inadequate or defective underlaying and adjoining work, surfaces and conditions will be considered, unless notice of such unsatisfactory conditions has been filed and agreed to in writing before Work

begins. Commencement of Work constitutes acceptance of surfaces. Test and report for moisture level in substrate to verify compliance with manufacturer's requirements. Do not proceed unless acceptable test results are achieved.

- B. Only installers approved by the manufacturer in writing shall perform installation of the material.
- C. Surface Preparation: Remove all surface contamination, loose or weakly adherent particles, laitance, grease, oil, curing compounds, paint, dust and debris by blast track method or approved mechanical means (acid etch not allowed). If surface is questionable try a test patch. Create a minimum surface profile for the system specified in accordance with the methods described in ICRI No. 03732 to achieve profile numbers as follows:
  - 1. Thin film, to 10 mils CSP-1 to CSP-3
  - 2. Thin and medium films, 10 to 40 mils CSP-3 to CSP-5
  - 3. Self-leveling mortars, to 3/16" CSP-4 to CSP-6
  - 4. Mortars and laminates, to 1/4" or more CSP-5 to CSP-9

# 3.2 ENVIRONMENTAL CONDITIONS

- A. All applicators and all other personnel in the area of the RF installation shall take all required and necessary safety precautions. All manufacturers' installation instructions shall be implicitly instructions shall be implicitly followed.
- B. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
- C. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions by using the following methods as recommended by the resinous flooring manufacturer.
  - 1. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. or that required in manufacturer's instructions of slab area in 24 hours.
  - 2. Perform plastic sheet test, ASTM D 4263. Proceed with application only after testing indicates absence of moisture in substrates.
  - 3. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a percent relative humidity level measurement as noted acceptable by resinous floor manufacturer.
- D. Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.
- E. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

- F. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
- G. Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written instructions.

# 3.3 <u>APPLICATIONS</u>

- A. Install resinous floor over properly prepared concrete surface in strict accordance with the manufacturer's directions.
  - 1. Install the primer and/or base coats over thoroughly cleaned and prepared concrete.
  - 2. Install topcoat over flooring after excess aggregate has been removed.
  - 3. Maintain a slab temperature of 60°F to 80°F for 24 hours minimum before applying floor topping.
- B. Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.
  - 1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
  - 2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
  - 3. At substrate expansion and isolation joints, comply with resinous flooring manufacturer's written instructions.
- C. Sealant: Saw cut resinous floor topping at expansion joints in concrete slab. Fill sawcuts with sealant prior to final seal coat application. Follow manufacturer's written recommendations.
- D. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
- E. Slip Resistant Finish: Provide grit for slip resistance.
- F. Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.

# 3.4 <u>COMPLETED WORK</u>

- A. Cleaning: Upon completion of the Work, clean up and remove from the premises surplus materials, tools, appliances, empty cans, cartons and rubbish resulting from the Work. Clean off all spatterings and drippings, and all resulting stains.
- B. Protection: Protect Work in accordance with manufacturer's directions from damage and wear during the remainder of the construction period. Use protective

methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

C. Contractor shall insure that coating is protected from any traffic until it is fully cured to the satisfaction of the coating manufacturer.

END OF SECTION 09 40 00

# SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS (FILED SUB-BID REQUIRED)

#### PART 1 - GENERAL

#### 1.1 <u>TIME, MANNER AND REQUIREMENTS FOR FILING SUB-BIDS</u>

- A. Sub-Bids shall be submitted in accordance with the provisions of General Laws, Chapter 149, Section 44A, inclusive, as amended.
- B. Sub-Bids for work under this Section shall be received electronically, until 2:00
   p.m. on Tuesday, October 29, 2019, at which time and place all Trade Contractor Bids shall be duly recorded.
- C. This project is being Electronically Bid (E-Bid). All bids shall be submitted online at <u>www.Projectdog.com</u>. Hard copy bids will not be accepted by the Awarding Authority. E-Bid tutorials and instructions are available within the specifications and online at <u>www.Projectdog.com</u>. For assistance, call Projectdog, Inc at (978)499-9014, M-F 8:30AM-5PM.
  - a. All required bid forms must be submitted in **PDF** format only. The bidder must complete all required signatures either digitally (using Adobe Acrobat) or manually (print, sign and scan as a PDF file).
  - b. Bid Bonds issued by a surety company shall be submitted on the E-Bid page. Bid bonds in the form of cash or check shall be completed and delivered as outlined on the Bid Bond Affidavit form.
  - c. The bidder must enter bid price on the E-Bid form as a whole dollar value only with no punctuation. Sums shall be expressed in both words and figures on the bid form. Note: The E-Bid form will automatically match the word value to the numeric figure entered by the bidder.
  - d. Bidders may save, submit or modify an E-Bid at any time prior to bid close. Once submitted, a bid cannot be edited. To modify a bid the bidder must retract the bid, make any necessary changes, and then submit the bid again. Upon submitting or retracting the bidder will receive a convenience email for informational purposes only. Bidders are encouraged to contact Projectdog, Inc at (978) 499-9014, M-F 8:30AM-5PM, if an email is not received.
  - e. If a bid is submitted prior to an Addendum being issued, the bidder will receive an automated email for informational purposes only. The bidder must review the addendum, retract the bid, acknowledge all addenda, and submit the bid again. If a bidder fails to acknowledge addenda their bid may be rejected by the Awarding Authority.

- f. Timely submission of an E-Bid shall be the full responsibility of the Bidder. The server clock is the time of record. It is the bidder's responsibility to review and confirm online that a bid has been submitted and/or retracted and that the bid is 100% true, complete and accurate. All bidders are required to review their submitted E-Bid via the "View My Bid Package" link.
- D. Sub-Bids filed with the Awarding Authority shall be accompanied by a Bid Deposit in the form of a certified check or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to the "**Town of Carver**". A bid bond shall be:
  - 1. In a form satisfactory to the Awarding Authority.
  - 2. With a surety company qualified to do business in the Commonwealth and satisfactory to the Awarding Authority.
  - 3. Conditioned upon the faithful performance by the principal of the agreements contained in the Bid. The amount of such bid deposit shall be five percent (5%) of the value of the Bid.
- E. Sub-Bids for work under this Section shall be for the complete work required as specified and as shown on the drawings.
- F. Sub-Bidders are directed to the Instructions to Bidders, and to the requirements that all bidders visit the site to determine the scope of work required under this Section.
- G. Sub-Bidders must comply with all provisions of Division 1, General Requirements, in the same manner as the General Contractor.

# 1.2 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

# 1.3 <u>SUMMARY</u>

- A. This section includes furnishing and installing acoustical panel ceilings with exposed suspension systems.
- B. Related Sections: The following sections contain requirements that relate to this section:
  - 1. Section 01 23 00 "Alternates" for work affection this section.
  - 2. Division 21 for sprinkler heads in acoustical ceilings.

- 3. Division 23 for grilles, registers, and diffusers in acoustical ceilings.
- 4. Division 26 for lighting fixtures in acoustical ceilings.

# 1.4 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
  - 1. Product data for each type of product specified.
  - 2. Samples for verification purposes of each type of exposed finish required, prepared on samples of size indicated below and of same thickness and material indicated for final unit of Work. Where finishes involve normal color and texture variations, include sample sets showing full range of variations expected.
    - a. 6-inch-square samples of each acoustical panel type, pattern, and color.
    - b. Set of 12-inch-long samples of exposed suspension system members, including moldings, for each color and system type required.

# 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has successfully completed acoustical ceilings similar in material, design, and extent to those indicated for Project. Installer shall thoroughly review Contract Documents and be familiar with structure and all necessary requirements for attachment to same.
- B. Fire-Performance Characteristics: Provide acoustical ceilings that are identical to those tested for the following fire-performance characteristics, per ASTM test method indicated below, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
  - 1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
    - a. Flame Spread: 25 or less.
    - b. Smoke Developed: 50 or less.
- C. Single-Source Responsibility for Ceiling Units: Obtain each type of acoustical ceiling unit from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- D. Single-Source Responsibility for Suspension System: Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.

- 1. Obtain suspension system from same manufacturer that produces acoustical ceiling units.
- E. Coordination of Work: Coordinate layout and installation of acoustical ceiling units and suspension system components with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system components.

# 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

## 1.7 **PROJECT CONDITIONS**

A. Space Enclosure: Do not install interior acoustical ceilings until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

# 1.8 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with appropriate labels.
  - 1. Acoustical Ceiling Units: Furnish quantity of full-size units equal to 2.0 percent of amount installed.
  - 2. Exposed Suspension System Components: Furnish quantity of each exposed component equal to 2.0 percent of amount installed.

# PART 2 - PRODUCTS

# 2.1 <u>MANUFACTURERS</u>

- A. Ceiling Panel Products: Subject to compliance with requirements, provide one of the following:
  - 1. For use in 2 x 2 Grid Systems where indicated on drawings unless noted otherwise:
    - a. 2 x 2 x 5/8 inch panels, "Dune" Item #1772, fine texture, square lay-in, Armstrong, or equal.

- b. NRC Range: .50
- c. Light Reflectance: 0.83
- d. Sag resistance: Humigard Plus
- e. Fire rating: Class A
- f. Color: White
- g. Warranty: 10 years
- 2. For use in 2 x 4 Grid Systems where indicated on drawings unless noted otherwise:
  - a. 2 x 4 x 5/8 inch panels, "Dune" Item #1773, fine texture, square lay-in, Armstrong, or equal.
  - b. NRC Range: .50
  - c. Light Reflectance: 0.83
  - d. Sag resistance: Humigard Plus
  - e. Fire rating: Class A
  - f. Color: White
  - g. Warranty: 10 years
- 3. For use in 2 x 2 Grid Systems within Vestibule 101, <u>Public Lobby 106,</u> <u>Training Classroom 100, Dispatch 107, Break Room 111</u>:
  - a. 2 x 2 x 1 1/2 inch panels, "Optima Open Plan", Item #3254, Fiberglass with Tuffshield membrane, Armstrong, or equal.
  - b. NRC Range: 1.00
  - c. Articulation Class (AC) Range: 200
  - d. Humidity Resistance: Humiguard Plus
  - e. Color: White
  - f. Warranty: 10 years
  - g. Grid System: "Silhouette XL 9/16 inch Bolt-Slot", Armstrong World Industries, Inc., or equal
- 4. For use in 2 x 4 Grid Systems within <u>Interview 121, Prisoner</u> <u>Processing 122</u>:
  - a. 2 x 4 x 1 inch panels, "Optima Open Plan", Item #3252, Fiberglass with Tuffshield membrane, Armstrong, or equal.
  - e. NRC Range: 0.95
  - f. Articulation Class (AC) Range: 190
  - g. Humidity Resistance: Humiguard Plus
  - e. Color: White
  - f. Warranty: 10 years
  - g. Grid System: "Prelude XL 15/16" ", Armstrong World Industries, Inc., or equal
  - h. Accessories: **Retention Clips** (#414) at all installations.
- B. Ceiling Grid Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Non-Fire-Resistance-Rated Wide-Face Double-Web Steel Suspension Systems for use in ceilings designated:
    - a. "15/16" Prelude XL", Armstrong World Industries, Inc.

- b. "200 Snap-Grid System", Chicago Metallic Corporation.
- c. "DX System", USG Interiors, Inc.
- 2. Edge Moldings:
  - a. Armstrong World Industries, Inc.
  - b. Chicago Metallic Corporation.
  - c. National Rolling Mills, Inc.

# 2.2 ACOUSTICAL CEILING UNITS, GENERAL

- A. Standard for Acoustical Ceiling Units: Provide manufacturers' standard units of configuration indicated that comply with ASTM E 1264 classifications as designated by reference to types, patterns, acoustical ratings, and light reflectance's, unless otherwise indicated.
  - 1. Mounting Method for Measuring NRC: Type E-400 (plenum mounting in which face of test specimen is 15-3/4 inches [400 mm] away from the test surface) per ASTM E 795.
- B. Colors and Patterns: Provide products to match appearance characteristics indicated under each product type. Color: white.

# 2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Standard for Metal Suspension System: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C635 requirements.
- B. Finishes and Colors: Provide manufacturer's standard factory-applied finish for type of system indicated. Color: white.
- C. Attachment Devices: Size for 5 times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
- D. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft temper.
  - 1. Gage: Provide wire sized so that stress at 3 times hanger design load (ASTM C 635, Table 1, Direct-Hung), will be less than yield stress of wire, but provide not less than 0.106-inch diameter (12 gage).
- E. Edge moldings and Trim: Metal of manufacturer's standard moldings for edges and penetrations that fit type of edge detail and suspension system indicated.
  - 1. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
  - 2. For narrow faced suspension systems, provide suspension system manufacturer's standard edge moldings that match width and configuration of exposed runners.
  - 3. For radius corners, provide manufacturer's standard bullnose corner cover to conform to outline of wall and/or CMU radius profile.

#### 2.4 <u>NON-FIRE-RESISTANCE-RATED DIRECT-HUNG SUSPENSION SYSTEMS</u>

- A. Wide-Face Capped Double-Web Steel Suspension System: Main and crossrunners roll-formed from prepainted or electrolytic zinc-coated cold-rolled steel sheet, with prefinished 15/16-inch-wide metal caps on flanges; other characteristics as follows:
  - 1. Structural Classification: Intermediate-Duty system.
  - 2. End Condition of Cross-Runners: Override or Butt-edge type, as stated with Manufacturer.
  - 3. Cap Material and Finish: Steel sheet painted white.

## PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine substrates and structural framing to which ceiling system attaches or abuts, with Installer present, for compliance with requirements specified in this and other sections that affect installation and anchorage of ceiling system. Do not proceed with installation until unsatisfactory conditions have been corrected.

# 3.2 <u>PREPARATION</u>

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-halfwidth units at borders, and comply with reflected ceiling plans.

#### 3.3 <u>INSTALLATION</u>

- A. General: Install acoustical ceiling systems to comply with installation standard referenced below, per manufacturer's instructions and CISCA "Ceiling Systems Handbook".
  - 1. Standards for Installation of Ceiling Suspension Systems: Comply with ASTM C 636 and ASTM E 580 for areas requiring seismic restraint.
- B. Arrange acoustical units and orient directionally patterned units in a manner shown by reflected ceiling plans.
- C. Suspend ceiling hangers from building structural members and as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling space that are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  - 2. Where width of ducts and other construction within ceiling space produces hanger spacings that interfere with the location of hangers at spacings required to support standard suspension system members, install

supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

- 3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eyescrews, or other devices that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
- 4. Do not attach hangers to steel roof deck. Attach hangers to structural members.
- 5. Space hangers not more than 4 feet-0 inch o.c. along each member supported directly from hangers, unless otherwise shown, and provide hangers not more than 8 inches from ends of each member.
- D. Install edge moldings of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges
- E. Install acoustical panels in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.
  - 1. Install hold-down clips in areas where required by governing regulations; space as recommended by panel manufacturer unless otherwise indicated or required.

# 3.4 <u>CLEANING</u>

A. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

# SECTION 09 65 00 - RESILIENT FLOORING AND BASE (FILED SUB BID REQUIRED)

#### PART 1 - GENERAL

#### 1.1 TIME, MANNER AND REQUIREMENTS FOR FILING SUB-BIDS

- A. Sub-Bids shall be submitted in accordance with the provisions of General Laws, Chapter 149, Section 44A, inclusive, as amended.
- B. Sub-Bids for work under this Section shall be received electronically, until 2:00
   p.m. on Tuesday, October 29, 2019, at which time and place all Trade Contractor Bids shall be duly recorded.
- C. This project is being Electronically Bid (E-Bid). All bids shall be submitted online at <u>www.Projectdog.com</u>. Hard copy bids will not be accepted by the Awarding Authority. E-Bid tutorials and instructions are available within the specifications and online at <u>www.Projectdog.com</u>. For assistance, call Projectdog, Inc at (978)499-9014, M-F 8:30AM-5PM.
  - a. All required bid forms must be submitted in **PDF** format only. The bidder must complete all required signatures either digitally (using Adobe Acrobat) or manually (print, sign and scan as a PDF file).
  - b. Bid Bonds issued by a surety company shall be submitted on the E-Bid page. Bid bonds in the form of cash or check shall be completed and delivered as outlined on the Bid Bond Affidavit form.
  - c. The bidder must enter bid price on the E-Bid form as a whole dollar value only with no punctuation. Sums shall be expressed in both words and figures on the bid form. Note: The E-Bid form will automatically match the word value to the numeric figure entered by the bidder.
  - d. Bidders may save, submit or modify an E-Bid at any time prior to bid close. Once submitted, a bid cannot be edited. To modify a bid the bidder must retract the bid, make any necessary changes, and then submit the bid again. Upon submitting or retracting the bidder will receive a convenience email for informational purposes only. Bidders are encouraged to contact Projectdog, Inc at (978) 499-9014, M-F 8:30AM-5PM, if an email is not received.
  - e. If a bid is submitted prior to an Addendum being issued, the bidder will receive an automated email for informational purposes only. The bidder must review the addendum, retract the bid, acknowledge all addenda, and submit the bid again. If a bidder fails to acknowledge addenda their bid may be rejected by the Awarding Authority.

# **RESILIENT FLOORING AND BASE**

- f. Timely submission of an E-Bid shall be the full responsibility of the Bidder. The server clock is the time of record. It is the bidder's responsibility to review and confirm online that a bid has been submitted and/or retracted and that the bid is 100% true, complete and accurate. All bidders are required to review their submitted E-Bid via the **"View My Bid Package"** link.
- D. Sub-Bids filed with the Awarding Authority shall be accompanied by a Bid Deposit in the form of a certified check or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to the "**Town of Carver**". A bid bond shall be:
  - 1. In a form satisfactory to the Awarding Authority.
  - 2. With a surety company qualified to do business in the Commonwealth and satisfactory to the Awarding Authority.
  - 3. Conditioned upon the faithful performance by the principal of the agreements contained in the Bid. The amount of such bid deposit shall be five percent (5%) of the value of the Bid.
- E. Sub-Bids for work under this Section shall be for the complete work required as specified and as shown on the drawings.
- F. Sub-Bidders are directed to the Instructions to Bidders, and to the requirements that all bidders visit the site to determine the scope of work required under this Section.
- G. Sub-Bidders must comply with all provisions of Division 1, General Requirements, in the same manner as the General Contractor.

#### 1.2 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.3 <u>SUMMARY</u>

CARVER POLICE CARVER, MA

- A. This Section includes furnishing and installing the following where indicated on the drawings:
  - 1. Solid vinyl floor tile and all accessories as specified herein.
  - 2. Luxury Vinyl floor tile and all accessories as specified herein.
  - 3. Static Control rubber flooring
  - 4. Resilient base
  - 5. Resilient molding accessories
- B. Related Sections:

- 1. Division 9 Section "Sheet Vinyl Floor Coverings" for resilient sheet floor coverings. (Part of FSB)
- 2. Division 9 Section "Resilient Wall Base and Accessories" for resilient base, reducer strips, and other accessories installed with resilient floor coverings. (Part of FSB).

# 1.4 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product Data: For each type of product indicated.
- C. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
  - 1. Show details of special patterns.
- D. Samples for Initial Selection: For each type of floor tile indicated.
- E. Samples for Verification: Full-size units of each color and pattern of floor tile required.
- F. Qualification Data: For qualified Installer.
- G. Maintenance Data: For each type of floor tile to include in maintenance manuals.

# 1.5 **QUALITY ASSURANCE**

- A. Retain option in first paragraph below for heat-welded or chemically bonded seams.
- B. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation indicated.
  - 1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.
- C. Delete first paragraph below if fire-test-response testing is not required by authorities having jurisdiction. In most building codes, floor tile is exempt from fire-test-response requirements. See "Fire-Test-Response Characteristics" Article in the Evaluations in Division 9 Section "Resilient Flooring" for additional information.
- D. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

# CARVER POLICECARVER, MARESILIENT FLOORING AND BASE

#### 1.6 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

# 1.7 <u>PROJECT CONDITIONS</u>

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 100 deg F in spaces to receive floor tile during the following time periods:
  - 1. 48 hours before installation.
  - 2. During installation.
  - 3. 48 hours after installation.
- B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Install floor tile after other finishing operations, including painting, have been completed.

# 1.7 <u>EXTRA MATERIALS</u>

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

# PART 2 - PRODUCTS

# 2.1 <u>TILE PRODUCTS</u>

- A. Solid Vinyl Tile: (SVT-01)(SVT-02)(SVT-03)
  - 1. Manufacturer: Tarkett, Web: www.tarkett.com
  - 2. Product: Cortina Grande
  - 3. Wearing Surface: Smooth
  - 4. Thickness: 1/8", 0.125", (3.18 mm).
  - 5. Size: 16" x 16"
  - 6. Colors: See Finish Key on F-0.1
- B. Luxury Vinyl Tile: (LVT-01)

# RESILIENT FLOORING AND BASE

- 1. Manufacturer: Mannington Commercial; Web: www.manningtoncommercial.com
- 2. Product: Amtico Wood
- 3. Wearing Surface: 40 mil wear layer
- 4. Thickness: .096", (2.5mm)
- 5. Size: 9" x 36"

CARVER POLICE CARVER, MA

- 6. Colors: See Finish Key on F-0.1
- C. Rubber Sports Floor (RTF-01):
  - 1. Manufacturer: Roppe, Web: www.roppe.com
  - 2. Product: Recoil Fitness Flooring
  - 3. Tile Standard: Interlocking Tile
  - 4. Thickness: 3/8"
  - 5. Size: 34-1/4" x 34-1/4"
  - 6. Acclimation Time: 48 hours
  - 7. Colors and Patterns: See Finish Key on F-01.

## 2.2 <u>STATIC-DISSIPATIVE RESILIENT FLOOR COVERINGS</u>

- A. Rubber Tile: Anti-Static (ESD-01):
  - 1. Manufacturer: Nora Systems, Inc.; Web: www.nora.com
  - 2. Pattern: Noraplan Sentica ED Article 2702
  - 3. Thickness: 0.08", (2.0 mm)
  - 4. Size: 24.015" x 24.015"
  - 5. Colors and Patterns: See Finish Key on F-0.1

#### 2.3 <u>RESILIENT RUBBER BASE (RB-01)(RB-02)</u>

- A. Resilient Base:
  - 1. Manufacturer: Johnsonite
  - 2. Product: Baseworks Thermoset Rubber (Type TSB) with toe
  - 3. Color: See Finish Key on F-0.1
  - 4. Thickness: 1/8 inch (3.175 mm)
  - 5. Height: 4"
  - 6. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length of 120 feet.
  - 7. Outside Corners: Job formed
  - 8. Inside Corners: Job formed
  - 9. Finish: Matte

#### 2.4 <u>RESILIENT MOLDING ACCESSORY</u>

- A. Resilient Molding Accessory:
  - 1. Manufacturer: Tarkett

- B. Description: Carpet edge for glue-down applications, Reducer strip for resilient floor covering, Joiner for tile and carpet, Transition strips.
- C. Material: Rubber.

- D. Profile and Dimensions: As indicated.
- E. Colors and Patterns: As selected by Architect and Interior Designer from full range of industry colors.

# 2.5 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.
  - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
    - a. VCT and Asphalt Tile Adhesives: Not more than 50 g/L.
    - b. Rubber Floor Adhesives: Not more than 60 g/L.
- C. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

# PART 3 - EXECUTION

#### 3.1 <u>EXAMINATION</u>

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 <u>PREPARATION</u>

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

- B. Concrete Substrates: Prepare according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
  - 4. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
- C. Access Flooring Panels: Remove protective film of oil or other coating using method recommended by access flooring manufacturer.
- D. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- E. Do not install floor tiles until they are same temperature as space where they are to be installed.
  - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- F. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

# 3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
  - 1. Lay tiles square with room axis or in pattern indicated on Finish Plan.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
  - 1. Lay tiles with grain running in one direction.
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansionjoint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

# 3.4 <u>CLEANING AND PROTECTION</u>

- A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
  - 1. Remove adhesive and other blemishes from exposed surfaces.
  - 2. Sweep and vacuum surfaces thoroughly.
  - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive and surface blemishes from floor tile surfaces before applying liquid floor polish.
  - 1. Apply recommended number of coats according to the manufacturer's instructions. Allow drying time between coats.
- E. Joint Sealant: Apply sealant to resilient terrazzo floor tile perimeter and around columns, at door frames, and at other joints and penetrations.
- F. Cover floor tile with undyed, untreated building paper until Substantial Completion.

END OF SECTION 09 65 00

## SECTION 09 68 10 - CARPETING

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

# 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing and installing the following where indicated on the drawings:
  - 1. Modular carpet tile and all accessories as specified herein.
- B. Related Sections:
  - 1. Division 02 Section "Selective Structure Demolition" for removing existing floor coverings.
  - 2. Division 09 Section "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.
  - 3. Division 09 Section "Sheet Carpeting."

# 1.3 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate.
- C. Shop Drawings: Show the following:
  - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
  - 2. Existing flooring materials to be removed.
  - 3. Existing flooring materials to remain.
  - 4. Carpet tile type, color, and dye lot.
  - 5. Type of subfloor.
  - 6. Type of installation.
  - 7. Pattern of installation.
  - 8. Pattern type, location, and direction.
  - 9. Pile direction.
  - 10. Type, color, and location of insets and borders.

- 11. Type, color, and location of edge, transition, and other accessory strips.
- 12. Transition details to other flooring materials.
- D. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
  - 1. Carpet Tile: Full-size Sample.
  - 2. Exposed Edge, Transition, and other Accessory Stripping: 12-inch- (300mm-) long Samples.

# 1.4 **QUALITY ASSURANCE**

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
- B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Mockups: Before installing carpet tile, build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.

# 1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104, Section 5, "Storage and Handling."

#### 1.6 **PROJECT CONDITIONS**

- A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."
- B. Environmental Limitations: Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

# 1.7 <u>WARRANTY</u>

- A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
  - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
  - 2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excess static discharge and delamination.
- 3. Warranty Period: 10 years from date of Substantial Completion.
- B. Milliken (CPT-01) Milliken warrants that the carpet will lose no more than ten percent (10%) of its face fiber by weight during the Lifetime of the carpet and no pattern loss (unless installed on stairs, then five years). Carpet treated with StainSmart will resist staining and soiling during the Lifetime of the carpet. Other Lifetime warranties: backing will not delaminate; no edge ravel or "zippering"; carpet will maintain its tuft bind integrity; carpet will not cause a reactivation of old adhesives due to plasticizer migration; carpet will not generate static shock greater than 3.5 kilovolts; the AlphaSan antimicrobial agent will remain active; modular carpet with attached cushion will retain 90% of its cushion resilience; dimensional stability will be maintained; the initial installation of the modular carpet will release from the floor; and carpet will resist moisture penetration with the exception of moisture penetration at the seams.
- C. Mannington Commercial (WOM-01) Lifetime limited warranty, including face wear, moisture barrier, unraveling, tuft bind, and static protection.

# 1.8 <u>EXTRA MATERIALS</u>

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd. (8.3 sq. m).

# PART 2 - PRODUCTS

- 2.1 <u>CARPET TILE</u>:
  - A. Carpet Tile (CPT-01)
    - 1. Milliken; web: https://floors.milliken.com
      - a. Pattern: Metro Modular
      - b. Color: See Finish Key on F-0.1
      - c. Fiber System: Milliken-Certified WearOn® Nylon Type 6 and 6,6

# CARPETING

- d. Dye Method: Digital Dye Infusion (printed carpet)
- e. Gage: 0.37" (9.4 mm)
- f. Weight: 24 oz/yd2 (814 g/m2)
- g. Primary Backing/Backcoating: PVC-Free Comfort Plus® ES Cushion Backing System: TractionBack®
- h. Size: 19.7" x 19.7" (50 cm x 50 cm)
- i. Applied Soil-Resistance Treatment: StainSmart®
- j. Antimicrobial Treatment: Antimicrobial AlphaSan®
- k. Total Product Thickness: 0.133" (3.38 mm)
- 1. Construction: Patterned Cut & Loop, Tip Sheared
- m. Installation Method: Monolithic
- B. Entryway Carpet Tile (WOM-01)
  - 1. Mannington Commercial; web: www.manningtoncommercial.com
    - a. Pattern: Ruffian II
    - b. Color: See Finish Key on F-0.1
    - c. Fiber System: Type 6,6 Nylon
    - d. Dye Method: Solution
    - e. Gauge: 5/32
    - f. Face Weight: 38 Ounces per sq. yd.
    - g. Construction Type: Non-Patterned Loop Tip Shear
    - h. Primary Backing/Backcoating: 100% Synthetic
    - i. Size: 24" X 24"
    - j. Applied Soil-Resistance Treatment: XGUARD
    - k. Antimicrobial Treatment: none
    - 1. Radiant Panel (ASTM E-648): Class I (Direct Glue)
    - m. Smoke Chamber (ASTM E-662): Less than 450 (Flaming Mode)
    - n. Methenamine Pill Test (ASTM D-2859): Passes
    - o. Dimensional Stability Aachen Test: Passes
    - p. Electrostatic Propensity: Less than 3.0 KV
    - q. Pile Thickness: .155 inches
    - r. Installation Method: Monolithic

# 2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydrauliccement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
  - 1. VOC Limits: Provide adhesives with VOC content not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).

## PART 3 - EXECUTION

# 3.1 <u>EXAMINATION</u>

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
  - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
  - 2. Subfloor finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
  - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. For wood subfloors, verify the following:
  - 1. Underlayment over subfloor complies with requirements specified in Division 06 Section "Rough Carpentry."
  - 2. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.
- D. For metal subfloors, verify the following:
  - 1. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.
- E. For painted subfloors, verify the following:
  - 1. Perform bond test recommended in writing by adhesive manufacturer.
- F. For raised access flooring systems, verify the following:
  - 1. Access floor complies with requirements specified in Division 09 Section "Access Flooring."
  - 2. Access floor substrate is compatible with carpet tile and adhesive if any.
  - 3. Underlayment surface is flat, smooth, evenly planed, tightly jointed, and free of irregularities, gaps greater than 1/8 inch (3 mm) protrusions more than 1/32 inch (0.8 mm), and substances that may interfere with adhesive bond or show through surface.
- G. Proceed with installation only after unsatisfactory conditions have been corrected.
## 3.2 <u>PREPARATION</u>

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider and protrusions more than 1/32 inch (0.8 mm), unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.
- E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

# 3.3 <u>INSTALLATION</u>

- A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders.

H. Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

## 3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
  - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
  - 2. Remove yarns that protrude from carpet tile surface.
  - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protection of Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 10

#### SECTION 09 72 00 - WALLCOVERINGS

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes the following:
  - 1. Impact Resistant Vinyl Wallcovering
  - 2. Vinyl Wallcovering
  - 3. Surface Mounted Corner Guard
- B. Related Sections:
  - 1. Division 09 Section "Painting".

## 1.3 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product Data: For each type of product indicated. Include data on physical characteristics, durability, fade resistance, and flame-resistance characteristics.
- C. Shop Drawings: Show location and extent of each wall-covering type. Indicate seams and termination points.
- D. Samples for Initial Selection: For each type of wall covering indicated.
- E. Samples for Verification: Full width by 36-inch- (914-mm-) long section of wall covering.
  - 1. Sample from same print run or dye lot to be used for the Work. Mark top and face of fabric.
- F. Qualification Data: For qualified testing agency.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for wall covering.

H. Maintenance Data: For wall coverings to include in maintenance manuals.

## 1.4 **QUALITY ASSURANCE**

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for wallcovering installation indicated.
  - 1. Engage an installer who employs workers for the Project who are trained or certified by manufacturer for installation techniques required.
- B. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Surface-Burning Characteristics: As follows, per ASTM E 84:
    - a. Flame-Spread Index: 15 or less.
    - b. Smoke-Developed Index: 250 or less.
- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
  - 1. Build mockups for each type of wall covering on each substrate required. Comply with requirements in ASTM F 1141.
  - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.5 **PROJECT CONDITIONS**

- A. Environmental Limitations: Do not deliver or install wall coverings until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Lighting: Do not install wall covering until a permanent level of lighting is provided on the surfaces to receive wall covering.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

## 1.6 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Wall-Covering Materials: For each type, full-size units equal to 5 percent of amount installed.
  - 2. Corner Guard Covers: Full-size plastic covers of maximum length equal to 2 percent of each type, color, and texture of units installed, but no fewer than two, 4-foot- (1.2-m-) long units.

# PART 2 - PRODUCTS

## 2.1 <u>VINYL WALL COVERING</u>

- A. Impact Resistant Wall Solution: (RWC-01)
  - 1. Manufacturer: Wolf Gordon, Web:www.wolfgordon.com
  - 2. Pattern: Rampart "Sparta"
  - 3. Color: See Finish Key on F-0.1
  - 4. Content: 100% Vinyl
  - 5. Total Weight: 35 oz per linear yard.
  - 6. Width: 52 inches (1321 mm).
  - 7. Finish: Surcoat stain and abrasion-resistant
  - 8. Hanging Information: Reserve Hang, Random Match; Can be railroaded.
  - 9. Fire Rating: Passes ASTM E84.
- B. Vinyl Wallcovering: (VWC-01)(VWC-02)
  - 1. Manufacturer: DeNovo Wall, Web:www.denovowall.com
  - 2. Pattern: Zeteo Linen
  - 3. Color: See Finish Key on F-0.1
  - 4. Content: 100% Vinyl, Low VOC Type II
  - 5. Backing: Osnaburg, 10% Recycled content
  - 6. Total Weight: 20 oz per linear yard.
  - 7. Width: 52"/54"
  - 8. Repeat: 24"V, 27"H
  - 9. Hanging Information: Random Match, Reversible
  - 10. Fire Rating: Passes ASTM E84, Class A Fire Rated

# 2.2 CORNER GUARDS (CG-01)

A. Surface-Mounted, Resilient, Plastic Corner Guards: Surface mounted corner guard with 1-1/2" legs self-adhesive tape backing; fabricated with 90- or 135-degree turn to match wall condition.

- 1. Manufacturers: Construction Specialties, Inc.
- 2. Product: VA Series, VA-200N
  - a. Cover: Extruded rigid plastic, Acrovyn 4000
  - b. Color and Texture: See Finish Key on F-0.1
  - c. Height: Partial Height

### 2.3 <u>ACCESSORIES</u>

- A. Adhesive: Mildew-resistant, clay-based vinyl wallcovering adhesive, for use with specific wall covering and substrate application; as recommended in writing by wall-covering manufacturer and with a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Primer/Sealer: Mildew resistant, complying with requirements in Division 09 Section "Interior Painting" and recommended in writing by wall-covering manufacturer for intended substrate.

## PART 3 - EXECUTION

### 3.1 <u>EXAMINATION</u>

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 <u>PREPARATION</u>

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
  - 1. Moisture Content: Maximum of 4 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
  - 2. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
  - 3. Painted Surfaces: Treat areas susceptible to pigment bleeding.

- D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finish with fine sandpaper.
- E. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- F. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 6 days before installation.

## 3.3 INSTALLATION

- A. General: Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated except where more stringent requirements apply.
- B. Wall protection rolls are numbered consecutively and should be cut and installed in reverse sequence, starting with the highest numbered roll.
- C. Cut the material into full strip widths as they will be hung, and lay them flat on the floor in a heated room the day before installation to remove any flat spots that may have occurred when storing.
- D. Reverse hang alternate strips of material in sequence, as they are cut from the roll.
- E. Install wall covering with no gaps or overlaps, no lifted or curling edges, and no visible shrinkage.
- F. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.
- G. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without any overlay or spacing between strips. Trim at the ceiling and base with a sharp razor blade.

## 3.4 <u>CLEANING</u>

- A. Remove excess adhesive immediately with a natural sponge at finished seams, perimeter edges, and adjacent surfaces. Solvents including alcohol and products that contain alcohol should not be used.
- B. Use cleaning methods recommended in writing by wall-covering manufacturer.
- C. Replace strips that cannot be cleaned.
- D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 09 72 00

## PAINTING

## SECTION 09 90 00 - PAINTING

#### (FILED SUB-BID REQUIRED)

## PART 1 GENERAL

### 1.1 <u>TIME, MANNER AND REQUIREMENTS FOR FILING SUB-BIDS</u>

- A. Sub-Bids shall be submitted in accordance with the provisions of General Laws, Chapter 149, Section 44A, inclusive, as amended.
- B. Sub-Bids for work under this Section shall be received electronically, until 2:00
  p.m. on Tuesday, October 29, 2019, at which time and place all Trade Contractor Bids shall be duly recorded.
- C. This project is being Electronically Bid (E-Bid). All bids shall be submitted online at <u>www.Projectdog.com</u>. Hard copy bids will not be accepted by the Awarding Authority. E-Bid tutorials and instructions are available within the specifications and online at <u>www.Projectdog.com</u>. For assistance, call Projectdog, Inc at (978)499-9014, M-F 8:30AM-5PM.
  - a. All required bid forms must be submitted in **PDF** format only. The bidder must complete all required signatures either digitally (using Adobe Acrobat) or manually (print, sign and scan as a PDF file).
  - b. Bid Bonds issued by a surety company shall be submitted on the E-Bid page. Bid bonds in the form of cash or check shall be completed and delivered as outlined on the Bid Bond Affidavit form.
  - c. The bidder must enter bid price on the E-Bid form as a whole dollar value only with no punctuation. Sums shall be expressed in both words and figures on the bid form. Note: The E-Bid form will automatically match the word value to the numeric figure entered by the bidder.
  - d. Bidders may save, submit or modify an E-Bid at any time prior to bid close. Once submitted, a bid cannot be edited. To modify a bid the bidder must retract the bid, make any necessary changes, and then submit the bid again. Upon submitting or retracting the bidder will receive a convenience email for informational purposes only. Bidders are encouraged to contact Projectdog, Inc at (978) 499-9014, M-F 8:30AM-5PM, if an email is not received.
  - e. If a bid is submitted prior to an Addendum being issued, the bidder will receive an automated email for informational purposes only. The bidder must review the addendum, retract the bid, acknowledge all addenda, and submit the bid again. If a bidder fails to acknowledge addenda their bid may be rejected by the Awarding Authority.
  - f. Timely submission of an E-Bid shall be the full responsibility of the Bidder. The server clock is the time of record. It is the bidder's responsibility to

review and confirm online that a bid has been submitted and/or retracted and that the bid is 100% true, complete and accurate. All bidders are required to review their submitted E-Bid via the **"View My Bid Package"** link.

- D. Sub-Bids filed with the Awarding Authority shall be accompanied by a Bid Deposit in the form of a certified check or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to the "**Town of Carver**". A bid bond shall be:
  - 1. In a form satisfactory to the Awarding Authority.
  - 2. With a surety company qualified to do business in the Commonwealth and satisfactory to the Awarding Authority.
  - 3. Conditioned upon the faithful performance by the principal of the agreements contained in the Bid. The amount of such bid deposit shall be five percent (5%) of the value of the Bid.
- E. Sub-Bids for work under this Section shall be for the complete work required as specified and as shown on the drawings.
- F. Sub-Bidders are directed to the Instructions to Bidders, and to the requirements that all bidders visit the site to determine the scope of work required under this Section.
- G. Sub-Bidders must comply with all provisions of Division 1, General Requirements, in the same manner as the General Contractor.

# 1.2 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

# 1.3 <u>SUMMARY</u>

- A. This Section includes the following:
  - 1. Interior and Exterior high-performance paint and coating systems including surface preparation.
  - Material Safety Data Sheets/ Environmental Data Sheets: Per manufacturer's MSDS/EDS for specific VOCs (calculated per 40 CFR 59.406). VOCs may vary by base and sheen.
  - 3. South Coast Air Quality Management District (SCAQMD): Rule 1113 Architectural Coatings.
  - 4. Green Seal Inc: GS11 Standard for Paints and Coatings (1<sup>st</sup> Edition, May 20, 1993; GC-03- Environmental Criteria for Anti-Corrosive Paints.
- B. Related Sections:
  - 1. Division 5 Sections for shop priming of metal substrates with primers.

- 2. Division 8 Sections for shop priming doors
- 3. Division 9 Other Finishes not covered by this section.

## 1.4 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product Data: For each paint system indicated, including.
  - 1. Product characteristics.
  - 2. Surface preparation instructions and recommendations.
  - 3. Primer requirements and finish specification.
  - 4. Storage and handling requirements and recommendations.
  - 5. Application methods.
  - 6. Cautions for storage, handling and installation.
- C. Selection Samples: Submit a complete set of color chips that represent the full range of manufacturer's products, colors and sheens available.
- D. Verification Samples: For each finish product specified, submit samples that represent actual product, color, and sheen.
- E. Only submit complying products based on project requirements (i.e. LEED). One must also comply with the regulations regarding VOCs (CARB, OTC, SCAQMD, LADCO). To ensure compliance with district regulations and other rules, businesses that perform coating activities should contact the local district in each area where the coating will be used.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Paint exposed surfaces. If a color of finish, or a surface is not specifically mentioned, Architect will select from standard products, colors and sheens available.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels unless indicated.
- D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
  - 1. Finish surfaces for verification of products, colors and sheens.
  - 2. Finish area designated by Architect.
  - 3. Provide samples that designate primer and finish coats.
  - 4. Do not proceed with remaining work until the Architect approves the mockup.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacturer's name, label, and the following list of information.
  - 1. Product name, and type (description).
  - 2. Application and use instructions.
  - 3. Surface preparation.
  - 4. VOC content.
  - 5. Environmental handling.
  - 6. Batch date.
  - 7. Color number.
- B. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
- C. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing.
- D. Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

## 1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

#### 1.8 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.
- B. Furnish Owner with an additional one percent of each material and color, but not less than 1 gal (3.8 l) or 1 case, as appropriate.

## PART 2 PRODUCTS

## 2.1 <u>MANUFACTURERS</u>

- A. Acceptable Manufacturer: Benjamin Moore and Co., which is located at: 101 Paragon Dr ; Montvale, NJ 07645; Toll Free Tel: 866-708-9181; Email: info@benjaminmoore.com; Web:www.benjaminmoore.com
- B. Substitutions: Coronado Paint Company and Sherwin Williams Paint Company.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01 33 00 Submittal Procedures.
- 2.2 MATERIALS GENERAL

- A. Volatile Organic Compound (VOC) Content:
  - 1. Provide coatings that comply with the most stringent requirements specified in the following:
    - a. 40 CFR 59, Subpart D-National Volatile Organic Compound Emission Standards for Architectural Coatings.
    - b. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- B. Compatibility: Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

# 2.3 MIXING AND TINTING

- A. Except where specifically noted in this section, all paint shall be ready-mixed and pre-tinted. Agitate all paint prior to and during application to ensure uniform color, gloss, and consistency.
- B. Thinner addition shall not exceed manufacturer's printed recommendations. Do not use kerosene or other organic solvents to thin water-based paints.
- C. Where paint is to be sprayed, thin according to manufacturer's current guidelines.

# 2.4 INTERIOR PAINT SYSTEMS

- A. MASONRY: CMU Concrete.
  - 1. Latex Systems: Mechanical Closets, etc.
    - a. Eggshell / Satin Finish:
      - 1st Coat: Benjamin Moore Super Spec® Masonry Interior/Exterior Hi-Build Block Filler 206 (45 g/L), MPI # 4, X-Green 4, LEED 2009, LEED V4, CHPS Certified.
      - 2nd Coat: Benjamin Moore Ultra Spec 500 Latex Eggshell N538 (0 g/L), MPI # 52, X-Green 52, 145, X-Green 145, 139, X-Green 139, LEED 2009, LEED V4, CHPS Certified.
      - 3rd Coat: Benjamin Moore Ultra Spec 500 Latex Eggshell N538 (0 g/L), MPI # 52, X-Green 52, 145, X-Green 145, 139, X-Green 139, LEED 2009, LEED V4, CHPS Certified.
  - 2. Epoxy Systems (Water Base):
    - a. Semi-Gloss Finish: Prisoner Cells, Processing Areas
      - 1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97g/L), MPI # 3, LEED 2009.
      - 2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.
      - 3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.
    - b. Eggshell Finish: Prisoner Cells, Processing Areas

PAINTING

- 1) 1st Coat: Benjamin Moore Super Spec® Interior/Exterior Acrylic High Build Masonry Primer N068 (97 g/L), MPI # 3, LEED 2009.
- 2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.
- 3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Eggshell V342 (73 g/L), MPI # 151, LEED 2009.
- B. METAL (Exposed Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous and Ornamental Iron, Structural Iron, Ferrous Metal, Detention Equipment).
  - 1. Latex Systems:
    - a. Semi-Gloss Finish: metal trim
      - 1) 1st Coat: Benjamin Moore Super Spec® HP Acrylic Metal Primer P04 (47 g/L), MPI # 107, X-Green 107, 134, LEED 2009, CHPS Certified.
      - 2nd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (45 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
      - 3) 3rd Coat: Benjamin Moore Ultra Spec HP D.T.M. Acrylic Semi-Gloss Enamel, HP29 (45 g/L), MPI # 141, X-Green 141, 153, X-Green 153, LEED 2009, LEED V4.
  - 2. Epoxy Systems (Water Base): stairwells
    - a. Semi-Gloss Finish:
      - 1) 1st Coat: Corotech Acrylic Metal Primer V110 (199 g/L), LEED Credit..
      - 2) 2nd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.
      - 3) 3rd Coat: Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss V341 (71 g/L), LEED 2009.
- C. DRYWALL (Walls, Ceilings, Gypsum Board and similar items)
  - 1. Latex Systems: Mechanic room, electric closet, custodial closet, offices a. Eggshell / Satin System:
    - 1) 1st Coat: Benjamin Moore Ultra Spec 500 Interior Latex Primer N534 (0 g/L), MPI # 50, X-Green 50, 149, X-Green 149, LEED 2009, LEED V4, CHPS Certified.
    - 2nd Coat: Benjamin Moore Ultra Spec 500 Latex Eggshell N538 (0 g/L), MPI # 52, X-Green 52, 145, X-Green 145, 139, X-Green 139, LEED 2009 LEED V4, CHPS Certified.
    - 3rd Coat: Benjamin Moore Ultra Spec 500 Latex Eggshell N538 (0 g/L), MPI # 52, X-Green 52, 145, X-Green 145, 139, X-Green 139, LEED 2009, LEED V4, CHPS Certified.
    - b. Flat Finish:
      - 1st Coat: Benjamin Moore Ultra Spec 500 Interior Latex Primer N534 (0 g/L), MPI # 50, X-Green 50, 149, X-Green 149, LEED 2009, LEED V4, CHPS Certified.
      - 2nd Coat: Benjamin Moore Ultra Spec 500 Interior Latex Flat N536 (0 g/L), MPI # 53, X-Green 53, 143, X-Green 143, LEED 2009, LEED V4, CHPS Certified.

- c. Flat Finish : Ceilings
  - 1) 1st Coat: Benjamin Moore Fresh Start High Hiding All Purpose Primer 046 or Fresh Start Alkyd Enamel Underbody 217.
  - 2) 2nd Coat: Benjamin Moore Waterborne Ceiling Paint Interior Latex Flat 508
- D. WOOD (Bullet Resistant Doors, Trims, exposed wood millwork, ornamental woodwork, Partitions, Frames).
  - 1. Stain and Varnish System:
    - a. Gloss Finish:
      - 1) 1st Coat: Lenmar Waterborne Interior Wiping Stain 1WB.1300 (240 g/L), MPI # 186 LEED Credit.
      - 2) 2nd Coat: Lenmar Waterborne Aqua-Plastic Urethane Gloss 1WB.1400 (322 g/L), MPI # 121, 130.
      - 3) 3rd Coat: Lenmar Waterborne Aqua-Plastic Urethane Gloss 1WB.1400 (322 g/L), MPI # 121, 130.
    - b. Satin Finish:
      - 1) 1st Coat: Lenmar Waterborne Interior Wiping Stain 1WB.1300 (240 g/L), MPI # 186 LEED Credit.
      - 2) 2nd Coat: Lenmar Waterborne Aqua-Plastic Urethane Satin, 1WB.1427 (335 g/L), MPI # 121, 128.
      - 3) 3rd Coat: Lenmar Waterborne Aqua-Plastic Urethane Satin, 1WB.1427 (335 g/L), MPI # 121, 128.

# 2.5 EXTERIOR PAINT SYSTEMS

- A. <u>Steel- Unprimed exposed to view:</u>
  - 1. One coat acrylic metal primer
  - 2. Two coats acrylic enamel, semi-gloss or two coats direct to metal semi-gloss enamel.
  - A.1 Latex Systems, Semi-Gloss Finish:
    - 4) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series (5.0 mils wet, 2.0 mils dry).
    - 5) 2nd Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series.
    - 6) 3rd Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series (6.0mils wet, 2.5 mils dry per coat).
- B. <u>Architectural- Decorative Columns</u>
  - a. Satin Finish Early Moisture Resistant Finish:
  - 7) 1st Coat: S-W PrepRite ProBlock Latex Primer Sealer, B51 Series (4 mils wet, 1.4 mils dry).
  - 8) 2nd Coat: S-W Resilience Latex Satin, K43 Series.
  - 9) 3rd Coat: S-W Resilience Latex Satin, K43 Series (4 mils wet, 1.52 mils dry per coat).
  - 10) Color to be determined by Architect. Note: this is not white.

- C. <u>Exterior Gypsum Board Soffit, Latex Systems:</u>
  - 1. 1st Coat: S-W Exterior Latex Primer, B42W08041
  - Series (5.0 mils wet, 2.0 mils dry).
  - 2. 2nd Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series.
  - 3. 3rd Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series (6.0mils wet, 2.5 mils dry per coat).
  - D. <u>METAL Primed surfaces exposed to view: Protection Bollards, Iron,</u> <u>Ornamental Iron, Structural Iron, Steel and Ferrous Metal Latex Systems exposed</u> <u>to view:</u>
    - c. Semi -Gloss Finish:
      - 1st Coat: S-W Recoatable Epoxy Primer, B67 Series (6.0 mils wet, 4.0 mils dry).
      - 2) 2nd Coat: S-W Macropoxy Fast Cure 646-100, B58 Series .
      - 3) 3rd Coat: S-W Macropoxy Fast Cure 646-100, B58 Series A (7.0 mils wet, 5.0 mils dry per coat).
      - 4) Note: Bollard to receive color: "Safety Yellow"- Fluorescent -SW-4084 for Exterior Use.

## PART 3 EXECUTION

- 3.1 EXAMINATION
  - A. Do not begin installation until substrates have been properly prepared; notify Architect of unsatisfactory conditions before proceeding. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
  - B. Proceed with work only after conditions have been corrected and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.
  - C. Previously Painted Surfaces: Verify that existing painted surfaces do not contain lead based paints, notify Architect immediately if lead based paints are encountered.

## 3.2 SURFACE PREPARATION

- A. General: Surfaces shall be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.
  - 1. Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow the surface to dry a minimum of 48 hours before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.
  - 2. Remove items including but not limited to thermostats, electrical outlets,

switch covers and similar items prior to painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

- B. Block (Cinder and Concrete): Remove all loose mortar and foreign material. Surface must be free of laitance, concrete dust, dirt, form release agents, moisture curing membranes, loose cement, and hardeners. Concrete and mortar must be cured at least 30 days at 75 degrees F (24 degrees C). The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments. On tilt-up and poured-in-place concrete, commercial detergents and abrasive blasting may be necessary to prepare the surface. Fill bug holes, air pockets, and other voids with a cement patching compound.
- C. Concrete, SSPC-SP13 or NACE 6: This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems. The requirements of this standard are applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces. An acceptable prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.
- D. Cement Composition Siding/Panels: Remove all surface contamination by washing with an appropriate cleaner, rinse thoroughly and allow to dry. Existing peeled or checked paint should be scraped and sanded to a sound surface. Pressure clean, if needed, with a minimum of 2100 psi pressure to remove all dirt, dust, grease, oil, loose particles, laitance, foreign material, and peeling or defective coatings. Allow the surface to dry thoroughly. The pH of the surface should be between 6 and 9, unless the products are designed to be used in high pH environments.
- E. Drywall Interior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth and all dust removed prior to painting.
- F. Galvanized Metal: Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils. Apply a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP7 is necessary to remove these treatments.
- G. Plaster: Must be allowed to dry thoroughly for at least 30 days before painting, unless the products are designed to be used in high pH environments. Room must be ventilated while drying; in cold, damp weather, rooms must be heated. Damaged areas must be repaired with an appropriate patching material. Bare plaster must be cured and hard. Textured, soft, porous, or powdery plaster should be treated with a solution of 1 pint household vinegar to 1 gallon of water. Repeat until the surface is hard, rinse with clear water and allow to dry.
- H. Steel: Structural, Plate, And Similar Items: Should be cleaned by one or more of the surface preparations described below. These methods are used throughout the

world for describing methods for cleaning structural steel. Visual standards are available through the Society of Protective Coatings. A brief description of these standards together with numbers by which they can be specified follow.

- 1. Solvent Cleaning, SSPC-SP1: Solvent cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation.
- 2. Hand Tool Cleaning, SSPC-SP2: Hand Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before hand tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
- 3. Power Tool Cleaning, SSPC-SP3: Power Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before power tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
- 4. White Metal Blast Cleaning, SSPC-SP5 or NACE 1: A White Metal Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
- 5. Commercial Blast Cleaning, SSPC-SP6 or NACE 3: A Commercial Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 33 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
- Brush-Off Blast Cleaning, SSPC-SP7 or NACE 4: A Brush-Off Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, and loose paint. Tightly adherent mill scale, rust, and paint may remain on the surface. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP 1 or other agreed upon methods.
- 7. Power Tool Cleaning to Bare Metal, SSPC-SP11: Metallic surfaces that are prepared according to this specification, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxide corrosion products, and other foreign matter. Slight residues of rust and paint may be left in the lower portions of pits if the original surface is pitted. Prior to power tool surface preparation, remove visible deposits of oil or grease by any of the methods specified in SSPC-

SP1, Solvent Cleaning, or other agreed upon methods.

- 8. Near-White Blast Cleaning, SSPC-SP10 or NACE 2: A Near White Blast Cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, and other foreign matter, except for staining. Staining shall be limited to no more than 5 percent of each square inch of surface area and may consist of light shadows, slight streaks, or minor discoloration caused by stains of rust, stains of mill scale, or stains of previously applied paint. Before blast cleaning, visible deposits of oil or grease shall be removed by any of the methods specified in SSPC-SP1 or other agreed upon methods.
- 9. High- and Ultra-High Pressure Water Jetting for Steel and Other Hard Materials: SSPC-SP12 or NACE 5: This standard provides requirements for the use of high- and ultra-high pressure water jetting to achieve various degrees of surface cleanliness. This standard is limited in scope to the use of water only without the addition of solid particles in the stream.
- 10. Water Blasting, SSPC-SP12/NACE No. 5: Removal of oil grease dirt, loose rust, loose mill scale, and loose paint by water at pressures of 2,000 to 2,500 psi at a flow of 4 to 14 gallons per minute.

## 3.3 <u>INSTALLATION</u>

- A. Apply all coatings and materials with the manufacturer's specifications in mind. Mix and thin coatings according to manufacturer's recommendations.
- B. Do not apply to wet or damp surfaces. Wait at least 30 days before applying to new concrete or masonry. Or follow manufacturer's procedures to apply appropriate coatings prior to 30 days. Test new concrete for moisture content. Wait until wood is fully dry after rain or morning fog or dew.
- C. Apply coatings using methods recommended by manufacturer.
- D. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.
- E. Apply coatings at spreading rate required to achieve the manufacturers recommended dry film thickness.
- F. Regardless of number of coats specified, apply as many coats as necessary for complete hide, and uniform appearance.
- G. Inspection: The coated surface must be inspected and approved by the Architect just prior to the application of each coat.

# 3.4 <u>PROTECTION</u>

- A. Protect finished coatings from damage until completion of project.
- B. Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

END OF SECTION 09 90 00

### 10 11 00 - VISUAL DISPLAY BOARDS

#### PART 1 - GENERAL

## 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing the following types of visual display boards:
  - 1. Porcelain enamel markerboards (for liquid chalk).
  - 2. Vinyl-fabric-faced cork tackboards.
- B. Related Sections: The following sections contain requirements that relate to this section:
  - 1. Section 06 10 00 "Rough Carpentry" for wood blocking and grounds and installation of visual display boards.

## 1.3 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data: Include manufacturer's data substantiating that tackboard materials comply with requirements indicated.
- C. Shop Drawings: Provide shop drawings for each type of markerboard, and tackboard required. Include sections of typical trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
- D. Samples: Provide the following samples of each product for initial selection of colors, patterns, and textures, as required, and for verification of compliance with requirements indicated.
  - 1. Samples for initial selection of color, pattern, and texture:
    - a. Porcelain Enamel Markerboard: Manufacturer's color charts consisting of actual sections of porcelain enamel finish showing the full range of colors available for each type of markerboard required.
    - b. Vinyl-fabric-faced Cork Tackboards: Manufacturer's color charts consisting of actual sections of vinyl fabric, showing the full range

of colors, textures, and patterns available for each type of vinyl-fabric-faced cork tackboard indicated.

E. Certificates: In lieu of laboratory test reports, when permitted by the Architect, submit the manufacturer's certification that vinyl-fabric-faced cork tackboard materials furnished comply with requirements specified for flame spread ratings.

## 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who is an authorized representative of the manufacturer for both installation and maintenance of the units required for this Project.
- B. Fire Performance Characteristics: Provide vinyl-fabric-faced tackboards with surface burning characteristics indicated below, as determined by testing assembled materials composed of facings and backings identical to those required in this section, in accordance with ASTM E 84, by a testing organization acceptable to authorities having jurisdiction.
  - 1. Flame Spread: 25 or less.
  - 2. Smoke Developed: 10 or less.
- C. Design Criteria: The drawings indicate dimensional width requirements of visual display boards and are based on the specific type and model indicated. Other visual display boards having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions and profiles are minor and do not change the design concept or intended performance as judged by the Architect. The burden of proof of equality is on the proposer. All visual display boards to be 4 feet-0 inch, high by width indicated on documents.

## 1.5 **PROJECT CONDITIONS**

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.
  - 1. Allow for trimming and fitting wherever taking field measurements before fabrication might delay the Work.

#### 1.6 <u>WARRANTY</u>

A. Porcelain Enamel Markerboard Warranty: Furnish the manufacturer's written warranty, agreeing to replace porcelain enamel markerboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking, provided the manufacturer's instructions with regard to handling, installation, protection, and maintenance have been followed. 1. Warranty Period: Lifetime of the building.

### PART 2 - PRODUCTS

## 2.1 <u>MANUFACTURERS</u>

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
  - 1. Porcelain Enamel Marker Boards:
    - a. Claridge Products and Equipment, Inc.
    - b. Greensteel, Inc.
    - c. ADP Lemco, Inc
  - 2. Tackboards:
    - a. Claridge Products and Equipment, Inc.
    - b. Greensteel, Inc.
    - c. ADP Lemco, Inc.

## 2.2 <u>MATERIALS</u>

- A. Porcelain Enamel Markerboards: Provide balanced, high-pressure-laminated porcelain enamel markerboards of 3-ply construction consisting of face sheet, core material, and backing.
  - 1. Markerboard Face Sheet: Provide Manufacturer's standard 24-gauge steel porcelain enamel, Type 1 stretcher-leveled aluminized steel face sheet with fused porcelain enamel coating to steel at approximately 1000 deg F (538 deg C).
    - a. Markerboard Cover Coat: Provide the manufacturer's standard light-colored special writing surface with gloss finish intended for use with liquid felt-tipped markers and magnetic aids.
  - 2. Core: Provide the manufacturer's standard 3/8-inch-thick particleboard core material complying with the requirements of ANSI A208.1, Grade 1-M-1.
  - 3. Backing Sheet: Provide the manufacturer's standard 0.015-inch-thick aluminum sheet backing.
  - 4. Laminating Adhesive: Provide the manufacturer's standard moistureresistant thermoplastic-type adhesive.
- B. Vinyl-Fabric-Faced Tackboards: Provide mildew-resistant, washable, vinyl fabric complying with FS CCC-W-408, Type II, weighing not less than 13 ounces per square yard, laminated to 1/4-inch-thick cork sheet. Provide fabric that has a flame spread rating of 25 or less when tested in accordance with ASTM E 84. Provide color and texture as scheduled or as selected from the manufacturer's standards.
  - 1. Vinyl Manufacturer: Subject to compliance with requirements, provide products of one of the following:
    - a. BF Goodrich, Koroseal, Harborweave.
    - b. Claridge, Fabricork.

- c. K-Pro, Pro-Tak Fabrics.
- 2. Backing: Make panels rigid by factory laminating cork face sheet under pressure to 5/16-inch-thick particleboard backing.

## 2.3 <u>ACCESSORIES</u>

- A. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062inch-thick aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units wherever possible; keep joints to a minimum. Miter corners to a neat, hairline closure.
  - 1. Where the size of boards or other conditions exist that require support in addition to the normal trim, provide structural supports or modify the trim as indicated or as selected by the Architect from the manufacturer's standard structural support accessories to suit the condition indicated.
  - 2. Field-Applied Trim: Provide the manufacturer's standard snap-on trim, with no visible screws or exposed joints.
  - 3. Chalktray: Furnish the manufacturer's standard continuous, solid extrusion-type aluminum chalktray with ribbed section and aluminum ends, for each markerboard.
  - 4. Map Rail: Furnish map rail at the top of each markerboard, complete with the following accessories:
    - a. Display Rail: Provide continuous cork display rail approximately 1 inch wide, integral with the map rail.
    - b. End Stops: Provide one end stop at each end of the display rail.
- B. Metal Map Hooks: Provide 4 map hooks for each display rail.

## 2.4 FABRICATION

- A. Porcelain Enamel Markerboards: Laminate facing sheet and backing sheet to core material under pressure with manufacturer's recommended flexible, waterproof adhesive.
- B. Assembly: Provide factory-assembled markerboard and tackboard units, except where field-assembled units are required.
  - 1. Make joints only where total length exceeds maximum manufactured length. Fabricate with the minimum number of joints, balanced around the center of the board, as acceptable to the Architect.
  - 2. Provide the manufacturer's standard vertical joint system between abutting sections of markerboard.
  - 3. If required, provide manufacturer's standard mullion trim at joints between markerboard and tackboard.

## 2.5 <u>FINISHES</u>

A. General: Comply with NAAMM "Metal Finishes Manual,, for recommendations relative to application and designations of finishes.

1. Finish designations prefixed by "AA" conform to the system established by the Aluminum Association for designating aluminum finishes.

## PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Deliver factory-built markerboard and tackboard units completely assembled in one piece without joints, wherever possible. Where dimensions exceed panel size, provide 2 or more pieces of equal length as acceptable to the Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.
- B. Install units in locations and at mounting heights indicated and in accordance with the manufacturer's instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for a complete installation.
  - 1. Finished vertical surfaces shall be flat, free of warp or bends.
- C. Coordinate job-site assembled units with grounds, trim, and accessories. Join parts with a neat, precision fit.

## 3.2 ADJUST AND CLEAN

- A. Verify that accessories required for each unit have been properly installed and that operating units function properly.
- B. Clean units in accordance with the manufacturer's instructions. Break in markerboards only as recommended by the manufacturer.

#### END OF SECTION 10 11 00

### SECTION 10 12 00 - DISPLAY CASE

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

 A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing and installing the following types of visual display cases:
  - 1. Display case within **Public Lobby 106**, (1 required)
- B. Related Sections: The following sections contain requirements that relate to this section:
  - 1. Section 06 10 00 "Rough Carpentry" for wood blocking and grounds.
  - 2. Section 10 11 00 "Visual Display Boards" for wall mounted display boards.

## 1.3 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.
- B. Shop Drawings: Provide shop drawings for each type of display case required. Include sections of typical trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, layout, and installation details.

#### 1.4 **QUALITY ASSURANCE**

- A. Installer Qualifications: Engage an experienced Installer who is an authorized representative of the manufacturer for both installation and maintenance of the units required for this Project.
- B. Fire Performance Characteristics: Provide vinyl-fabric-faced backgrounds with surface burning characteristics indicated below, as determined by testing assembled materials composed of facings and backings identical to those required in this section, in accordance with ASTM E 84, by a testing organization acceptable to authorities having jurisdiction.
  - 1. Flame Spread: 25 or less.
  - 2. Smoke Developed: 10 or less.

C. Design Criteria: The drawings indicate dimensional width requirements of visual display cases and are based on the specific type and model indicated. Other visual display cases having equal performance characteristics by other manufacturers may be considered provided that deviations in dimensions and profiles are minor and do not change the design concept or intended performance as judged by the Architect. The burden of proof of equality is on the proposer.

## 1.5 <u>WARRANTY</u>

- A. Manufacture guarantees that the products provided will be built in accordance with the drawings and specifications as approved. Manufacture agrees to repair of replace product that may prove to be defective in workmanship or material.
  - 1. Warranty Period: One (1) year from Substantial Completion.

# PART 2 - PRODUCTS

# 2.1 <u>MANUFACTURERS</u>

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
  - 1. Compete Display Case:
    - a. Poblocki Sign Company, Milwaukee, WI, (800)-776-7064, or equal.

## 2.2 <u>MATERIALS</u>

- A. Aluminum extrusions are to be 6063-T5 alloy, conforming to ASTM B-221.
- B. Corners are to have hairline miters and be braced by means of internal aluminum angles. If welding is used, there shall be no visible welds. Fasteners are to be concealed when doors are closed. Frames shall have a continuous back-up member behind the door.
- C. Metals and shapes shall be of sufficient thickness and with proper reinforcement to produce a surface that is free of "oil-canning" and strong enough for size, design and application.

## 2.3 <u>DISPLAY CASES</u>

6.

- A. Provide fully recessed display cases with the following characteristics:
  - 1. Model C, recess mount
  - 2. Construction: Complete Case
  - 3. Usage: Interior
  - 4. Mounting: Fully Recessed
  - 5. Dimensions: 4'-0" high X 6'-0" wide X 1'-2" deep
    - Quantity: One (1) complete unit
  - 7. Doors: Type A, regular sliding doors

9.

12.

- 8. Glazing:
  - 1/4 inch glass, horizontally tempered Dark Bronze anodized Finish:

Top mounted light fixture located within cabinet. 10. Lighting Type: High-output T-8 fluorescent lamps with dual 120 or 277 voltage ballasts and .063 aluminum baffle.

- Lighting Location: 11. Top
  - Shelving: <sup>1</sup>/<sub>4</sub> inch polished plate glass

2

2

- 12 inches Depth of shelving: 13.
- Quantity of Sets: 14.
- Level of Shelves: 15.
- Edgework: Front edge polished, others swiped 16.
- Standards: Surface mounted 17.
- 18. Brackets: Regular, satin zincro finish
- 19. Background location: Full, flat back
- 20. Background type: Fabric over cork
- 21. Locking: Keyed, flush mounted plunger lock

#### 2.5 **ACCESSORIES**

- A. Metal Trim and Accessories: Provide straight, single-length units wherever possible; keep joints to a minimum. Miter corners to a neat, hairline closure.
  - 1. Where the size of cases or other conditions exist that require support in addition to the normal trim, provide structural supports or modify the trim as indicated or as selected by the Architect from the manufacturer's standard structural support accessories to suit the condition indicated.

#### 2.6 FABRICATION

A. Assembly: Provide factory-assembled cases.

# PART 3 - EXECUTION

#### 3.1 **INSTALLATION**

- A. Deliver factory-built cases completely assembled in one piece without joints, wherever possible. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.
- Install units in locations and at mounting heights indicated and in accordance with B. the manufacturer's instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for a complete installation.
  - 1. Finished vertical surfaces shall be flat, free of warp or bends.
- C. Coordinate job-site assembled units with grounds, trim, and accessories. Join parts with a neat, precision fit.

## 3.2 ADJUST AND CLEAN

- A. Verify that accessories required for each unit have been properly installed and that operating units function properly.
- B. Clean units in accordance with the manufacturer's instructions.

# 3.3 <u>SCHEDULE</u>

A. Refer to drawings for installation locations. Provide solid wood blocking for all installations.

END OF SECTION 10 12 00

## <u>SECTION 10 14 19 – CAST METAL SIGNS</u>

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing and installing the following types of signs:
  - 1. Cast Metal Plaques
  - 2. Cast Metal Lettering
- B. Related Sections: The following sections contain requirements that relate to this section:
  - 1. Division 23 Section "Mechanical Identification" for labels, tags, and nameplates for mechanical equipment.
  - 2. Division 26 Section "Electrical Identification" for labels, tags, and nameplates for electrical equipment.
  - 3. Division 26 Section "Emergency Lighting" for illuminated exit signs.

## 1.3 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data: Include manufacturer's construction details relative to materials, dimensions of individual components, profiles, and finishes for each type of sign required.
- C. Shop Drawings: Provide shop drawings for fabrication and erection of signs. Include plans, elevations, and large-scale sections of typical members and other components. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
  - 1. Furnish full-size rubbings for metal plaques.

## 1.4 QUALITY ASSURANCE

A. Single-Source Responsibility: For each separate type of sign required, obtain signs from one source from a single manufacturer.

B. Design Criteria: The specifications indicate size, profiles, and dimensional requirements of signs and are based on the specific type and model indicated. Signs by other manufacturers may be considered provided that deviations in dimensions and profiles are minor and do not change the design concept as judged by the Architect. The burden of proof of equality is on the proposer.

## 1.5 **PROJECT CONDITIONS**

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

# PART 2 - PRODUCTS

# 2.1 <u>MANUFACTURERS</u>

- A. Manufacturers: Subject to compliance with requirements, provide products of one of the following:
  - 1. Manufacturers of Cast Plaques:
    - a. Barlo Signs
    - b. The Southwell Company.
    - c. Matthews International Corporation
    - d. Gemini, Inc.
  - 2. Manufacturers of Cast Metal Letters.
    - a. Metal Arts.
    - b. Gemini, Inc.
    - c. Approved equal

## 2.2 <u>MATERIALS</u>

- A. Fasteners: Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.
- B. Anchors and Inserts: Use nonferrous metal or hot-dipped galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

# 2.3 <u>CAST METAL PLAQUES</u>

 Plaques: Castings shall be free from pits, scale, sand holes, or other defects. Comply with requirements specified for metal, border style, background texture, and finish and with requirements shown for thickness, size, shape, and copy. Hand-tool and buff borders and raised copy to produce the manufacturer's standard satin polished finish. Refer to "Finish" article for other finish requirements.

- Building Dedication Plaque (for mounting within Vestibule 101):
  a. Metal: Bronze.
  - b. Border Style: Single Line, Bevel Edge.
  - c. Background Texture: Manufacturer's standard leatherette finish.
  - d. Background Finish: Provide light oxide stain finish to comply with the requirement specified for bronze finishes, except provide background texture specified above in lieu of mechanical finish indicated.
  - e. Size: 24" x 36".
  - f. Graphic Content and Style: Text and format to be provided by the Architect at a later date, no pictures or insignias.

## 2.4 <u>CAST METAL LETTERS</u>

- A. Furnish and install 6" cast aluminum letters in **Public Lobby 106** to say "**INFORMATION**" and **"RECORDS".**
- B. Furnish and install **10**" cast aluminum letters Exterior Elevation, Western Exposure, to say "CARVER POLICE DEPARTMENT".
- C. Faces are to have a satin finish. Sides are to be filed smooth with all tool marks removed. Fastening of letters, flush mounted. Supply templates for use in installation.
- D. Color: Dark Bronze Anodized, Fine Satin Finish.
- E. Style: Architectural, UPPER CASE ONLY.
- F. For specification purposes, all cast metal letters are as manufactured by Gemini Incorporated, (800)-538-8377, or equal.

#### PART 3 - EXECUTION

#### 3.1 <u>INSTALLATION</u>

- A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
  - 1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
- B. Cast Metal Plaques: Mount plaques using the standard method recommended by the manufacturer for the type of wall surface indicated.
  - 1. Face Mounting: Mount plaques using exposed fasteners with rosettes attached through the face of the plaque into the wall surface.
    - a. Provide toggle bolts for stud wall installations.

# 3.2 <u>CLEANING AND PROTECTION</u>

A. At completion of the installation, clean soiled sign surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

END OF SECTION 10 14 19

## **SECTION 10 14 23 - PANEL ROOM SIGNS**

#### PART 1 - GENERAL

### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

## 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing and installing the following types of signs:
  - 1. Interior, panel rooms signs as specified and scheduled herein and as indicated on the drawings.
  - 2. Stencil template for painted identification of fire rated partitions as indicated on the drawings and required by applicable codes.

## 1.3 <u>SUBMITTALS</u>

- A. Samples: Provide samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.
- B. Product Data: Include manufacturer's construction details relative to materials, dimensions of individual signs, profiles, and finishes for each type of sign required.
- C. Full size or scaled proof of each type of sign for approval before fabrication.

# 1.3 QUALITY ASSURANCE

- A. Code Compliance: Provide panel room signs in conformance with the Uniform Federal Accessibility Standards; Section 4.30, ANSI A117.1; 521 CMR, section 41.1; and Americans with Disabilities Act (ADA), sections 4.28.2, -.3, -.5.
- B. Single-Source Responsibility: For each separate type of sign required, obtain signs from one source from a single manufacturer.

#### 1.4 PROJECT CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication to ensure proper fitting. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

## PART 2 - PRODUCTS

## 2.1 <u>MATERIALS</u>

- A. ADA Panels: Provide 1/8" thick Photopolymer per ANSI A117 and ADA requirements. Letters and graphics shall be raised and Braille shall be raised tactical type detail.
- B. Updatable Panels: ASI Infinity Window Sign or approved equal w/ Anodized Silver Finish & Matte Clear Lens.
- C. Modular Sign Backers: ASI Infinity Chassis or approved equal w/ Powder Coat Black Finish. Modular panels mounted to Chassis w/ ASI Infinity Presstabs or approved equal.
- D. Fasteners: Panels or Backers mounted to surface w/ Double sided foam vinyl VHB.

## 2.2 PANEL ROOM SIGNS

- A. Panel Room Signs: Comply with requirements indicated for materials, thickness, finishes, colors, designs, shapes, sizes, and details of construction.
  - 1. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.
- B. Unframed Panel Room Signs: Fabricate signs with edges mechanically and smoothly finished to conform to the following requirements:
  - 1. Edge Condition: Square cut.
  - 2. Corner Condition: Square.
  - 3. Typical ADA panel Size: See drawings.
  - 4. Typical Updatable panel Size: See drawings
  - 5. Handicapped Accessible Toilet Room Signs: See drawings.
  - 6. Color: Backgrounds to be manufacturer's CUSTOM color as selected by Architect.
- C. Graphic Content and Style: Provide signs that comply with format and wording indicated in Schedule, Section 3.3, and conforming to the following characteristics:
  - 1. Letters and Numerals: 3/4" or 5/8" high Univers 57 Condensed, with a width-to-height ratio of 3:3.5, and a stroke-width to height ratio of 1:5. Upper case only.
  - 2. Braille: Grade 2 (ONLY WHERE ISHA INDICATED)
  - 3. Pictograms: Accompanied by the equivalent verbal description placed directly below the pictogram.

## PART 3 - EXECUTION

# CARVER POLICE CARVER, MA

## 3.1 INSTALLATION

- A. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
  - 1. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
- B. Wall Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:
  - 1. Vinyl-Tape Mounting: Use double-sided VHB foam tape to mount signs. A blank sign is required to be mounted on the reverse side of any glassmounted sign.
  - 3. Mounting Location and Height: Install signs on the wall adjacent to the latch side of the door. Where there is no wall space to the latch side of the door, including at double leaf doors, install signs at the nearest adjacent wall. Mounting height shall be 60" to centerline above the finish floor. Mounting location for such signage shall be so that a person may approach within 3" of signage without encountering protruding objects or standing within the swing of a door.

## 3.2 CLEANING AND PROTECTION

A. At completion of the installation, clean soiled sign surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

Door Number	Quantity	Туре	ADA Panel	Updatable Panel
100A	1	RS-S	100	) yes
101A	1	RS-E	NO SMOKING pictogram only (w/matching back plate for mount	no ng on glass)
102A	1	RS-Ua	RESTROOM (w/ Male/Female/HC pictograms)	I no )
104A	1	RS-S	104	yes
105A	1	RS-Ua	RESTROOM (w/ Male/Female/HC pictograms)	I no )
108A	1	RS-S	108	3 yes
109A	1	RS-S	109	) yes

## 3.3 <u>SCHEDULE: (refer to drawing A-6.3 for further clarifications)</u>
CARVER POLICE CARVER, MA		PANE	EL ROOM SIGNS	10 14 23-4
111A	1	RS-S	107	yes
112A	1	RS-Ua	RESTROOM (w/ Male/Female/HC pictograms)	no
122A	1	RS-DA	SECURE ALL WEAPONS PRIOR TO ENTERING	no
122B	1	RS-DA	SECURE ALL WEAPONS PRIOR TO ENTERING	no
126A	1	RS-E	126 ELECTRICAL	no
126A	1	RS-E	127 MECHANICAL	no
128A	1	RS-S	128	yes
129A	1	RS-S	129	yes
130A	1	RS-S	130	yes
132A	1	RS-S	132 (w/matching back plate for mountin	yes g on glass)
133A	1	RS-S	133 (w/matching back plate for mountin	yes g on glass)
134A	1	RS-S	134	yes
135A	1	RS-S	135 (w/matching back plate for mountin	yes g on glass)
137A	1	RS-Ua	RESTROOM (w/ Male/Female/HC pictograms)	no
140A	1	RS-S	140	yes
141A	1	RS-S	141	yes
142A	1	RS-S	142 (w/matching back plate for mountin	yes g on glass)
143A	1	RS-S	143	yes
145A	1	RS-S	145	yes

CARVER POLICE CARVER, MA		PANE	CL ROOM SIGNS	10 14 23-5
147A	1	RS-S	147	yes
149A	1	RS-S	149 (w/matching back plate for mounting	yes g on glass)
151A	1	RS-S	151	yes
154A	1	RS-ML	MALE LOCKER ROOM (w/ Male pictogram)	no
160A	1	RS-WL	FEMALE LOCKER ROOM (w/ Female pictogram)	n0
161A	1	RS-S	161 (w/matching back plate for mounting	yes g on glass)
162A	1	RS-S	162 (w/matching back plate for mounting	yes g on glass)
163A	1	RS-S	163	yes
164A	1	RS-S	164	yes
101A	1 ANY CO (w/ 1	RS-DA ( NTAINERS INCLUDIN natching BL	FOR THE SAFETY AND SECURIT OF ALL WHO USE THIS BUILDING S BROUGHT INTO THIS BUILDING NG BACKPACKS AND HANDBAGS MAY BE SUBJECT TO SEARCH ANK back plate for mounting on glass	Y no 3 3, 3, 5, H <i>s)</i>
101A	1	RE-E	EXIT	no
152A	1	RE-E	EXIT	no
138A	1	RE-E	EXIT	no
118A	1	RE-E	EXIT	no
125A	1	RE-E	EXIT	no
100B	1	RE-E	EXIT	no

END OF SECTION 10 14 23

### <u>10 14 53 – TRAFFIC SIGNS</u>

#### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

### 1.2 SUMMARY

- A. Contractor shall provide all facilities, labor, materials, equipment, transportation, supervision, and related work necessary to install traffic signs in location(s) shown on the drawings and as detailed.
- B. Provide all facilities, labor, materials, equipment, transportation, supervision, and related work necessary to complete the work in this Specification, and as shown on the Drawings.
- C. All work shall be performed in accordance with applicable codes, permits and regulations, and the requirements of all local, state, and federal agencies having jurisdiction over the work.

#### 1.3 RELATED SECTIONS

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specifications Sections that directly relate to Work of this Section include, but are not limited to:
  - 1. Division 32, Section 32 12 16 Hot Mix Asphalt Pavement.
  - 2. Division 32, Section 32 16 13 Precast Concrete Curb.
  - 3. Division 32, Section 32 13 13 Cement Concrete Pavement.

#### 1.4 REFERENCES AND DEFINITIONS

A. Refer to Division 01, Section 01 42 16 Standard Sitework References & Definitions for definition of specific referenced standards as may be abbreviated in this section.

### 1.5 QUALITY ASSURANCE

A. Refer to Division 01, Section 01 43 00 Quality Assurance for testing and quality standards and for site work defined elsewhere in this specification.

# 1.6 <u>SUBMITTALS</u>

A. Shop Drawings: Provide shop drawings for each item showing dimensions, materials, finishes, anchoring, color selections and any other pertinent manufacturer's information.

# PART 2 - PRODUCTS

# 2.1 <u>MATERIALS</u>

- A. Traffic Signs shall conform to the standards as set by MASSDOT.
- B. Posts shall be square, 12-gauge steel, two-piece breakaway style.

# PART 3 - EXECUTION

# 3.1 INSTALLATION

- A. Posts: Install two-piece breakaway post according to manufacturer's instructions.
- B. Signs: Attached signs to posts using galvanized bolts, washers and nuts sized for the type of sign and post being installed
- C. Height: Provide post so that the bottom of sign shall be 7 feet from grade if located in paved walking surface, 5 feet from grade if located behind walk.
- D. Protect all in-place site furnishing from damage from other work. Any damaged site furnishings shall be replaced with new, rather than repaired, at the Architects direction at no additional cost to the contract.

END OF SECTION 00 22 13

### SECTION 10 21 13 - TOILET COMPARTMENTS

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

 A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing and installing stock, manufactured toilet compartments as specified and where indicated on the drawings.
- B. Types of toilet partitions and urinal screens include:
  - 1. Solid phenolic core.
- C. Style of Toilet Compartment, include:
  - 1. Floor mounted, overhead braced, toilet partitions.
  - 2. Wall mounted urinal screens
- D. Toilet accessories, such as grab bars are specified in Section 10 28 00 "Toilet Accessories".

# 1.3 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for materials, fabrication, and installation including catalog cuts of anchors, hardware, fastenings, and accessories.
- C. Shop drawings for fabrication and erection of toilet compartment assemblies not fully described by product drawings, templates, and instructions for installation of anchorage devices built into other work.
- D. Samples of full range of colors for each type of unit required. Submit 6-inchsquare samples of each color and finish on same substrate to be used in work, for color verification after selections have been made.

#### 1.4 <u>QUALITY ASSURANCE</u>

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of work.

However, allow for adjustments where taking of field measurements before fabrication might delay work.

B. Coordination: Furnish inserts and anchorages which must be built into other work for installation of toilet compartments and related items. Coordinate delivery with other work to avoid delay.

# PART 2 - PRODUCTS

# 2.1 <u>MANUFACTURERS</u>

- A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
  - 1. Solid Phenolic:
    - a. American Sanitary Partition Corp.
    - b. Bobrick Washroom Equip, Inc.
    - c. Flush-Metal Partition Corp.
    - d. Global Steel Products, Corp.
    - e. General Partitions Mfg. Corp.

# 2.2 <u>MATERIALS</u>

- A. General: Provide materials which have been selected for surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections on finished units are not acceptable.
- B. Solid Phenolic: Provide <sup>3</sup>/<sub>4</sub> inch thick solid phenolic doors and pilasters and <sup>1</sup>/<sub>2</sub> inch thick solid phenolic partitions and panels. Provide solid phenolic core with multiple resin-impregnated kraft, color, and clear Melamine surface sheets fused at high temperature and pressure. Edges shall be polished phenolic warranted for 10 years against delamination, corrosion or breakage.
- C. Hardware and Accessories: Heavy duty operating hardware and accessories of ASTM 162, Type 302/304 Stainless Steel, #4 satin finish.
- D. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, chromium-plated steel, or brass, finished to match hardware, with theft-resistant-type heads and nuts. For concealed anchors, use stainless steel.
- E. Fire resistance characteristics per ASTM E-84 Tests: flame spread of 0-25 max. smoke density 100 max.

# 2.3 <u>FABRICATION</u>

- A. General: Furnish doors, fabricated for compartment system. Furnish units with cutouts, drilled holes, and internal reinforcement to receive hardware and accessories as indicated.
- B. Door Dimensions: Unless otherwise indicated, furnish 24-inch-wide in-swinging doors for ordinary toilet stalls and 32-inch-wide (clear opening) out-swinging doors for stalls equipped for use by handicapped.
- C. Hardware: Furnish hardware for each compartment to comply with ANSI A117.1 and U.S. ADA Guidelines for handicapped accessibility and as follows:
  - 1. Hinges: Continuous hinge full height of door. Type 304 satin finish stainless steel; extra heavy duty 16 gauge. Through bolted to door and stile with 12 theft-resistant, one way screws fastened into threaded metal inserts.
  - Latch and Keeper: Door latch with shock resistant nylon track into 1 inch wide keeper formed from one piece 1/8 inch 11 gauge stainless steel. Keeper shall be through bolted to stile with theft resistant one-way screws fastened into threaded metal inserts. Vinyl coated door stops.
  - 3. Coat Hook: Manufacturer's standard unit, combination hook and rubbertipped bumper, sized to prevent door hitting mounted accessories.
  - 4. Door Pull: Manufacturer's standard unit for out-swinging doors. Provide pulls on both faces of handicapped compartment doors.
  - 5. Pilaster Shoes: ASTM A 167, Type 304 stainless steel not less than 4 inches high, finished to match hardware.
  - 6. Overhead bracing: Continuous stainless steel at all sides and subdivisions.

# 2.4 <u>FINISH</u>

A. Color: One (1) of manufacturer's standard colors for <u>each room</u> indicated to receive toilet partitions. Color to be as selected by Architect from manufacturer's standard colors, or as indicated on the Finish Schedules.

# PART 3 - EXECUTION

# 3.1 INSTALLATION

A. General: Comply with manufacturer's recommended procedures and installation sequence. Install compartment units rigid, straight, plumb, and level. Provide clearances of not more than 1/2 inch between pilasters and panels, and not more than 1 inch between panels and walls.

# 3.2 ADJUST AND CLEAN

A. Hardware Adjustment: Adjust and lubricate hardware for proper operation. Set hinges on in-swinging doors to hold open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors (and entrance swing doors) to return to fully closed position.

B. Clean exposed surfaces of partition system components using materials and methods recommended by manufacturer, and provide protection as necessary to prevent damage during remainder of construction period.

END OF SECTION 10 21 13

# SECTION 10 22 13 - WIRE MESH PARTITIONS

#### PART 1 - GENERAL

# 1.2 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing and installing heavy duty wire mesh partitions, passage doors, and accessories to be installed at the following locations:
  - 1. Main Building: **Armory 150**
  - (<u>Alternate No. 1</u>) Storage Outbuilding: Bulk Evidence Storage B07, Found Property Storage B06, Road Supply Storage B03 as indicated on the drawings.

# 1.3 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data consisting of manufacturer's specification, technical data, and installation instructions.
- C. Shop drawings showing fabrication and installation of wire mesh partitions. Include plans, elevations, and large scale details showing anchorage and accessory items. Provide location template drawings for items supported or anchored to permanent construction.

#### 1.4 **QUALITY ASSURANCE**

A. Manufacturer: Provide wire mesh partitions as complete units produced by a single manufacturer, including necessary mounting accessories, fittings, and fastenings.

#### 1.5 PROJECT CONDITIONS

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible, to ensure proper fitting of work. However, allow for adjustments and fitting wherever taking of field measurements before fabrication might delay work.

# PART 2 - PRODUCTS

# 2.1 <u>MANUFACTURERS</u>

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
  - 1. Hartford Wire Works Company Inc.
  - 2. Acorn Wire and Iron Works, Inc.
  - 3. The G-S Company.
  - 4. approved equal

# 2.2 <u>HEAVY DUTY MESH PARTITIONS</u>

- A. Mesh: 6-gauge crimped steel wire woven into 2-inch diamond mesh (or 10 gauge crimped steel wire woven into 1 <sup>1</sup>/<sub>2</sub>" diamond mesh), securely clinched to frame members.
- B. Frames: Wall Construction
  - 1. Frame Members: 1-1/2-inch by 3/4-inch cold-rolled steel channels with 3/8-inch bolt holes approximately 18 inches o.c.
  - 2. Horizontal Reinforcing Members: 1-1/2-inch by 3/4-inch by 1/8-inch coldrolled steel channel with wire woven through, or two 1-inch by 1/2-inch channels bolted or riveted toe-to-toe through the mesh and secured to vertical members. Provide number of horizontal reinforcing members to suit panel height as recommended by partition manufacturer.
- C. Stiffening Bars: Provide flat bar stiffener posts between all abutting panel frames. Size as recommended by partition manufacturer for partition height required. Increase size of stiffening bars if required to maintain partition rigidity.
- D. Top Capping Bars: 3-inch by 4.1-pound channel secured to top framing member with 1/4-inch "All bolts spaced not more than 28 inches o.c.
- E. Floor Shoes: Cast metal, sized to suit vertical framing and to provide approximately 3 inches clear space between finished floor and bottom horizontal frame members. Furnish units with set screw for leveling adjustment.
- F. Corner Posts: 2-inch by 1/8 inch angles with floor shoe and 3/8 inch bolt holes to align with bolt holes in vertical frame members.

# 2.3 <u>DOORS</u>

A. Sliding Door Assemblies: Door frame of 1-1/2-inch by 3/4-inch by 1/8 inch channel with 1-1/2-inch by 1/8-inch flat bar cover plate on all 4 sides. Provide door with all latching and sliding door hardware. Align bottom of door with bottom of adjacent panels. Door sizes to be as indicated on Drawings.

# B. Locking Mechanisms: Approach Side: Keyed cylinder lock; Interior Side: Thumb turn. Cylinder locks to be furnished by Section 08 71 00.

#### 2.4 <u>FABRICATION</u>

- A. Do not use components less than sizes indicated. Use larger size components as recommended by partition component manufacturer.
- B. Provide bolts, hardware, and accessories for complete installation. All hardware is to be tamper-resistant type.
- C. Finish: Manufacturer's standard shop-applied enamel finish coat (2 coats) over rust inhibitive primer coat (one coat). Color to be selected by Architect at a later date from manufacturer's standard colors.

# PART 3 - EXECUTION

#### 3.1 <u>PREPARATION</u>

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete construction. Coordinate delivery of such items to project site.

#### 3.2 <u>INSTALLATION</u>

- A. Erect partitions plumb, rigid, properly aligned, and securely fastened in place, complying with drawings and manufacturer's recommendations.
- B. Provide additional field bracing as shown or necessary for rigid, secure installation. Erector to provide additional clips and bracing as required.
- C. All panels to extend to underside of finished ceilings. Coordinate the wall panels to accommodate all overhead utilities / ductwork / piping for a complete, secure installation.

### 3.3 ADJUST AND CLEAN

- A. Adjust moving components for smooth operation without binding.
- B. Touch-up damaged finish after completion of installation using field-applied paint to match color of shop-applied finish.

END OF SECTION 10 22 13

#### SECTION 10 28 00 - TOILET AND BATH ACCESSORIES

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing toilet and bath accessory items as shown on the drawings and as specified herein.
- B. Installation of toilet and bath accessories is specified in Section 06 10 00, "Rough Carpentry".
- C. Installation of wood blocking is specified in Section 06 10 00, "Rough Carpentry".

# 1.3 <u>SUBMITTALS</u>

- A. General: Submit the following according to Conditions of Contract and Division 1 Specifications Sections.
- B. Product data for each toilet accessory item specified, including construction details relative to materials, dimensions, gages, profiles, mounting method, specified options, and finishes.
- C. Schedule indicating types, quantities, sizes, and installation locations (by room) for each toilet accessory item to be provided for project.
- D. Setting drawings where cutouts are required in other work, including templates, substrate preparation instructions, and directions for preparing cutouts and installing anchorage devices.
- E. Maintenance instructions including replaceable parts and service recommendations.

#### 1.4 <u>QUALITY ASSURANCE</u>

A. Inserts and Anchorages: Furnish accessory manufacturers' standard inserts and anchoring devices that must be set in concrete or built into masonry. Coordinate delivery with other work to avoid delay.

- B. Single-Source Responsibility: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise acceptable to Architect.
- C. Catalog Standards: Manufacturer's catalog numbers may be shown on drawings for convenience in identifying certain work. Unless modified by notation on drawings or otherwise specified, catalog description for indicated number constitutes requirements for each item.
  - 1. The use of catalog numbers and specific requirements set forth in drawings and specifications are not intended to preclude the use of any other acceptable manufacturer's product or procedures which may be equivalent, but are given for purpose of establishing standard of design and quality for materials, construction, and workmanship.
  - 2. The approval of other listed manufacturers, products does not relieve the Contractor from compliance with the detailed requirements of this Section.

# 1.5 **PROJECT CONDITIONS**

A. Coordination: Coordinate accessory locations, installation, and sequencing with other work to avoid interference with and ensure proper installation, operation, adjustment, cleaning, and servicing of toilet accessory items.

# 1.6 <u>WARRANTY</u>

- A. Warranty: Submit a written warranty executed by mirror manufacturer, agreeing to replace any mirrors that develop visible silver spoilage defects within warranty period.
- B. Warranty Period: 15 years from date of Substantial Completion.
- C. The warranty shall not deprive the Owner of other rights the owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

# PART 2 - PRODUCTS

# 2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide toilet accessories by one of the following:
  - 1. American Specialties, Inc. (ASI)
  - 2. Bobrick Washroom Equipment, Inc. (Bobrick)
  - 3. Georgia-Pacific Professional, or equal.

### 2.2 <u>MATERIALS, GENERAL</u>

- A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 0.034-inch (22-gage) minimum thickness.
- B. Brass: Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flat products with finished edges, ASTM B 16; Castings, ASTM B 30.
- C. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 0.04-inch (20-gage) minimum. Surface preparation and metal pretreatment as required for applied finish.
- D. Galvanized Steel Sheet: ASTM A 527, G60.
- E. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.
- F. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.
- G. Fasteners: Screws, bolts, and other devices of same material as accessory unit, or of galvanized steel where concealed.

# 2.3 <u>SMALL PAPER TOWEL DISPENSER AND WASTE RECEPTACLES (P.T.D.W.R.S)</u>

- A. Small Recess-Mounted Paper Towel Dispenser and Waste Receptacle (<u>P.T.D.W.R.S</u>):
  - 1. Recessed paper towel dispenser and waste receptacle, Contura series.
  - 2. Cabinet: 18-8, type 304, heavy gauge stainless steel. Welded construction, Exposed surfaces have satin finish.
  - 3. Door: 18-8, type 304, 18 gauge stainless steel with satin finish. Drawn one-piece seamless construction. Secured to cabinet with a full-length stainless steel piano hinge. Equipped with tumbler lock keyed like other washroom accessories.
  - 4. Waste Receptacle: 18-8, type 304, 18 gauge stainless steel with satin finish. Formed, one-piece, seamless construction. Removable front panel has same degree of arc as front of paper towel dispenser door. Top edge hemmed for safe handling. Capacity: 3.0 gallons. Unit equipped with LinerMate trash liner holder fabricated with molded plastic trash liner holder sleeve and a 20-gauge, u-shaped support strap, riveted construction.
  - 5. Accepts 350 C-fold or 475 multifold paper towels.
  - 6. Subject to conformance with requirements, provide "Model B-4369", Bobrick, or equal.

# 2.4 PAPER TOWEL DISPENSER AND WASTE RECEPTACLES (P.T.D.W.R.)

# CARVER POLICE CARVER, MA

- A. Recess-Mounted Paper Towel Dispenser and Waste Receptacle (<u>P.T.D.W.R.</u>):
  - 1. Recessed paper towel dispenser and waste receptacle, Contura series.
  - 2. Cabinet: 18-8, type 304, heavy gauge stainless steel. Welded construction, Exposed surfaces have satin finish.
  - 3. Door: 18-8, type 304, 18 gauge stainless steel with satin finish. Drawn one-piece seamless construction. Secured to cabinet with a full-length stainless steel piano hinge. Equipped with tumbler lock keyed like other washroom accessories.
  - 4. Waste Receptacle: 18-8, type 304, 18 gauge stainless steel with satin finish. Formed, one-piece, seamless construction. Removable front panel has same degree of arc as front of paper towel dispenser door. Top edge hemmed for safe handling. Capacity: 15.0 gallons. Unit equipped with LinerMate trash liner holder fabricated with molded plastic trash liner holder sleeve and a 20-gauge, u-shaped support strap, riveted construction.
  - 5. Accepts 600 C-fold or 800 multifold paper towels.
  - 6. 2. Subject to conformance with requirements, provide "Model B-43944", Bobrick, or equal.

# 2.5 TOILET TISSUE DISPENSERS (T.T.D.)

- A. Stainless Steel Surface Mounted "Contura" Series Multi-Roll Toilet Tissue Dispenser:
  - 1. Mounting: Surface mounted, concealed anchorage.
  - 2. Cabinet: 18-8, type 304, heavy gauge stainless steel. Welded construction, Exposed surfaces have satin finish. Radius on top corners of cabinet match corners and edges of door.
  - 3. Capacity: Spindles accommodate two toilet tissue rolls up to 5-1/4" diameter.
  - 4. Subject to conformance with requirements, provide "Model B-4288", Bobrick.

# 2.6 <u>SOAP DISPENSERS (S.D. / S.D.C)</u>

- A. Wall Mounted "Classic" Series Soap Dispenser (S.D.)
  - 1. Surface mounted soap dispenser for liquid and lotion soaps and detergents.
  - 2. Capacity: 40 fluid ounces.
  - 3. Construction: Two tone black and grey. Valve dispenses all-purpose soaps. Vandal resistant lid has keyless locking device, pivots up for easy top filling. Translucent container provides visible soap level. Concealed wall mounting, removable for cleaning.
  - 4. Subject to conformance with requirements, provide "Model B-40", Bobrick.
- B. Lavatory Mounted (S.D.C.):
  - 1. Surface mounted soap dispenser for liquid and lotion soaps and detergents.
  - 2. Capacity: 34 fluid ounces.

- 3. Piston, spout, and top cover: Type 304 stainless steel with bright polished finish.
- 4. Body and shank: High impact resistant plastic.
- 4. Subject to conformance with requirements, provide "Model B-8226", Bobrick.

### 2.7 <u>SANITARY NAPKIN DISPOSAL (S.N.D.)</u>

- A. Surface Mounted "Contura" Series Sanitary Napkin Disposal:
  - 1. Construction: 18-8, type 304, 22 gauge stainless steel with satin finish. Drawn, one-piece seamless construction. Front of cover has same degree of arc as front of container. Radius on corners and edges of cover match side edges of container. Secured to wall with full length stainless steel piano hinge.
  - 2. Subject to conformance with requirements, provide "Model B-270", BOBRICK.

#### 2.8 <u>GRAB BARS (G.B.)</u>

- A. Stainless Steel Type: Provide grab bars with wall thickness not less than 0.05 inch (18 gage) and as follows:
  - 1. Mounting: Concealed, manufacturer's standard flanges and anchorages.
  - 2. Clearance: 1-1/2-inch clearance between wall surface and inside face of bar.
  - 3. Gripping Surfaces: Manufacturer's standard nonslip texture.
  - 4. Heavy-Duty Size: Outside diameter of 1-1/2 inches.
  - 5. Subject to conformance with requirements, provide grab bar units manufactured by Bobrick Washroom Equipment, Inc.:
    - a. "Model B-6806.99 x 42, for side wall and rear wall toilet installations.
    - b. "Model B-6806.99 x 24 for shower installation.
    - c. Refer to drawings for grab bars required for Boot Wash within **Med 138**. Provide size and quantities indicated.

### 2.9 <u>ROBE HOOKS (R.H.)</u>

- A. Single-Prong Single Robe Hook: Heavy-duty satin finished stainless steel singleprong robe hook; rectangular wall bracket with backplate for concealed mounting.
  - 1. Subject to conformance with requirements, provide "Model B-2116", Bobrick.

#### 2.10 <u>MIRRORS (M.W.F. / F.H.M.)</u>

- A. Full Height, Wall Mounted Mirror (<u>Men's Locker Room 156 and Women's</u> Locker Room 159): (F.H.M.)
  - 1. 24"W x 60"H. One-piece, <sup>1</sup>/<sub>2</sub>" x <sup>1</sup>/<sub>2</sub>" x 3/8" channel frame. Type 430 stainless steel with bright polished finish. Mitered corners. Frame screw

points easy replacement of glass. No 1 quality, <sup>1</sup>/4" glass mirror, warranted against silver spoilage for ten (10) years. Corners shall be protected by friction-absorbing filler strips and the back shall be protected by full-size, shock absorbing, water-resistant, nonabrasive, 3/16" thick polyethylene padding. Galvanized steel back shall have integral horizontal hanging brackets located at top and bottom for mounting on concealed rectangular wall hanger to prevent the mirror from pulling away from the wall. Locking devices secure mirror to concealed wall hanger. Mirror shall be removable form the wall. Secured to concealed wall hanger with snaplock design.

- 2. Subject to conformance with requirements, provide "Model B-165-2460", BOBRICK.
- B. Wall Mounted Mirrors with Frames (M.W.F.):
  - 24"W x 36"H. One-piece, <sup>1</sup>/<sub>2</sub>" x <sup>1</sup>/<sub>2</sub>" x 3/8" channel frame. Type 430 stainless steel with bright polished finish. Mitered corners. Frame screw points easy replacement of glass. No 1 quality, <sup>1</sup>/<sub>4</sub>" glass mirror, warranted against silver spoilage for ten (10) years. Corners shall be protected by friction-absorbing filler strips and the back shall be protected by full-size, shock absorbing, water-resistant, nonabrasive, 3/16" thick polyethylene padding. Galvanized steel back shall have integral horizontal hanging brackets located at top and bottom for mounting on concealed rectangular wall hanger to prevent the mirror from pulling away from the wall. Locking devices secure mirror to concealed wall hanger. Mirror shall be removable form the wall. Secured to concealed wall hanger with snaplock design.
  - 2. Subject to conformance with requirements, provide "Model B-165-2436", BOBRICK.

# 2.11 SHOWER RODS, CURTAINS AND HOOKS (S.C.R. / S.C. / S.C.H.)

- A. Shower Rods to be provided within <u>Men's Locker Room 156 and Women's</u> <u>Locker Room 159</u> at Shower areas where indicated on the drawings (Refer to Plumbing Drawings for shower units to be supplied with shower Rods):
  - 1. Subject to conformance with requirements, provide shower curtain rod with concealed mounting.
    - a. "Model B-207", Bobrick, Heavy duty, or equal.
- B. Shower curtain, and hooks to be provided at each shower and for each shower rod installed within <u>Men's Locker Room 156 and Women's Locker Room 159</u> as indicated on the drawings.
  - 1. Subject to conformance with requirements, provide "Model 204-1", BOBRICK, stainless steel shower curtain hooks.
  - 2. Subject to conformance with requirements, provide "Model 204-2", BOBRICK, shower curtain of opaque white vinyl, required height to be coordinated with shower unit.

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# 2.12 MOP / BROOM HOLDERS (M.B.H.)

- A. Mop / Broom holders to be provided at all floor sinks within Custodial Rooms:
  - 1. Subject to conformance with requirements, provide "Model B-223 X 36", BOBRICK, stainless steel mop / broom holder to hold up to four (4) mops per installation.
  - 2. Quantity: Provide one (1) unit to be mounted above floor sink within <u>Custodial 141</u>.

#### 2.13 FABRICATION

- A. General: Only a maximum 1-1/2-inch-diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of toilet or bath accessory units. on either interior surface not exposed to view or back surface, provide additional identification by either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.
- B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight welded seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.
- C. Framed Mirror Units, General: Fabricate frames for glass mirror units to accommodate wood, felt, plastic, or other glass edge protection material. Provide mirror backing and support system that will permit rigid, tamperproof glass installation and prevent moisture accumulation, as follows:
  - 1. Provide galvanized-steel backing sheet, not less than 0.034 inch (22 gage) and full mirror size, with non-absorptive filler material. Corrugated cardboard is not an acceptable filler material.
- D. Mirror Unit Hangers: Provide system for mounting mirror units that will permit rigid, tamperproof, and theft proof installation, as follows:
  - 1. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
- E. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing, resupply, etc. Provide minimum of six (6) keys to Owner's representative.

# PART 3 - EXECUTION

# 3.1 <u>INSTALLATION</u>

A. Install toilet accessory units according to manufacturers, instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.

- 1. Reinforcement of stud walls to support wall-mounted cabinets will be accomplished during wall erection by trade involved; however, indicating accurate location and sizing of reinforcement is responsibility of toilet and bath accessories installer.
- 2. Install toilet accessory units furnished by the owner using fasteners appropriate to substrate as required.
- B. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to manufacturer's instructions for type of substrate involved.
- C. Install grab bars to withstand a downward load of at least 250 lbs, complying with ASTM F 446.

# 3.2 ADJUSTING AND CLEANING

- A. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
- B. Clean and polish all exposed surfaces strictly according to manufacturer's recommendations after removing temporary labels and protective coatings.

# END OF SECTION 10 28 00

### SECTION 10 44 16 - FIRE EXTINGUISHERS AND ACCESSORIES

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes the following at locations indicated on drawings:
  - 1. Fire extinguishers
  - 2. Fire extinguisher cabinets
  - 3. Fire extinguisher mounting brackets
- B. Refer to Section 01 23 00 "Alternates" for work affection this section.

# 1.3 <u>SUBMITTALS</u>

- A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for fire extinguisher cabinets include rough-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type and materials, trim style, door construction, panel style, and materials.
- C. Samples for initial selection purposes in the form of manufacturer's color charts consisting of actual units or sections of units showing full range of colors, textures, and patterns available for each type of fire extinguisher cabinet finish indicated or exposed to view.

#### 1.4 <u>QUALITY ASSURANCE</u>

- A. Single-Source Responsibility: obtain extinguishers and cabinets from one source from a single manufacturer.
- B. Coordination: Verify that extinguisher cabinets are sized to accommodate type and capacity of extinguishers indicated and provided by Owner under separate Contract.
- C. UL-Listed Products: Fire extinguishers shall be UL listed with UL Listing Mark for type, rating, and classification of extinguisher.

- 10 44 16-2
- D. FM-Listed Products: Fire extinguishers approved by Factory mutual Research Corporation for type, rating, and classification of extinguisher with FM marking.

# PART 2 - PRODUCTS

# 2.1 <u>MANUFACTURERS</u>

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. J.L. Industries.
  - 2. Larsen's Manufacturing Co.
  - 3. Potter-Roemer, Inc.
  - B. For the purpose of establishing performance criteria the Contract Drawings and specifications have been based on Larsen's Manufacturing Co.

# 2.2 <u>FIRE EXTINGUISHERS</u>

- A. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard that comply with authorities having jurisdiction and as follows:
  - 1. <u>For all installations</u>: Multipurpose (MP) Dry Chemical Type: UL-rated 4A-80B:C, 10-lb nominal capacity, in enameled steel container, similar to Larsen's, Model MP-10, or equal.

# 2.3 MOUNTING BRACKETS

- A. Brackets: Designed to prevent accidentally dislodging extinguisher, of sizes required for type and capacity of extinguisher indicated, in plated finish, square edge trim
  - 1. Provide standard wall brackets (Larsen's #546, or equal) for extinguishers not located in cabinets.

# 2.4 FIRE EXTINGUISHER CABINETS

- A. General: Provide fire extinguisher cabinets of suitable size for housing fire extinguishers of types and capacities indicated.
  - 1. Provide fire extinguisher cabinets where indicated on the drawings.
- B. Construction: Manufacturer's standard enameled steel box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.
- C. Cabinet Type: Suitable for mounting conditions indicated of the following types:
  - 1. Fully recessed: Cabinet box fully recessed in walls.

- D. Trim Style: Fabricate trim in one piece with corners mitered, welded, and ground smooth.
  - 1. 5/16" Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
    - a. Trim Metal: Of same metal and finish as door.
- E. Door Style: Manufacturer's standard design.
  - 1. Vertical Duo-Panel:
- F. Door Material and Construction: Manufacturer's "vertical duo" construction, of material indicated, coordinated with cabinet types and trim styles selected.
  - 1. Enameled Steel: Manufacturer's standard finish, hollow steel door construction with tubular stiles and rails.
  - 2. Door Glazing: Tempered float glass complying with ASTM C 1048, Type I, Quality q3, Class as follows:
    - a. Clear glass, Class 1 (transparent), tempered.
- G. Identify fire extinguisher in cabinet with FIRE EXTINGUISHER die-cut lettering applied to door.
  - 1. Application Process: Silk screen. Field applied decals will not be acceptable.
  - 2. Lettering Color: Red
  - 3. Application on Door: Vertical on metal section of the door, not on glazing.
- H. Identify <u>bracket-mounted extinguishers</u> with FIRE EXTINGUISHER in red letter decals applied to wall surface.
  - 1. Field applied decal.
  - 2. Lettering Color: Red
  - 3. Application: Vertical decal mounted over bracket location.
- I. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide door pull, exposed, and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 deg.
- J. Fully Recessed Fire Extinguisher Cabinet meeting the requirements of this specification shall be:
  - 1. Larsen's Architectural Series Fire Extinguisher Cabinet, Model No. 2409-R2, or equal.

# 2.5 FINISHES FOR FIRE EXTINGUISHER CABINETS, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering prior to shipping.

### 2.6 <u>STEEL FIRE EXTINGUISHER CABINET FINISHES</u>

- A. Surface Preparation: Solvent-clean surfaces complying with SSPS-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel complying with SSPC-SP 5 (white metal blast cleaning) or SSPC-SP 8 (pickling).
- B. Baked Enamel Finish: Immediately after cleaning and pretreatment, apply manufacturer's standard two-coat baked enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's instructions for applying and baking to achieve a minimum dry film thickness of 2.0 mils.
  - 1. Color and Gloss: As selected by Architect from manufacturer's standard choices for color and gloss. Paint the following:
    - a. Exterior of cabinet, except for those surfaces indicated to receive another finish.
    - b. Interior of cabinet.

# PART 3 - EXECUTION

# 3.1 INSTALLATION

- A. Follow manufacturer's printed instructions for installation.
- B. Install in locations and at mounting heights indicated or, if not indicated, at heights to comply with applicable regulations of governing authorities.
  - 1. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
  - 2. Fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb.

END OF SECTION 10 44 16

#### SECTION 10 51 00 - PERSONAL PROPERTY LOCKERS

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

 A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

1.

- A. This Section includes the following:
  - Metal lockers and accessories, including the following:
    - a. Personal Property lockers (**Prisoner Processing 122**), 3 units, single tier
    - b. Dispatch lockers (**Break Room 111**), 4 units, 3- tier
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 06 10 00 "Rough Carpentry" for wood base, furring and grounds.
  - 2. Section 10 51 13 "Metal Wardrobe Lockers" for fully welded police duty lockers within Locker Rooms.

# 1.3 <u>SUBMITTALS</u>

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data: Manufacturer's printed data including materials, accessories, construction, finishes, assembly, and installation instructions for lockers and benches.
- C. Shop Drawings: Layout and dimensions of metal lockers and benches. Indicate relationship to adjoining surfaces. Show locker elevations and details, fillers, trim, base, sloping tops, and accessories. Include numbering sequence for lockers. Indicate installation and anchorage requirements.
- D. Samples for Initial Color Selection: Manufacturer's color charts showing a full range of available colors.
- E. Maintenance Instructions: Instructions for cleaning lockers and for adjusting, repairing, and replacing locker doors and latching mechanisms.

#### 1.4 **QUALITY ASSURANCE**

A. Single-Source Responsibility: Obtain locker units and accessories from one manufacturer.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver lockers until spaces to receive them are clean, dry, and ready for locker installation.
- B. Protect lockers from damage during delivery, handling, storage, and installation.

#### PART 2 - PRODUCTS

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#### 2.1 <u>MANUFACTURERS</u>

- A. Manufacturer: Subject to compliance with requirements, provide products by one of the following:
  - 1. Penco Products, Inc., Standard Duty Knocked Down Lockers.
  - 2. Republic Storage Systems Company, Inc.
  - 3. Architect's approved equal
- B. Products: Subject to compliance with requirements, provide each type of locker listed:
  - 1. **Dispatch lockers (Break Room 111)**:
    - a. 12"w X 18"d X 72"h, 3-tier, single door (4-wide, for a total of 12 compartments), with sloping hoods, closed metal bases, recess trim, and filler panels as necessary for a finished installation.
  - 2. **Personal Property lockers (Prisoner Processing 122)**:
    - a. 12"w X 18"d X 72"h, single-tier, single door (3-wide, for a total of 3 compartments), with sloping hoods, closed metal bases, and filler panels as necessary for a finished installation.

# 2.2 <u>MATERIALS</u>

- A. Steel: Prime grade mild cold-rolled sheet steel free from surface imperfection, capable of taking a high-grade enamel finish and in compliance with ASTM A1008.
- B. Steel: Sheet steel components shall be fabricated using zinc-coated steel free from surface imperfection, capable of taking a high-grade enamel finish and in compliance with ASTM A879.
- C. Bolts and Nuts: Zinc plated truss fin head bolts and hex nuts.

### 2.3 LOCKERS

A. Standard Duty Lockers:

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- 1. Acceptable Product: Penco Vanguard, knock-down lockers, or equal meeting the performance criteria established herein.
- 2. Tops, Bottoms, Backs, Sides, and Shelves: 24 gauge sheet steel.
- 3. Doors 12 inches or more (305 mm) wide or 20 inches (760 mm) high: 16 gauge sheet steel.
- 4. Doors less than 12 inches (305 mm) wide: 18 gauge sheet steel.
- 5. Legs: 6 inches (150 mm) high (standard).
- 6. No legs (optional).
- B. Locker Body: Steel specially formed for added strength and rigidity and to ensure tight joints at fastening points.
  - 1. Tops and bottoms with three sides formed 90 degrees, the front offset formed to be flush with horizontal frame member.
  - 2. Shelves with four sides formed to 90 degrees, front edge having a second bend.
  - 3. Hole spacing in locker body construction: Not exceeding 9 inches.
  - 4. Form door frame members to a channel shape, not less than 16 gauge steel.
  - 5. Provide vertical door frame members with additional 3/8 inch flange as a continuous door strike.
  - 6. Mortise and tenon intermembering parts; electrically weld together in a rigid assembly capable of resisting strains.
  - 7. Securely weld cross frame members of channel shapes to vertical framing members to ensure rigidity, including intermediate cross frame on double and triple tier lockers.
  - 8. Optional factory assembly of locker bodies using rivets.
  - 9. Center partitions: 24 gauge steel vertical partitions, full depth between bottom and shelf.
- C. Locker Doors: One piece sheet steel.
  - 1. Multi-Point Latch Doors: Full channel formation of adequate depth to fully conceal lock bar on lock side, channel formation on hinge side, right angle formations across top and bottom, with holes for attaching number plates.
  - 2. Provide holes for attaching number plates.
  - 3. Doors over 15 inches (380 mm) wide by 60 inches (1.524 m) or 72 inches high: 3 inch wide 20 gauge full height reinforcing pan welded to inside face of door at 6 inch (150 mm) centers.
  - 4. Box Lockers: Channel formations on lock and hinge sides, right angle flanges on top and bottom; pre-punch doors for padlock latch and friction catch and built-in combination and key locks.
  - 5. Ventilation: Provide louvered doors in manufacturer's standard louver pattern.
    - a. Doors 60 inches or Higher: Louvers in groups of 6 at top and bottom.
    - b. 36 inch (0.914 m) High Doors: 3 and 6 louvers.
    - c. 30 inch (0.762 m) High Doors: Minimum one group of 6 louvers.

- d. 24 inch (0.610 m) High Doors: Minimum one group of 3 louvers.
- D. Locking:
  - 1. **Personal Property Lockers (Prisoner Processing 122)**: Provide **builtin** <u>key</u> locks. Each locker to be keyed to one (1) masterkey. Provide a minimum of three (3) masterkeys for Owner's use.
  - 2. **Dispatch Lockers (Break Room 111)**: Provide **built-in** <u>combination</u> **locks**. Each locker to be keyed to one (1) masterkey. Provide a minimum of three (3) masterkeys for Owner's use.
- E. Hinges:
  - 1. Two inch high, 0.074 inch thick sheet steel, double spun, full loop, tight pin, projection welded to door frame and securely fastened to the door with two steel rivets.
    - a. Doors over 48 inches (1.066 m) high: Three 2 inch (51 mm) high five-knuckle hinges.
    - b. Doors over 24 inches (1.066 m) wide: Four 2 inch (51 mm) high five-knuckle hinges.
    - c. All other doors: Two 2 inch (51 mm) high five-knuckle hinges.

# 2.6 LOCKER ACCESSORIES

A. Number Plates: Provide each locker with a polished aluminum number plate, 2-1/4 inches wide by 1 inch high, with black numerals not less than 3/8 inch high; attach to face of door with two aluminum rivets.

- B. Closed Bases: 18 gauge closed metal front and end bases, finished to match lockers.
- C. Continuous Sloped Hoods: 18 gauge steel, slope rise equal to 1/3 of the locker depth (18.5 degrees), plus a 1 inch vertical rise at front.
  - 1. Supplied in 72 inch (1829 mm) lengths only.
  - 2. Slip joints without visible fasteners at splice locations.
  - 3. Provide necessary end closures.
  - 4. Finish to match lockers.
- D. Front Fillers: 20 gauge steel formed in an angle shape, with 20 gauge slip joint angles formed in an angle shape with double bend on one leg forming a pocket to provide adjustable mating with angle filler.
  - 1. Attachment by means of concealed fasteners.
  - 2. Finish to match lockers.
- E. Zee Bases for Knock-Down Lockers: 14 gauge, steel flanged outward at top for support of lockers, flanged inward at bottom for anchoring to floor.
  - 1. Height: 4 inches
- F. Recess Trim: 18 gauge steel, 3 inch face dimension.

- 1. Vertical and/or horizontal as required.
- 2. Standard lengths as long as practical.
- 3. Attach to lockers with concealed clips.
- 4. Provide necessary finish caps and splices.
- 5. Finish to match lockers.

#### 2.7 <u>FABRICATION</u>

- A. Fabricate lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make exposed metal edges free of sharp edges and burrs, and safe to touch.
  - 1. Form locker body panels, doors, shelves and accessories from 1-piece steel sheet unless otherwise indicated.

#### 2.8 FINISHES, GENERAL

- A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.
- B. Finish all steel surfaces and accessories, except prefinished stainless-steel and chrome-plated surfaces.
- C. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering prior to shipment.
- D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within ½ of the range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved samples and they are assembled or installed to minimize contrast.

#### 2.9 <u>STEEL SHEET FINISHES</u>

- A. Surface Preparation: Solvent-clean surfaces complying with SSPC-SP 1 to remove dirt, oil, grease, and other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel complying with SSPC-SP 5 (White Metal Blast Cleaning) or SSPC-SP 8 (Pickling), and phosphatize surfaces.
- B. Finish: Enamel powder coat paint finish electrostatically applied and properly cured to manufacturer's specifications for optimum performance. Finishes containing volatile organic compounds and subject to out-gassing are not acceptable.
  - 1. Powder Coat Dry Thickness: 1 to 1.2 mils
  - 2. Color and Gloss: As selected by Architect from manufacturer's standard colors. One (1) color may be selected for <u>each</u> installation location.

#### PART 3 - EXECUTION

### 3.1 <u>INSTALLATION</u>

- A. Install metal lockers complete with accessories according to manufacturer's recommendations. Install plumb, level, rigid, and flush.
- B. Connect together locker groups with standard fasteners according to manufacturer's recommendations, with no exposed fasteners on face frames.
- C. Anchor lockers to bases and walls at intervals recommended by manufacturer but no greater than 36 inches. Install anchors through back-up reinforcing plates where necessary to avoid metal distortion, using concealed fasteners.
- D. Install recess trim to recessed lockers using concealed fasteners. Provide hairline joints and concealed splice plates.
- E. Install sloping hood units to lockers using concealed fasteners. Provide hairline joints and concealed splice plates.

#### 3.2 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.
- B. Clean interior and exposed exterior surfaces and polish nonferrous metal surfaces.
- C. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit locker use during construction.
- D. Touch up marred finishes, or replace locker units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 10 51 00

# SECTION 10 51 13 - METAL WARDROBE LOCKERS

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing and installing the following:
  - 1. Metal wardrobe lockers and accessories as specified herein and indicated on the drawings at the following locations:
    - a. **Men's Locker Room 156** thirty two (32) 24" wide wardrobe lockers as specified herein.
    - b. **Women's Locker Room 159** nine (9) 24" wide wardrobe lockers as specified herein.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 06 10 00 "Rough Carpentry" for wood furring and grounds required for locker installations.
  - 3. Section 11 19 16 "Evidence & Pistol Lockers" for built-in evidence and pistol lockers.
  - 4. Division 23 "Mechanical" for air distribution system attached to locker tops.
  - 5. Division 26 "Electrical" for power distribution to wardrobe lockers.

# 1.3 <u>PERFORMANCE REQUIREMENTS</u>

A. Design Requirements: Total height of all units shall not be greater than elevations per attached drawings.

# 1.4 <u>SUBMITTALS</u>

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data: Manufacturer's printed data including materials, accessories, construction, finishes, assembly, and installation instructions for lockers.
- C. Shop Drawings: Layout and dimensions of metal lockers. Indicate relationship to adjoining surfaces. Show locker elevations and details, fillers, trim, base, and

accessories. Include locker numbering sequence. Indicate installation and anchorage requirements.

- D. Samples for Initial Color Selection: Manufacturer's color charts showing a full range of available colors.
- E. Maintenance Instructions: Instructions for cleaning lockers and for adjusting, repairing, and replacing locker doors and latching mechanisms.
- F. Warranty: Submit a written warranty, by Contractor, Installer, and Manufacturer, agreeing to repair or replace units which fail in materials or workmanship within the specified warranty period. This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under Contract Documents.

The entire installation will be warranted against defects in material and workmanship of moving parts for 5 years from date of acceptance by the Owner. Provide a 10 year warranty on the frame.

- G. Project detailed completion timeline from date of award showing detailed milestones for manufacturing, delivery and installation.
- H. Reference List: Provide a list of 10 installed systems of same size, scope and magnitude to be contacted by owner. Reference list must include system address, contact and phone number, number and type of lockers.

# 1.5 **QUALITY ASSURANCE**

- A. Installer Qualifications: Engage an experienced installation supervisor who is an authorized and certified representative (employee) of the vendor with 2 years' experience installing systems similar to those required for this project, and certified by the manufacturer. Certification required by manufacturer on manufacturer's letterhead at time of bid. Certifications by sales reps, dealers or distributors are unacceptable. Guaranteed maximum response time to service call of 24 hours required, and must be part of submittal. Qualification must include resume of certified installation supervisor.
- B. Single-Source Responsibility: Obtain metal wardrobe locker units and accessories from one manufacturer.

# 1.6 **PROJECT CONDITIONS**

A. Field Measurements: Verify locker locations by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

- 1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating units without field measurements. Coordinate construction to ensure actual dimensions correspond to established dimensions.
- B. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings". Review methods and procedures related to units including, but not limited to, the following:
  - 1. Inspect and discuss condition and levelness of flooring and other preparatory work performed under other contracts.
  - 2. Review structural loading limitations.
  - 3. In addition to the Contractor and the installer, arrange for attendance of the following:
    - a. Other installers affected by the work of this section.
    - b. The Owner's representative.
    - c. The Architect.
    - d. Manufacturer's representative.

# 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery, Storage, & Handling: Comply with instructions and recommendations of manufacturer for special delivery, storage and handling requirements.
- B. Do not deliver lockers until spaces to receive them are clean, dry, and ready for locker installation.
- C. Protect lockers from damage during delivery, handling, storage, and installation.
- D. Sequence & Scheduling: Sequence installation with other work to minimize possibility of damage and soiling during remainder of construction period.

# PART 2 – PRODUCTS

# 2.1 MATERIALS / BASIS OF DESIGN

- A. Basis-of-design shall be SENTINEL *AIRFLOW* Wardrobe Lockers by TIFFIN METAL PRODUCTS, Tiffin, Ohio USA (800-537-0983), or equal product as manufactured by LINCORA GROUP, Montreal, Quebec, Canada. Products by other manufacturers will be considered provided they comply with technical requirements and match the specified product in layout, configuration, construction, appearance and finish, in accordance with the design concept and intent.
- B. Provide overall wardrobe locker assemblies with the following dimensions where indicated on the drawings:

1. 24" W x 24" D x 72" H. (without bench assembly). Lockers shall be factory assembled to specifications, quantity, and size listed.

# 2.2 PRODUCT DESCRIPTION

- A. Locking Mechanism: Combination Lock with Master Key Override
- B. Locker Material: Top, bottom, back and sides are 14-gauge. Shelves, door and reinforcements are 16-gauge, cold-rolled steel conforming to ASTM A 1008B. All steel to be free from imperfections and capable of taking a high-grade powder coat finish. Surfaces shall be cleaned in a multi-stage process to inhibit corrosion. Door hinges shall be continuous type, 14-gauge.
- C. Finish: All parts shall be finished with heavy (5 mil min) baked on powder coat finish.
- D. Locker Fabrication
  - 1: Frames: Formed as integrated part of sides and tops with doors installed.
  - 2: Body Parts: Formed shelves, tops and bottoms (perforated to allow air to flow through the bottom and out the top of the locker), back panels and sides. All body parts to be attached to assembly by using corrosion resistant nuts/bolts and 3/16" plated steel rivets.
  - 3: Doors: Both doors are formed on all sides and are solid with no louvers. Lift latch operated, right door top and bottom bayonet engaged, allows door to latch when pushed closed without raising lift handle. Equipped with lock as specified in section 2.2.A. Left door is secured in place by right door overlap. Doors can be opened with one-handed operation. No twist handles.
    - a. Doors open at least 130 degrees and have steel 14-gauge continuous full-length hinges.
    - b. Recessed door latch, painted cup with integral door latch/pull so locking device does not protrude beyond face of door, pry resistant.
    - c. Number plates included and shipped loose for installation in factory punched mounting holes.
- E. Interior Equipment: <u>Each</u> 24" wide locker to be supplied with the following:
  - Three (3) small shelves: Two are 7"W x 13-15/16"D x 8"H. Including a lockable compartment for storage of sidearm and/or other valuables. One is 7"W x 10-15/16"D x 8"H. NOTE: All shelves stop 2" from rear of locker to allow a positive flow of fresh air.
  - 2. Two (2) larger shelves (1) 24"W x 13-15/16"D x 4-15/16"H for briefcases and (1) shelf 24"W x 20 -11/16"D x 7-7/8"H for headgear etc.
  - 3. Clothing section, with slotted coat rack bar, 16"W x 22 3/4"D x 55-5/16"H

- 4. Perforated metal boot tray allows dirt/sand to fall thru, easily removable for cleaning, shall sit below the clothing section for the storage and drying of footwear.
- 5. Separate compartment with hook for body armor 7"W x 22-3/4"D x 29-5/16"H allowing a full flow of air around it.
- 6. Single hooks on each side of interior.
- 7. Left door equipped with pegboard type panel with two (2) hooks per door to allow hanging of duty belt.
- 8. Left door furnished with large pocket for police clipboard
- 9. Unbreakable mirror with magnetic attachment (shipped loose)
- 10. Standard knockout placement for running conduit to the locker
- Modular electrical Plug and Play Kit to be provided by locker manufacturer, each locker to include two receptacles. Plug and Play kit to be 3 circuit system with dedicated neutral. Electrical Filed Sub Bid Contractor to provide necessary wiring from circuits indicated to junction boxes adjacent to locker outlet connection in ceiling space of locker room.
- F. Drawer Unit: A separate compartment under each locker, 24"W x 36"D x 18"H, complete with a nominal 22"W x 36"D x 18"H drawer, heavy-duty 200# capacity -28" drawer slides and integrally formed ventilated handles. Keyless lock (Drawer locks when pushed shut. Drawer can be closed when doors are shut. A mechanical release lever located inside of the upper compartment is pulled to unlock the drawer. A hardwood bench in lengths of 2', 4', 6', 8', 10' or 12' (longest length as required) x 9-1/2" D x 1-1/4"H to be attached to the top of drawer unit.

# 2.3 <u>ACCESSORIES</u>

- A. Finish trim and filler panels for a complete installation from finished wall surface to finished wall surface.
- B. Finished end panels to be provided at all exposed locker ends to conceal all fasteners and perforations.

# PART 3 – EXECUTION

# 3.1 INSTALLATION

- A. INSTALLATION: Install metal wardrobe lockers at location shown in accordance with approved shop drawings and manufacturer's instructions for plumb, level, and flush installation.
  - 1. Use Factory Trained and Certified installers
  - 2. Follow all manufacturers' supplied installation specifications without deviation.
  - 3. Perform a post installation walk-thru with the owner for verification of specification adherence and overall performance of the locker system.

- B. Anchor lockers / bases to the floor and wall as recommended by the manufacturer to suit adjacent materials and finishes.
- C. Install continuous fillers using concealed fasteners and holding devices where possible. Provide flush hairline joints against adjacent surfaces to completely close off unwanted openings.
- D. ADJUST & CLEAN: Adjust doors and latches to operate without binding. Verify that the latches are operating properly.
- E. Touch up marred finishes with manufacturer supplied, color matched, aerosol or touch-up paint.

END OF SECTION 10 51 13

### <u>SECTION 10 55 00 – HIGH SECURITY KEY BOX</u>

#### PART 1 - GENERAL REQUIREMENTS

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SCOPE OF WORK</u>

- A. The work under this section consists of furnishing high security key box including all related recessed mounting equipment for masonry construction, hardware and fasteners as required to provide a complete containment system.
- B. Refer to drawings for recessed installation location for one (1) high security key box containment system.
- C. Installation of high security key box recessed mounting kit within masonry construction is by Section 06 10 00 Rough Carpentry.

#### 1.3 **QUALITY ASSURANCE**

- A. High security key box manufacturer must show, to the satisfaction of the Architect, Owner, and Fire Department, that they are fully capable of providing equipment that is in strict accordance with the Contract Drawings and Specifications.
- B. Manufactures shall have at least (5) years active experience in the design/manufacture of equivalent high security key box containment systems.

#### 1.5 <u>SUBMITTALS</u>

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
- B. Product data consisting of manufacturer's technical data and installation instructions for key box units required.
- C. Shop drawings showing fabrication and installation of key box. Include plans, elevations, and large-scale details. Show anchorages and accessory items for a fully recessed installation. Provide location template drawings for items supported or anchored to permanent construction.
#### 1.6 <u>APPLICABLE RATINGS</u>

A. Comply with fire resistive classifications as required by governing authorities and local building codes. Provide materials and application procedures which have been tested in accordance with UL Listing.

#### 1.7 DELIVERY, STORAGE AND HANDLING

A. Equipment shall be delivered to the Project as designated in their original unopened packages, containers and bundles, bearing the manufacture's label, brand name and product identification number.

#### 1.8 <u>COORDINATION</u>

- A. Work of this Section shall be coordinated with the respective trades.
- B. Installation of high security key box within masonry wall construction to be performed by Section 06 10 00– Rough Carpentry.

#### 1.9 <u>PROTECTION</u>

A. Provide adequate protection of all products under this Section from the accumulation of dirt, dust and debris so as to avoid damage to the finished surfaces. The General Trades Contractor shall assure that stored and installed materials are not damaged by other contractors. All costs associated with repairing and replacing damaged materials caused by other contractors shall be paid by the General Trades Contractor.

## PART 2 - PRODUCTS

## 2.1 <u>MANUFACTURER</u>

- A. All High Security Key Box and Recessed Mounting Kit (RMK) described within this section and as indicated on the Contract Drawings, shall be as manufactured by:
  - 1. Knox Company, 1601 W. Deer Valley Road, Phoenix, AZ, (800) 552-5669
- B. For the purpose of establishing performance criteria the Contract Drawings and specifications have been based on Knox Company, or alternate manufacturer having prior approval of the **Town of Carver Fire Department**.

## 2.2 <u>SECURITY KEY BOX</u>

A. Knox Box shall be recessed mount with hinged door. <sup>1</sup>/<sub>4</sub>" plate steel housing, <sup>1</sup>/<sub>2</sub>" thick steel door with interior gasket seal and stainless steel door hinge. Box and

lock shall be UL Listed. Lock has 1/8" thick stainless steel dust cover with tamper seal mounting capability.

- 1. Exterior Dimensions: 7" high X 7" wide
- 2. Lock: UL Listed. Double action rotating tumblers and hardened steel pins accessed by giased cut key.
- 3. Finish: Dark Bronze, manufacturer's proprietary finishing process
- 4. Door Type: Hinged
- 5. Weight: 9 lbs.
- 6. Product Number: 3200 Series Knox Box, Product Number 3274
- B. Recessed Mounting Kit
  - 1. Dimensions: 6-1/2"H x 6-1/2"W x 5"D
  - 2. For mounting within solid board wall construction
  - 3. Includes: Shell housing and mounting hardware

## PART 3 - EXECUTION

#### 3.1 <u>INSTALLATION</u>

- A. Prior to installation all recessed mounting kits must be checked and corrected for rack, twist and out-of-square. Frames must be set true and plumb and remain in alignment until permanently built into walls.
- B. Adjust all components prior to acceptance by Owner.

#### 3.2 <u>ANCHORING</u>

- A. Anchorage devices to masonry required for the work of this Section shall be furnished and installed by Section 04 20 00 Unit Masonry.
- B. It is the responsibility of the General Trades Contractor to determine that high security key box is properly anchored for the type of abuse expected of this equipment.

#### 3.3 MAINTENANCE AND OPERATING INSTRUCTIONS

A. The Key Box manufacturer shall provide two (2) copies of an operation and maintenance manual for the locking and operating devices, including the manufacturer's standard part numbers for each component included in the assembly. These instructions shall be presented prior to final acceptance of the project.

## END OF SECTION 10 55 00

## SECTION 10 55 16 - POSTAL SPECIALTIES

#### PART I - GENERAL

## 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing the following postal specialties:
  - 1. Data Distribution Boxes (mailboxes) to be installed at **Mail 136.**
  - 2. Assembly and installation of Postal Specialties to be by Section 06 10 00 "Rough Carpentry".

#### 1.3 <u>SUBMITTALS</u>

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
- B. Product data consisting of manufacturer's technical data and installation instructions for postal specialty units required.
- C. Shop drawings showing fabrication and installation of postal specialties. Include plans, elevations, and large-scale details. Show anchorages and accessory items. Provide location template drawings for items supported or anchored to permanent construction.

#### PART 2 - PRODUCTS

#### 2.1 <u>MANUFACTURERS</u>

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Data Distribution Boxes, Salsbury Industries, Los Angeles, CA (800) 323-3003, or approved equal.

#### 2.2 <u>METALS AND FINISHES</u>

- A. Aluminum: Alloy and temper best suited for the intended use and finish indicated.
  - 1. Plate and Sheet: ASTM B 209, mill finish, where not exposed.
  - 2. Exposed Finish: Manufacturer's standard matching following BHMA or US finish according to ANSI/BHMA A156.18.

B. Steel: Cold-rolled steel sheet or plate, galvanized where indicated or exposed to outside elements with manufacturer's standard baked-enamel finish in color selected by the Architect.

## 2.3 DATA DISTRIBUTION BOXES

- A. General: Provide horizontal-type mailbox units in size and with features indicated.
- B. Compartment Doors and Trim: Fabricate doors and trim of clear-anodized extruded aluminum to suit type of installation and loading method equal to Series 2400.
  - 1. Identification: Custom engraved doors (#2268) for each compartment.
  - 2. Locking: Manufacturer's standard keyed locks, with two (2) keys per locker (1,000 key changes).
- C. Installation System: Rack ladder to accommodate number of boxes required.
- D. Trim: black snap-on peripheral trim 1-1/4"W x 3/8"D to be provided for full perimeter of installation.
- E. Furnish with solid rear cover (20 gauge steel) (#2250) to be provided for all units. <u>All units to be front loading only at individual compartment</u>.
- F. Materials, sizes and construction shall comply with current mailbox regulations.
- G. Provide data distribution boxes in quantity and arrangement as indicated on drawings.
- H. Provide the following model numbers:
  - 1. Model 2406: Quantity of nine (9)
  - 2. Model 2402: Quantity of three (3)
  - 3. Model 2401: Quantity of three (3)
  - 4. Units to be installed adjacent to **Mail Room 136** in configurations as indicated on the drawings.

#### PART 3 - EXECUTION

- 3.1 **PREPARATION** 
  - A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for preparing substrate, installing anchors, and applying postal specialties units.
- 3.2 <u>INSTALLATION</u>

A. Install units to comply with manufacturer's instructions and final drawings.

END OF SECTION 10 55 16

## SECTION 10 75 16 - FLAGPOLES

#### PART 1 – GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. Provide internal halyard, 25' overall height fiberglass flagpole (<u>2 total</u>) complete with all accessories and flag as herein specified for a complete installation at locations indicated on contract documents.
- B. Related Sections: Division 3 section "Cast-in-Place Concrete" for concrete footings for flagpoles.

## 1.3 <u>PERFORMANCE REQUIREMENTS</u>

- A. Structural Performance: Provide flagpoles capable of withstanding the effects of wind loads as determined according to NAAMM FP 1001-97, Guide Specifications for Design of Metal Flagpoles.
  - 1. Un-flagged wind speed: 120mph
- B. Base flagpole design on maximum standard size nylon flag suitable for use with pole or flag size indicated, whichever is more stringent.

## 1.4 <u>SUBMITTALS</u>

- A. Product Data: For each type of flagpole required, submit manufacturer s technical data and standard installation instructions.
- B. Shop Drawings: Show general layout, jointing, anchorage, support systems, and accessories.

# 1.5 **QUALITY ASSURANCE**

A. Source: Obtain each flagpole as a complete unit from single manufacturer, including fittings, accessories, bases, and anchorage devices.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. General: Spiral wrap flagpoles with a heavy paper or other lightweight wrapping.
- B. Store bare flagpoles in a dry location, protected from the weather and moisture, as recommended by the manufacturer.
- C. Ship to project site in one piece.

# 1.7 <u>WARRANTEE</u>

- A. Fiberglass flagpoles will be free from defects in materials and workmanship, under normal use, proper installation, and responsible care for a period of ten (10) years from date of first shipment to the original owner.
- B. Manufacturer further warrants that during use by the original owner after proper installation and responsible use, all commercial flagpole shafts will withstand wind gusts up to 120 miles per hour, unflagged. The use of oversized flags will negate this warrantee. As well, in the event of extreme weather conditions such as hurricanes, monsoons, tornados etc. it is the responsibility of the owner to remove all flagging in advance of the bad weather.

# PART 2 – PRODUCTS

# 2.1 <u>MANUFACTURER</u>

- A. Manufacturer, subject to compliance with requirements, shall be:
  - 1. Atlantic Fiberglass Products, P.O. Box 3934, Amity Station, New Haven, CT, 1-800-826-6687 (telephone), http://www.atlanticfiberglass.com
- B. Alternate manufacturers meeting the performance and materials as specified shall be considered "or equal" to the specified flagpole.
- C. Specifications have been based upon Atlantic Fiberglass, Model GS-25, Single Mast, internal halyard, ground sleeve installation.

## 2.2 FLAGPOLE TYPE AND CONSTRUCTION

- A. Fiberglass Flagpole Construction: High quality pressure molded fiberglass flagpole fabricates from wrapping fiberglass and polyester around a rubber inflatable bladder and then placing it inside a steel mold which is coated internally with gel coat resulting in a tensile strength not less than 10,000 psi.
  - 1. Model: GS-25
  - 2. Shape: Provide cone-tapered flagpoles, per manufacturer's standard rate of taper and true entasis shape.
  - 3. Finish: Gel-coat finish, color white
  - 4. Above ground height: 25'
  - 5. Base Diameter: 5.5"

- 6. Top Diameter: 2.5"
- 7. Ball Diameter: 6"
- 8. Foundation Size: 22"w X 36"d.
- 9. Halyard Type: Internal halyard with winch mechanism and winch handle
- 10. Accessories: ground sleeve, revolving truck, flash collar, flag clips, finial.

## 2.3 <u>MOUNTING</u>

- A. Ground Sleeve: Provide manufacturer's standard ground sleeve and all mounting accessories for a complete, in-ground installation. Ground sleeve to be specially designed and manufactured to receive flagpole height and diameter as specified herein.
  - 1. Concrete to be furnished and supplied by Division 3 Cast in Place Concrete.

#### 2.4 <u>ACCESSORIES</u>

- A. Finial Ball: Manufacturer's standard finial sized as indicated for height of flagpole.
  - 1. Gold paint is electrostatically adhered to the inside of a clear high density Plexiglas finial
- B. Halyard: Provide internal halyard, winch mechanism, and winch crank handle. Stainless steel plate to be provided with access port with security bolt to prevent unauthorized operation of internal halyard. Winch mechanism to include halyard spool, stainless steel roller with non-ratcheting friction brake, and holding bracket.
- C. Halyard Flag Clips: Provide 2 snap hooks per halyard.
- D. Flash Collar: Manufacturer's 14" standard flash collar manufactured of UV resistant, flexible polypropylene. Color to match flagpole finish.

## 2.5 <u>MISCELLANEOUS MATERIALS</u>

- A. Concrete: Comply with requirements of Division 3 Section "Cast in Place Concrete".
- B. Flags: Furnish the following flags for use with flagpoles:
  - 1. Provide one (1) United States of America flag, 6' x 10', nylon
  - 2. Provide one (1) Commonwealth of Massachusetts flag, 6' x 10', nylon

## PART 3 – EXECUTION

3.1 <u>PREPARATION</u>

- A. Excavation: For foundations, excavate to neat clean lines in undisturbed soil. Remove loose soil and foreign matter from excavation and moisten earth before placing concrete.
- B. Provide forms where required due to unstable soil conditions and for perimeter of flagpole base at grade. Secure forms, foundation tube, ground sleeve, or anchor bolts in position, braced to prevent displacement during concreting.
- C. Place concrete immediately after mixing. Compact concrete in place by using vibrators. Moist-cure exposed concrete for not less than 7 days or use a non-staining curing compound.
- D. Trowel exposed concrete surfaces to a smooth, dense finish, free of trowel marks and uniform in texture and appearance. Provide positive slope for water runoff to base perimeter

# 3.2 FLAGPOLE INSTALLATION

- A. General: Install flagpoles where shown and according to shop drawings and manufacturer's written instructions.
- B. Foundation-Tube Installation: Install flagpole in foundation tube, seated on bottom plate between steel centering wedges. Plumb flagpole and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch layer of elastometric sealant and cover with flashing collar.

END OF SECTION 10 75 16

## **SECTION 11 19 00 - DETENTION EQUIPMENT**

#### PART 1 - GENERAL REQUIREMENTS

#### 1.1 <u>GENERAL PROVISIONS</u>

- A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.
- B. Detention Equipment Manufacturer is designated as DEM in this Section of this specification.

#### 1.2 <u>SCOPE OF WORK</u>

- A. The work under this section consists of furnishing and installation of all Detention Wall Systems consisting of sliding door assemblies (3 total) and swinging door assemblies (2 total) and 7/8 inch laminated glass assembly including all related hardware and fasteners as required and as indicated on the Contract Drawings and as specified herein and as required to make a complete door operating system at Cell 115, Cell 117, Cell 119, Booking 123, and Booking 124
- B. Security Vents (total of 2 at Cell 115, Cell 117, Cell 119, Booking 123, Booking 124 and Shower 120) as indicated on the drawings.
- C. Steel plate bunks (total of 1 at Cell 115, Cell 117, and Cell 119) as indicated on the drawings.
- D. Steel plate access door, frame, and hardware to access plumbing at Cell 119, Cell 115 / 117, and Shower 120.
- E. Steel plate ceiling construction at Cell 115, Cell 117, Cell 119.
- F. Holding bench (1 total) and mounting to masonry construction within **Prisoner Processing 122**.
- G. Bench Seats (2) at **Booking Rooms 123 & 124**.
- H. Detention Equipment Manufacturer shall coordinate work with all other trades under the direction of the General Trades Contractor.

#### 1.3 <u>RELATED WORK SPECIFIED ELSEWHERE</u>

A. Finish painting, as specified under section 09 90 00 - Painting. NOTE: General Trades Contractor shall coordinate the finish painting of the Detention Entrance System including requiring the Painting Contractor to be on the job-site DURING INSTALLATION OF THE DETENTION ENTRANCE SYSTEM to assure that the inaccessible portions of the door and fixed wall system are finish painted prior to hanging the doors. Finish Painting Contractor shall start work 2 days after written notification by Detention Equipment Contractor.

- B. Joint Sealants, Section 07 92 00 for security sealants related to Detention Equipment installations.
- C. Miscellaneous Carpentry, Section 06 10 0, and Gypsum Board Assemblies, Section 09 21 00, for security ceiling construction within detention cells.
- D. HVAC Division 23. HVAC Contractor shall coordinate vent sizes and locations with this contractor.
- E. Electrical / Mechanical Sections Electrical and Mechanical Contractor shall coordinate lighting fixture, intercoms, fire suppression and closed circuit television locations and requirements with this Contractor.

#### 1.4 **QUALITY ASSURANCE**

- A. Detention Equipment Manufacturer must show, to the satisfaction of the Designer and owner, that they are fully capable of completing and servicing the detention equipment in strict accordance with the Contract Drawings and Specifications.
- B. Manufacturers shall have at least five (5) years active experience in the design/manufacture of equivalent detention systems.
- C. Quality Control
  - 1. Allowable Tolerances:
    - (a) Materials: Steel components min. 10 gauge +/-O.006 in. nom. metal thickness.
    - (b) Size: +-1/16 in. width and height.
    - (c) Size: +-1/32 in. frame depth.
    - (d) Glazing: As per manufacturers published standards.
- D. List of Installations
  - 1. Detention Equipment Manufacturer shall submit a list of at least five (5) installations of detention equipment, including locking devices, equal to the requirements of this project, which have been fabricated entirely in his plant and which have been installed by him. These installations shall have been in satisfactory use for a minimum of five years each. Submitted list of installations shall include the following information: Name and location of installation, date of occupancy by Owner, and dollar value of contract.
- E. Manufacturer/Installer
  - 1. The Detention Equipment Manufacturer shall install all detention equipment specified in this section of the specification to assure a single source responsibility.

#### 1.5 <u>SUBMITTALS</u>

- A. Submit shop drawings of all work under this Section to the Designer for approval in accordance with the General Requirements of this Specifications.
- B. Shop Drawings
  - 1. Shop Drawings shall be prepared in the offices of the Detention Equipment Manufacturer, and shall be prepared by designers regularly employed by him. The drawings shall exhibit all necessary dimensions, configurations and connections of detention equipment materials.
  - 2. Shop Drawings shall indicate elevations of each frame type, profiles and gauges of materials, wall conditions of all anchorages, typical and special details of construction, methods of assembling sections, shop finishes, and all other necessary information.
  - 3. Provide details at 3 in. to 1 ft. scale and dimensioned elevations at not less than 3/8 in to 1 ft. scale.
  - C. Templates
    - 1. DEM shall furnish necessary templates for all items of hardware that are applied or installed to door systems.
  - D. Hardware Schedule
    - 1. DEM shall provide a hardware schedule that specifies all hardware items such as lock types, hinges, door closers, door roller assemblies, key schedules etc, that each door requires according to the specifications herein.
    - 2. DEM shall coordinate with the Owner a key schedule specifying all key changes and designating which locks are one-way and two-way and, in the case of one-way locks, the schedule shall indicate on which side of the door the key operation will occur. If a key schedule is not provided by the Owner, the DEM shall submit a proposed schedule to the Owner for approval.
    - 3. DEM shall submit a door schedule along with the hardware schedule specifying door swing, lock mounting side, etc. for all doors in this Section.

## 1.6 FIRE RESISTIVE RATINGS

A. Comply with fire resistive classifications as required by governing authorities and local building codes. Provide materials and application procedures which have been tested in accordance with ANSI/U.L.10B (NFPA 252, ASTM E-152 CAN4 S-104, UBC 43.2).

#### 1.7 DELIVERY, STORAGE AND HANDLING

A. Materials shall be delivered to the Project as designated in their original unopened packages, containers and bundles, bearing the manufacture's label, brand name and product identification number.

- B. Materials shall be properly sorted and stored in an enclosed space protected from damage due to the elements and or other contractors on the project. The General Contractor shall designate a storage area within the building within the closest proximity of where the materials will be installed.
- C. Laminated glass sheet material shall be stored flat, under cover and out of contact with damp surfaces, and in a manner to prevent warping, twisting and/or chipping until ready for installation.

## 1.9 <u>PROTECTION</u>

A. Provide adequate protection of all products under this Section from the accumulation of dirt, dust and debris so as to avoid damage to the finished surfaces. The Detention Contractor shall assure that stored and install materials are not damaged by other contractors. All costs associated with repairing and replacing damaged materials caused by other contractors shall be paid by the Detention Contractor.

## 1.8 <u>GUARANTEE</u>

A. The Detention Equipment Manufacturer shall guarantee that the Detention Benches will be free from defects for a period of one (1) year after OWNER OCCUPATION. This Guarantee shall cover faulty materials and workmanship, but does not cover damage from abuse. Upon notification of any such defects the DEM shall make all necessary repairs and replacements at no cost or expense to the OWNER.

## PART 2 - PRODUCTS

## 2.1 <u>MANUFACTURER</u>

- A. All Detention Holding Cell Sliding / Swinging Doors, Fixed Panels and Frame Assemblies described within this section and as indicated on the Contract Drawings, shall be as manufactured by:
  - 1. GS Company, 7920 Stansbury Road, Baltimore, MD, (401)-284-9549
  - 2. Jails Correctional Products, a division of Fabcor, Inc., Minster, Ohio, (419)-628-4428
  - 3. Kelco / Industrial Fabricators, 4015 E. Baltimore Street, Baltimore, MD 21224, (410) 732-0400
- B. For the purpose of establishing performance criteria the Contract Drawings and specifications have been based on Kelco / Industrial Fabricators, Baltimore, MD.

## 2.2 <u>SECURITY DOOR UNITS</u>

- A. Doors shall be made of bullet-resisting steels complying with UL 752 and other code criteria if applicable. Steel shall be free of scale, pitting or other surface defects. Face sheets for doors shall be not less than 1/8 inch.
  - 1. All materials required for the work specified herein shall be new and produced especially for detention use and shall conform with accepted standards of the Detention Equipment Industry.
  - 2. Detention type hollow metal doors shall have face sheets of 1/8 inch steel with continuous inner-reinforcement full width and height of door. Vertical reinforcement shall be of truss design or 2 inch x 1 inch channels spaced approximately 7 inches on center, either construction shall meet testing criteria as specified in article 2.3 paragraph E.2.a.
- B. Design and Construction
  - 1. All doors shall be of the types as shown on the Contract Drawings, swinging type.
  - 2. Doors shall be of fully welded construction with no visible seams or joints on their faces or vertical edges. Door thickness shall be 2<sup>1</sup>/<sub>4</sub> inch.
  - 3. At all glass stop locations a continuous 10 gauge reinforcement shall be provided, spot welded or stitch welded to face sheets.
  - 4. Face sheets shall be stiffened by continuous formed steel sections spanning the full thickness of the interior space between door faces. These stiffeners shall be provided at all window openings and wherever necessary to provide maximum reinforcement. The stiffeners shall be constructed of 1/8 inch steel and attached to the face sheets with fillet welds and spot welds. Spaces between face sheets shall be sound deadened and insulated with an inorganic noncombustible insulation.
  - 5. Top and bottom edges of doors shall be closed with a continuous steel channel not less than 1/8 inch thick.
  - 6. All doors shall be strong, rigid and neat in appearance, free from warpage or buckle. Corner bends shall be true and straight and of minimum radius for the gauge of metal used.
  - 7. Doors constructed of mill tubing will not be accepted.
- C. Hardware Reinforcements
  - 1. Doors shall be mortised, reinforced, drilled and tapped at the factory for full template hardware, in accordance with the approved hardware schedule. Current templates shall be acquired by the DEM from the hardware manufacturer. All hardware shall be applied by the DEM at his plant to the doors and shipped to the job-site.
  - 2. Minimum gauges for all hardware reinforcements shall be 10 gauge, including but not limited to lock cover plate screws, door pulls, flush bolts and door closers.
- D. Test Reports
  - 1. Testing laboratory shall be a recognized independent testing laboratory capable of complying with the Specifications of the American Society for Testing and Materials. Testing laboratory shall be selected by the DEM and

approved by the designer. Cost or required testing shall be borne by the DEM. Certification and reports shall be furnished direct to the DEM with a copy to the Designer.

- 2. Doors
  - a. The DEM shall submit to the Architect an independent testing laboratory report, certifying the following minimum performance data for a typical security hollow metal door. Test report shall indicate all gauges of component parts and shall describe construction methods. The test sample shall be a 3 feet, x 7 feet, blank door panel.

TEST 1 - STATIC LOAD: Under a static load of 14,000 pounds at quarter points, with the door supported at 6 feet there shall be no more than .58 inch, deflection, without any failure of the door panel.

TEST 2 - RACK (Twist): Under a concentrated load of 7,500 pounds, on one unsupported corner, maximum deflection shall not exceed 3.50 inches with no failure of construction or welds.

#### 2.3 <u>GLAZING FOR FIXED PANEL</u>

- A. Transparent Security Armor: Security transparent armor for doors shall be 7/8 inch thick clear, and shall be constructed from five (5) layers of heat strengthened float glass and four (4) Polyvinyl Butyryl inter-layers of not less than 0.060". Each layer of heat strengthened glass shall be 1/8 inch thick and the total product thickness shall be 7/8 inch thick and shall be "Riotglass Detention Strength" Product no. Riotglass 5-360 as manufactured by Guardian Industries, Inc. or Laminated Glass Corporations "Superguard" or approved equal as determined by the Architect and Owner.
- B. The DEM shall factory glaze all vision panels.
- C. All glazing stops shall be positioned on the non-threat side of the vision panel.

# 2.4 <u>FACTORY-SUPPLIED HARDWARE FOR SECURITY DOORS / FRAMES –</u> <u>SWINGING DOOR ASSEMBLIES AND ACCESS PANELS)</u>

- A. The DEM shall fully prepare and supply the following hardware items, which shall be factory installed by him at his manufacturing plant.
  - 1. Deadlock shall be Southern Steel, Model #1070A-1, Combination Spring and Deadlock as manufactured by Southern Steel, San Antonio, TX, or equal. Deadlock designed for swinging doors where slamlocking is desired. Lock is hollow metal door mounted.
  - 2. Door Pull shall be detention type heavy duty recessed pull #214S as manufactured by Southern Steel, or equal.

- 3. Access panel locks shall utilize Southern Steel, Model #1010A, deadlock, or equal.
- 4. Food pass locks shall utilize Southern Steel, Model1017A, Snap latch, or equal.

# 2.6 <u>FACTORY-SUPPLIED HARDWARE FOR SECURITY DOORS / FRAMES</u> (SLIDING DOOR ASSSEMBLIES AND ACCESS PANELS)

- A. The DEM shall fully prepare and supply the following hardware items, which shall be factory installed by him at his manufacturing plant.
  - 1. Deadlock shall be Southern Steel, Model #1058M-1 x 24VDC, Electromechanical deadlatch, 24 volt, motor operated as manufactured by Southern Steel, San Antonio, TX, or equal. For power requirements, refer to electrical drawings. Deadlatch designed for sliding doors where electric unlocking from a remote station is required. Lock is jamb mounted. A hook-type lock bolt engages a keeper in detention sliding door. Remote switch activates a motor which raises the hookbolt. Spring-loaded, deadlock actuator pin then pushes the door open approximately 1" to 3". The door automatically latches and deadlocks upon closing.
  - 2. Lock Column shall be fabricated from 12 gauge steel plate, and it shall contain a removable cover for access to locking mechanism. The outer surface of the lock access shall be on the same plane as the outer face sheet of the lock column. Surface mounted lock mounting or cover plates will not be accepted.
  - 3. Door Pull shall be detention type heavy duty flush pull #FP4 as manufactured by Folger Adam Co.
  - 4. Access panel locks shall utilize Southern Steel, Model #1010A, deadlock, or equal.
  - 5. Food pass locks shall utilized Southern Steel, Model1017A, Snap latch, or equal.
  - 6. Door Controller: DEM to furnish and install electronic door controller to power all deadlocks and to coordinate release signal from dispatch position within **Communications Dispatch Center 107**. Doors to receive signal to release <u>individually</u>, gang-type release of doors will not be acceptable. Door controller to be countertop model supplied with all switches, faceplates, identifications, and accessories for a complete door controller installation. Exact mounting location within **Communications Dispatch Center 107** to be coordinated with the Owner prior to installation. DEM to be responsible for all wiring installations from cell deadlocks to controller.
- B. Sliding Door Hardware Specifications: The following sliding door hardware is intended to provide a system that is virtually maintenance free, corrosive resistive and smooth operating. Roller wheel assemblies of any kind will not be accepted.
  - 1. <u>#3154 Traveler Track</u> Track shall be #3154 as manufactured by Harken. Track shall be 6061-T6 aluminum which is Hardkote anodized with Teflon impregnation. Track

shall be supported for its entire length. Mounting screws shall be 5/16 inch round flat head stainless steel machine screws spaced at 3-15/16" on center. Track shall be 1.25 inch wide x .75 inch high.

#### 2. <u>#3163 Traveler Car</u> Traveler Car shall be #3163 as

Traveler Car shall be #3163 as manufactured by Harken. Cars shall have maximum working load of 3000 lbs. and breaking load of 7000 lbs.

- 3. <u>Ball Bearings</u> The #3163 traveler car shall ride on recirculating ball bearings. The bearings shall be Duratron for a totally non corrosive bearing system.
- 4. <u>Hanger Assembly</u> Hanger assembly shall be adjustable in height with the use of eccentric bolts. Hanger assemblies shall be constructed with steel having a thickness of not less than <sup>1</sup>/<sub>4</sub> inch.

# 2.5 <u>MATERIAL FINISHES</u>

A. After fabrication, all tool marks and surface imperfections shall be dressed, filled and sanded as required to make all faces and vertical edges smooth, level and free of irregularities. Doors and Vision Panels shall then be chemically treated to insure maximum paint adhesion and shall be spray painted on all exposed surfaces with a rust prohibitive primer that shall be fully cured prior to shipment.

# 2.6 STEEL PLATE CELL CEILING CONSTRUCTION

- A. Steel plate cell ceilings shall be constructed with 3/16 inch open hearth steel, free of scales and pitting.
- B. All connections between steel plate ceilings and walls shall be bolted and welded. All bolts shall be above ceilings and behind back walls, (bolts shall not be exposed to view).

## 2.7 <u>STEEL PLATE BUNKS WITH ENCLOSURE</u>

- A. Steel plate bunks within **Detention Cells (total of 3)** shall be constructed with 10 gauge open hearth steel. They shall span entire length of cell and they shall be supported along ends and back with continuous 2 inch x 2 inch x 3/16 inch angles.
- B. Along front of bunk a vertical plate shall be provided that will completely close in the underside of the bunk. The plate shall be 10 gauge open hearth steel and it shall be welded to bunk with 1 inch welds at 1 foot and connected to floor with a 2 inch x 2 inch x 3/16 inch angle.
- C. DEM shall surface apply a metal sound dampening compound to the inside vertical and horizontal surface of the bunk.
  - 1. Sound dampening compound to be Metal Damping Compound, VBD-10 (3/16" thickness when dry) or Soundamp Damping Sheet, as manufactured by Acoustical Solutions, Richmond, VA, or equal.

# 2.8 <u>CELL VENTS</u>

A. Cell vents shall be of the same gauge steel as where they are mounted, (3/16 inch) plate. They shall be flush mounted plates on the same plane of the material of which they are mounted. The vents shall have 3/16 inch round holes at 5/16 inch on center, staggered. A 2 inch x 2 inch x 3/16 inch angle shall be provided around the perimeter of the vent for attachment by the HVAC contractor. The vents shall be 12 inch square unless noted otherwise on the Contract Drawings. The HVAC Contractor shall calculate air flow requirements and he shall notify the DEM of any changes to vent sizes through the Design/Build Contractor with the approved shop drawings.

# 2.9 HOLDING BENCH

- A. Steel plate holding bench top shall be constructed with 10 gauge open hearth steel. They shall span entire length of bench and shall be supported by metal frames.
- B. Along front of holding bench a vertical plate shall be provided. The plate shall be 10 gauge open hearth steel and it shall be welded to bench top.
- C. Provide steel plate holding bench construction for **Prisoner Processing 119** (1 total) where indicated on the drawings.

## 2.10 <u>BENCH SEATS</u>

- A. Provide a seat where indicated on the drawings within Booking Rooms (2 total) fabricated of 10 gauge stainless steel attached to 3" x 3" x 3/16" structural tubing. Anchor tubing base plate to concrete floor with 3/8" expansion anchors.
  - 1. Provide seat for floor mounting within two (2) **Booking Rooms 123 and 124**.

## PART 3 - EXECUTION

# 3.1 INSTALLATION

- A. Prior to installation all frames must be checked and corrected for rack, twist and out-of-square. Frames must be set true and plumb and remain in alignment until permanently built into walls.
- B. Proper door clearances must be maintained in accordance with manufacturer's requirements for Swinging Door Assemblies, except for special conditions otherwise noted. Where necessary metal hinge shims are acceptable to maintain clearances. Hardware must be applied in accordance with the Hardware Manufacturer's instructions.

- C. All Detention Wall Systems shall be installed by experienced installation crews.
- D. All glazing shall be set according to the glazing manufactures installation instructions.
- E. Adjust all detention hardware prior to acceptance by Owner.

## 3.2 <u>ANCHORING</u>

- A. Anchorage devices required for the work of this Section shall be furnished and installed by the DEM.
- B. It is the responsibility of the DEM to determine that all detention equipment is properly anchored for the type of abuse expected of this equipment.
- C. Masonry Contractor shall secure all built in plates, bars and frames into masonry by filling voids solid with concrete.

## 3.3 <u>FASTENING</u>

- A. DEM shall fasten detention equipment components to each other and to the building construction as detailed or otherwise required to provide a secure installation.
- B. Where spacings or sizes are not shown for fasteners, use fasteners which shall develop of the members being fastened so that failure due to over stress will occur in the member before occurring in the fastening.
- C. Fastenings to concrete shall be with expansion bolts or anchor bolts. Toggle bolts will not be accepted.
- D. Fasteners which must be removed for maintenance or service shall be Torx security screws.
- E. Permanent fastenings shall be welds, screws, or rivets unless otherwise noted. Use security fasteners in all detention rooms.
- F. Where bolts are exposed to detainee's they shall have their threads disturbed or they shall be tack welded or security bolts shall be utilized. Where bolts are not exposed to detainee's, hex head bolts may be utilized.

## 3.4 <u>WELDING</u>

A. Welding shall be executed in accordance with the best-approved standard, as established by the American Welding Society. Arc welding shall be used in fabrication and erection work where practical, and where called for on detailed drawings, and where neat workmanship is reasonably possible. All welding shall

be by fully competent workmen and shall exhibit first class workmanship for this classification of work.

- B. Surfaces to welded shall be cleaned of all loose scale, rust, oil, grease, paint, or other foreign matter. Welds shall show uniform section and smoothness of weld metal without overlaps and a minimum of craters, porosity, and clinkers.
- C. Projecting burrs, edges, or rough spots shall be removed by grinding. Plug welds shall be ground smooth where exposed to view.
- D. Visual inspection of edges and end fillets and butt joint welds shall indicate good fusion width and penetration into base metals. Precautions shall be taken to minimize stresses and distortions due to heat.

#### 3.5 PAINTING AND FINISHING

- A. All burns, weld spatter, exposed field rivets, bolts, nuts, welds, and any marring of the shop coat of paint on the detention equipment shall be thoroughly cleaned and retouched as part of this contract.
- B. All steel detention equipment herein specified, except aluminum, bronze, or stainless steel hardware, and part of the work to be enameled or plated, shall be painted one (1) shop coat of rust resistant, red oxide metallic primer before shipment from factory. All burns, welds and weld splatter on detention equipment shall be thoroughly cleaned prior to the prime coat by the DEM.
- C. Finish painting of all detention equipment, after erection and final adjustment, shall be completed by the Painting Contractor under the direction of the General Contractor.
- D. DEM shall be fully responsible for surfaces adjacent to his work, whether finished or not, and shall be required to clean burns, weld splatter etc. from these surfaces and restore them to the condition in which they were when his work commenced.
- E. The DEM shall submit for approval to the General Contractor the Primer Paint he proposes to utilize. The General Contractor shall coordinate with the Finish Painting Contractor to assure compatibility with Finish Painting.

## 3.6 MAINTENANCE AND OPERATING INSTRUCTIONS

A. The DEM shall provide two (2) paper copies and one (1) electronic copy of an operation and maintenance manual for the locking and operating devices, including the DEM's standard part numbers for each component included the assembly. These instructions shall be presented prior to final acceptance of the project.

- B. After the building is substantially complete and prior to the final payment, the DEM shall provide four (4) hours of instruction of the maintenance and operation of the equipment furnished and installed under the work of this Section.
- C. DEM shall provide to the Owner two (2) of each type of security tool required for security screws provided under this Section.

END OF SECTION 11 19 00

## SECTION 11 19 16 - EVIDENCE STORAGE AND PISTOL LOCKERS

#### PART 1 - GENERAL

## 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes the following:
  - 1. Evidence Storage Lockers, pass-through type, as indicated on the drawings and specified herein.
  - 2. Refrigerated evidence locker as indicated on the drawings and specified herein.
  - 3. Pistol Lockers (2) as indicated on the drawings and specified herein.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 06 10 00 "Rough Carpentry" for wood furring and grounds.
  - 2. Section 10 51 00 "Personal Property Lockers" for dispatch personnel and prisoner property lockers.
  - 3. Section 10 51 13 "Metal Wardrobe Lockers" for wardrobe lockers within Locker Rooms.

## 1.3 <u>SUBMITTALS</u>

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data: Manufacturer's printed data including materials, accessories, construction, finishes, assembly, and installation instructions for lockers.
- C. Shop Drawings: Layout and dimensions of evidence storage lockers. Indicate relationship to adjoining surfaces. Show locker elevations and details and accessories. Include locker numbering sequence. Indicate installation and anchorage requirements.
- D. Samples for Initial Color Selection: Manufacturer's color charts showing a full range of available colors.
- E. Maintenance Instructions: Instructions for cleaning lockers and for adjusting, repairing, and replacing locker doors and latching mechanisms.

# 1.4 **QUALITY ASSURANCE**

A. Single-Source Responsibility: Obtain locker units and accessories from one manufacturer.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver evidence storage lockers until spaces to receive them are clean, dry, and ready for locker installation.
- B. Protect evidence storage lockers from damage during delivery, handling, storage, and installation.

## 1.6 <u>WARRANTEE</u>

A. Evidence Storage Lockers and Pistol lockers shall be provided with a two (2) year minimum limited warranty.

# PART 2 - PRODUCTS

# 2.1 <u>MANUFACTURERS</u>

- A. Manufacturer: Subject to compliance with requirements, provide products by the following:
  - 1. Pass-through, Drop-off, Evidence Storage Lockers, Sentinel Model; Refrigerated Locker, and Pistol Lockers:
    - a. Tiffin Metal Products, Tiffin, Ohio, (800)-537-0983
    - b. Law Enforcement Lockers, Lincora Group, Montreal, Quebec.
  - 2. Manufacturer's standard refrigerated pass through locker to fit within modular system of pass through lockers, recessed installation. Refrigerated unit to be supplied by same manufacturer as lockers.
- B. Products by any other manufacturers will be considered provided they comply with technical requirements and match the specified product in layout, configuration, construction, appearance and finish, in accordance with the design concept and intent and must be approved by the Architect.

# 2.2 EVIDENCE STORAGE LOCKERS

- A. Sizes and Quantities:
  - 1. Total installation Locations: One (1), keyless operated, pass-through configuration with lift latch.
  - 2. Recessed wall installation adjacent to **Evidence Processing 128**:
    - a. One (1) Unit: **07AB** (w/ refrigeration unit as specified), 36"w. x 82"h x 24" d.

- b. One (1) Unit: Configured as indicated on the drawings, 36"w. x 82"h. x 24" d.
- B. Locking Mechanism Customer Side: Keyless Lift Latch operation.
- C. Materials Doors and frames 16 gauge; shelves, sides, top and bottom of 24 gauge cold rolled steel sheet: ASTM A 1008/B, commercial-quality, matte finish, suitable for exposed locations, cold rolled carbon sheet steel, stretcher leveled, or roller leveled flatness, free of buckling, scale and surface imperfections.
- D. Fasteners Zinc-plated or nickel-plated steel; spotless-type exposed bolt heads; self-locking nuts or lock washers for nuts on moving parts.
- E. Finish 5 mil (minimum) powder coat finish, baked on. Submit manufacturer's standard colors for selection by Architect.
- F. Accessories:
  - 1. 2" front and rear trim for recessed, flush installation at adjacent surfaces.

## 2.3 <u>REFRIGERATED EVIDENCE STORAGE LOCKER</u>

- A. Quantities and Sizes: **One** (1) refrigerated insert unit to be installed at location indicated on the drawings.
  - 1. **Model ERF3642** (36"W x 24"D x 42.5"H.)
- B. Standard Features to include the following:
  - 1. CFC-free Urethane Foam Insulation
  - 2. Automatic Defrost
  - 3. Electric Condensate Removal
  - 4. Industrial Grade Hermetically Sealed Compressor
  - 5. Forced Air Circulation
  - 6. Temperature Controlled, factory set at +4 degrees C.
  - 7. Digital Thermometer
- C. Refrigerated evidence storage locker to consist of four (4) individual, equally sized compartments (8.43"w x 14"d x 5.5"h)
- D. Stainless steel finish inside and out with stainless steel fasteners. All stainless steel to be free from imperfections.
- E. Doors to be louverless and open at least 130 degrees. Interior doors to open 90 degrees. Interior doors shall be numbered. Non-pass through configuration.

## 2.4 <u>PISTOL STORAGE LOCKERS</u>

A. Door and face to be 16 gauge cold-rolled steel sheet CQ grade throughout: free of buckling, scale and surface imperfections. Doors to be louverless and open at

least 130 degrees, stainless steel pin hinge, and numbered. Frames are formed and welded into integrated units.

- B. Finish: Doors, door frames, and body parts shall be made of HRPO Steel. All steel to be free from imperfections and capable of taking a high-grade powder coat finish. Before powder is applied, the surfaces of the steel shall be cleaned thoroughly in a multi-stage process to inhibit corrosion and increase the durability of the applied finish. All parts shall then be finished with a heavy (5 mil min) powder coat finish. Finish shall be baked on. All component parts and accessories shall be the same finish.
- C. Quantity And Sizes:

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- 1. Pistol Lockers: Each unit is furnished with numbered doors and uniquely coded keys utilizing a replaceable lock cylinder with proprietary keying system and 12-gauge locking cam. Each door is nominal 6.5" high x 12.25" wide.
  - a. Quantity of (2) Recessed (1 @ Sally Port 118) and Surface Mounted (1 @ Corridor 131): Module size: #0190V Four-Door Module. Nominal 28.5" high x 6" deep x 14.25" wide.
- 2. Provide units for recessed and surface mounted wall installations. Provide manufacturer's recessed trim for flush wall installation at recessed installation. See drawings for quantities and wall construction details.
- D. Body: Flanged, angled, and holed to high industrial standard.
- E. Doors: Door is flush when closed and locked with minimal edge clearance providing a pry-resistant feature.
- F. Interior: Bottom is covered with cushioning material.
- G. Locks: Uniquely coded security lock has replaceable cylinder with proprietary keying system. Each lock to be keyed differently. All lock cylinders master keyed alike.
- H. Numbering: Manufacturer's standard etched, embossed, or stamped, plastic number plats with numerals at least 5/16"H. Number lockers in sequence.
  Numbering system shall be a three number system. Attach plates to each locker door, near top, centered..

## 2.5 LOCKER ACCESSORIES

A. Number Plates: Manufacturer's standard etched, embossed, or stamped, nonferrous-metal number plates with numerals not less than 3/8 inch (9 mm) high. Number lockers in sequence. Attach plates to each locker door, near top, centered, with at least 2 fasteners of same finish as number plate.

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B. Recess Trim: Manufacturer's standard 18 gage minimum steel sheet trim with concealed fastening clips for all recessed installations.

## 2.6 <u>FABRICATION</u>

- A. Fabricate storage lockers square, rigid, and without warp, with metal faces flat and free of dents or distortion. Make exposed metal edges free of sharp edges and burrs, and safe to touch. Weld frame members together to form a rigid, 1-piece structure.
  - 1. Form locker body panels, doors, shelves and accessories from 1-piece steel sheet unless otherwise indicated.
  - 2. Pre-assemble lockers by welding all joints, seams, and connections. Grind exposed welds flush.

#### PART 3 - EXECUTION

#### 3.1 <u>INSTALLATION</u>

- A. Install storage lockers complete with accessories according to manufacturer's recommendations. Install plumb, level, rigid, and flush.
- B. Connect together welded locker groups with standard fasteners according to manufacturer's recommendations, with no exposed fasteners on face frames.
- C. Anchor lockers to floors and walls at intervals recommended by manufacturer but no greater than 36 inches. Install anchors through back-up reinforcing plates where necessary to avoid metal distortion, using concealed fasteners.
- D. Install recess trim to recessed lockers using concealed fasteners. Provide hairline joints and concealed splice plates.

# 3.2 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust doors and latches to operate easily without binding. Verify that integral locking devices are operating properly.
- B. Clean interior and exposed exterior surfaces and polish nonferrous metal surfaces.
- C. Protect lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit locker use during construction.
- D. Touch up marred finishes, or replace locker units that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

#### END OF SECTION 11 19 16

#### SECTION 11 50 00 - CANOPY HOOD

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes all labor, materials and equipment required to furnish and install one (1) canopy hood, as shown in the Contract Documents and specified herein, including, but not limited to the following:
  - 1. Canopy Hood (1 total) at **Gun Cleaning 151**
  - 2. Component fittings and fixtures.
- B. Related Work Specified Elsewhere, including but not limited to:
  - 1. Division 23 Mechanical
  - 2. Division 26 Electrical

#### 1.3 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product Data: Manufacturer's data for each type of fume hood.
- C. Samples of the canopy hood component parts. Samples will be reviewed by Architect for color, texture, and pattern only.
- D. Shop drawings for canopy hoods, showing plan layout, elevations, ends, crosssections, service run-spaces, location and type of fixtures and service fittings, together with indication of associated service supply connections required.
  - 1. Include details and location of anchorages and fitting to floors, walls, and base.
  - 2. Include layout of units with relation to surrounding walls, doors, windows, lighting and air-conditioning fixtures, connections of hood-to-hood exhaust system, location of access doors, cut-off valves, junction boxes.
  - 3. Coordinate shop drawings with other trades whose work affects installation or performance of canopy hood.
  - 4. Provide roughing-in drawings for mechanical and electrical services.

#### 1.4 **QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Provide canopy hoods and accessories manufactured or furnished by a single source.
- B. General Performance: Design canopy hoods so that, when connected to exhaust system that provides proper exhaust volume under normal laboratory conditions, fume hoods will operate in a safe, efficient manner, within acceptable tolerances for face velocities specified. Dead-air pockets and reverse-air currents will not be permitted along surface of hood interiors.

## 1.5 **PRODUCT HANDLING**

- A. Coordinate delivery of canopy hoods with delivery of casework components.
- B. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.

# PART 2 - PRODUCTS

# 2.1 <u>CANOPY HOOD</u>

- A. To establish the design intent and to set a level of quality, the Contract Documents and Specifications are based on Canopy Hoods as manufactured by The Uniflow Company, (800)-779-4362, or equal.
  - 1. **Gun Cleaning 151**: Wall Canopy Hood Model No. 13030, fiberglass, 36" wide x 30" deep w/ vapor proof light, light switch, blower switch, and wall canopy mounting kit.
- B. Provide pre-wiring of hood to one light switch (#50035) and one blower switch (#50028). Provide all switches.
- C. Blower motor to be by Division 23 Mechanical.
- D. Canopy hood construction to be one-piece seamless construction with color molded in. Painted units will not be accepted.

## 2.4 <u>SOURCE QUALITY CONTROL</u>

A. Architect reserves right to require manufacturer to demonstrate hood performance prior to shipment to prove compliance with contract requirements. Test hoods, testing facility, necessary instrumentation, apparatus, and equipment shall be supplied by manufacturer at no cost to Owner. Test hoods to verify performance requirements, using smoke and air-flow meters in accordance with ASHRAE/ANSI 110.

## PART 3 - EXECUTION

# 3.1 <u>INSTALLATION</u>

- A. General: Install canopy hoods plumb, level, aligned, rigid, and securely anchored to building, in proper location, in accordance with manufacturer's instructions and approved shop (layout) drawings. Install closures neatly. Securely attach access panels, but provide for easy removal and secure reattachment.
- B. Coordinate sequence of work with mechanical and electrical trades.

# 3.2 FIELD QUALITY CONTROL

A. Field Test: Field test each unit after completion of installation to verify proper operation of hood.

# 3.3 ADJUST AND CLEAN

- A. Moving Parts: Carefully check and adjust moving parts to insure smooth, nearsilent, and accurate sash operation with one hand and with uniform contact of rubber bumpers; ensure counter-balances operate without interference.
- B. Damaged Work: Repair equal to new undamaged work, or replace with new units, as acceptable to Architect.

END OF SECTION 11 50 00

#### SECTION 11 52 13 - PROJECTION SCREEN

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing the following projection screens at locations as indicated on the drawings and specified herein:
  - 1. Recessed ceiling mounted, electrically operated projection screens. (quantity: 1) at **Training Classroom 100**
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Section 06 10 00 "Rough Carpentry" for wood blocking and installation of projection screen.
  - 2. Division 26 for power installed to motor housing.

#### 1.3 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of screen specified.
- C. Shop drawings showing layout and types of projection screens. Show the following:
  - 1. Location of screen centerline.
  - 2. Anchorage details.

#### 1.4 **QUALITY ASSURANCE**

- A. Single Source Responsibility: Obtain each type of projection screen required from a single manufacturer as a complete unit, including necessary mounting hardware and accessories.
- B. Coordination of Work: Coordinate layout and installation of projection screens with other construction.
  - 1. Wall mounted construction and equipment, including visual display boards.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver projection screens until building is enclosed, other construction within spaces where screens will be installed is substantially complete, and installation of screens is ready to take place.
- B. Protect screens from damage during delivery, handling, storage, and installation.

# 1.6 <u>WARRANTY</u>

- A. Project Warranty: Refer to Contract Conditions for project warranty provisions.
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official.
  Manufacturer's warranty is in addition to, and does not limit, other rights Owner may have under Contract Documents.
- C. Warranty: Commencing on the date of Substantial Completion.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

- A. Ensure manufacturer has minimum five (5) years' experience manufacturing components similar to or exceeding project requirements.
- Basis of Design: Da-Lite Screen Company, Inc., P.O. Box 137, 3100 N. Detroit St., Warsaw, IN 46581-0137; Telephone: (800) 622-3737, (574) 267-8101; Fax: (877) 325-4832, (574) 267-7804; E-mail: info@da-lite.com; website: www.da-lite.com, or equal meeting performance and dimensional requirements specified herein.

# 2.2 <u>RECESSED CEILING MOUNTED, ELECTRICALLY OPERATED PROJECTION</u> <u>SCREEN</u>

- A. Ceiling Recessed Electrically Operated Projection Screens. Da-Lite Screen Company, Inc., Advantage Deluxe Electrol Projection Screen, or equal.
  - 1. Screen Operation: Electrically operated, UL and ULC listed, retractable, with 2 rigid metal rollers.
  - 2. Motors: Housed inside metal roller and including automatic thermal overload protection, integral gears, capacitor and electric brake to prevent coasting.

- a. Type: 3-wire with ground with quick connect male plug-in connector, permanently lubricated, quick reversal type designed for mounting inside roller.
- b. Quantity: One (1)
- c. Voltage, Frequency: 115 V, 60 Hz
- d. Amperage: 1.2 amps maximum
- e. Include preset, adjustable limit switches to automatically stop fabric door and viewing surface in UP or DOWN position.
- 3. Electric Controls: Wall-mounted switch.
  - a. Voltage, Frequency: 115 V, 60 Hz
    - b. Switch: 3 button type with cover plate for UP, DOWN and STOP functions.
    - c. Junction Box: Internally attached to screen case
- 4. Screen Mounting: Ceiling recessed
  - a. Mounting Hardware: Include mounting hardware.
- 5. Screen Case: Designed to receive mounting hardware and sized to suit projection screen.
  - a. Extruded aluminum with heavy gage steel end caps and adjustable steel brackets.
    - 1) Case Bottom: Self-trimming with built-in flange and equipped with concealed-hinge automatic aluminum door for raising and lowering the viewing surface and concealedhinge aluminum door for manual access.
    - 2) Finish: White powder coated.
    - 3) Overall Case Length: 132-1/4"
- 6. Screen Size: 16:9 HDTV Format
  - a. Viewing Area: H 65 inches  $\times$  W 116 inches
  - b. Nominal Diagonal: 133"
- 7. Non-Tensioned Screen Material: Matte White (High Angle: 60 degrees, Gain: 1.0)
  - a. Front projection, flame retardant, mildew resistant fiberglass, black backing with standard black borders, easily cleaned with mild soap and water solution.
  - b. Bottom of fabric to form a pocket holding a metal rod.
  - c. Seams: Seamless

#### PART 3 - EXECUTION

- 3.1 INSTALLATION
  - A. General: Install projection screens at locations indicated in compliance with screen manufacturer's instructions.
  - B. Install projection screens with screen cases in position and relationship to adjoining construction as indicated, securely anchored to supporting substrate, and in manner that produces a smoothly operating screen with plumb and straight vertical edges and plumb and flat viewing surfaces when screen is lowered.

1. Test to verify that screen, closure and other operating components are in optimum functioning condition.

# 3.2 PROTECTION AND CLEANING

A. Protect projection screens after installation from damage during construction. If despite such protection damage occurs, remove and replace damaged components or entire unit as required to provide units in their original, undamaged condition.

END OF SECTION 11 52 13

#### SECTION 12 06 20 - WINDOW TREATMENT

#### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.City of Stamford General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. Manually operated sunscreen roller shades.
- B. Manually operated blackout roller shades.
- C. Electrically operated sunscreen and blackout roller shades.
- D. Manually operated sunscreen and blackout roller shades bottom up operation.

#### 1.3 <u>RELATED SECTIONS</u>

- A. Division 6 Rough Carpentry: Wood blocking and grounds for mounting roller shades and accessories.
- B. Division 9 Gypsum Board Assemblies: Coordination with gypsum board assemblies for installation of shade pockets, closures and related accessories.
- C. Division 9 Acoustical Ceilings: Coordination with acoustical ceiling systems for installation of shade pockets, closures and related accessories.
- D. Division 26 Electrical: Electric service for motor controls.

#### 1.4 <u>REFERENCES</u>

- A. ASTM G 21 Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- B. NFPA 70 National Electrical Code.
- C. NFPA 701 Fire Tests for Flame-Resistant Textiles and Films.

#### 1.5 <u>SUBMITTALS</u>

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.

- 2. Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
- 3. Storage and handling requirements and recommendations.
- 4. Mounting details and installation methods.
- 5. Typical wiring diagrams including integration of motor controllers with building management system, audiovisual and lighting control systems as applicable.
- C. Bid Submittal: Information Required with Submittal of Bid: In order to evaluate proposals for integrated lighting control and window shade systems, the Architect requires the following information be submitted prior to the award of the system.
  - 1. Bid proposal shall be accompanied with a document that notes all deviations from these specifications on a line-by-line basis.
  - 2. Bid shall confirm that roller shade EDU's and all related controls shall be integrated into a compatible control system as specified herein.
  - 3. Bid shall include separate line items listing the control/interface components required for building automation systems and building management systems (BAS/BMS), daylighting, audiovisual, and/or central integration systems. Roller shade controls manufacturer shall list all components included in their bid and shall include a letter stating that they shall be financially responsible for any change orders and/or back charges required by the BAS/BMS, audiovisual, or lighting control systems contractors to interface with the motorized roller shade system.
- D. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, wiring diagrams and relationship to adjacent work.
- E. Window Treatment Schedule: For all roller shades. Use same room designations as indicated on the Drawings and include opening sizes and key to typical mounting details.
- F. Selection Samples: For each finish product specified, one set of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and patterns.
- G. Verification Samples: For each finish product specified, one complete set of shade components, unassembled, demonstrating compliance with specified requirements. Shadecloth sample and aluminum finish sample as selected. Mark face of material to indicate interior faces.
- H. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

## 1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of twenty years experience in manufacturing products comparable to those specified in this section.
- B. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of ten years experience in installing products comparable to those specified in this section.
- C. Fire-Test-Response Characteristics: Passes NFPA 701 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
- D. Electrical Components: NFPA Article 100 listed and labeled by either UL or ETL or other testing agency acceptable to authorities having jurisdiction, marked for intended use, and tested as a system. Individual testing of components will not be acceptable in lieu of system testing.
- E. Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, ATCC9645.
- F. Requirements for Hardware, Controls, and Switches:
  - 1. Roller Shade Hardware, shade fabric, EDU, and all related controls shall be furnished and installed as a complete two-way communicating system and assembly.
- G. Mock-Up: Provide a mock-up (manual shades only) of one roller shade assembly for evaluation of mounting, appearance and accessories.
  - 1. Locate mock-up in window designated by Architect.
  - 2. Do not proceed with remaining work until, mock-up is accepted by Architect.

# 1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

## 1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Power and control wiring shall be complete and certified, fully operational with uninterrupted communication on the lines and minimal noise certified by a commissioning agent (by others).

## 1.9 WARRANTY

A. Roller Shade Hardware and Chain Warranty: Manufacturer's standard non-
depreciating twenty-five year limited warranty.

- B. Shadecloth: Manufacturer's standard ten year warranty.
- C. Roller Shade Installation: One year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas.

#### PART 2 PRODUCTS

#### 2.1 MANUFACTURER

A. Acceptable Manufacturer: MechoShade Systems, Inc., which is located at: 42-03 35th St.; Long Island City, NY 11101; Tel: 718-729-2020; Fax: 718-729-2941

#### 2.2 INTELLIGENT ENCODED ELECTRONIC DRIVE SYSTEM

- A. Electronic Drive Unit (EDU):
  - 1. Intelligent Encoded EDU, and Control System: Tubular, asynchronous (non-synchronous) EDU's, with built-in reversible capacitor operating at 120VAC/60Hz, (230VAC/50Hz) single phase, temperature Class B, thermally protected, totally enclosed, maintenance free with line voltage power supply equipped with locking disconnect plug assembly furnished with each EDU.
  - 2. Quiet [42 46 db] (within 3 feet open air).
  - 3. Conceal EDU's inside shade roller tube.
  - 4. Maximum current draw for each shade EDU of 0.9Amps at 120VAC.
  - 5. Use EDU's rated at the same nominal speed for all shades in the same room.
  - 6. Use EDU's with minimum of 34RPM, that shall not vary due to load / lift capacity.
  - 7. Total hanging weight of shade band shall not exceed 80 percent of the rated lifting capacity of the shade EDU and tube assembly.
- B. EDU System: (software, two-way communication): Specifications and design are based on the Intelligent EDU Control System, WhisperShade®IQ® System) as manufactured by MechoSystems. Other systems may be acceptable providing all of the following performance capabilities are provided. EDU and control systems not in complete compliance with these performance criteria shall not be accepted as equal systems.
  - 1. EDU shall support two methods of control.

- a. Local Dry Contact Control Inputs:
  - 1) EDU shall be equipped with dry contact inputs to support moving the EDU/shade to the upper and lower limits.
  - 2) EDU shall be equipped with dry contact inputs to support moving the EDU/shade to local switch preset positions.
  - 3) Shall support configuring the EDU under protected sequences so that a typical user would not change the EDU's setup. At a minimum the configuration should include setting limits, setting custom presets and configuring key modes of operation.
- b. Network Control:
  - EDU shall be equipped with a bi-directional network communication capability in order to support commanding the operation of large groups of shades over a common backbone. The network communication card shall be embedded into the tubular EDU assembly.
- 2. Upper and lower stopping points (operating limits) of shade bands shall be programmed into EDU's using either a hand held removable program module / configurator or a local switch.
- 3. Alignment Positions: Each EDU shall support a minimum of 133 repeatable and precisely aligned shade positions (including limits and presets).
  - a. All shades on the same switch circuit or with the same network group address with the same opening height shall align at each limit or preset (intermediate stopping position) when traveling from any position, up or down.
  - b. Shades of differing heights shall have capability for custom, aligned intermediate stop positions when traveling from any position, up or down.
  - c. Alignment of shades mechanically aligned on the same EDU shall not exceed +/- 0.125 inches (3.175mm) when commanded to the same alignment position.
  - d. Alignment of shades on adjacent EDU's shall not exceed +/- 0.25" inches (6.35mm) when commanded to the same alignment position.
  - e. Local Switch Presets: A minimum of 3 customizable preset positions shall be accessible over the local dry contact control inputs and over the network connection.
    - 1) Upon setting the limits for the shade EDU these preset

positions shall automatically default to 25%, 50% and 57% of the shade travel.

- 2) These positions shall be capable of being customized to any position between and including the upper and lower limits of the shade. A removable program module / configurator or local switch shall be capable of customizing the position of these presets.
- f. Network Presets: A minimum of 29 customizable preset positions (including the 3 local switch presets) shall be accessible via network commands.
  - 1) Upon setting the limits for the shade EDU these preset positions shall automatically default to the lower limit unless customized elsewhere.
  - These positions shall be capable of being customized to any position between and including the upper and lower limits of the shade. A removable program module / configurator shall be capable of customizing the position of these presets.
- 4. Network Control:
  - a. The system shall have the capability of two-way digital communication with the EDU's over a common backbone.
  - Each EDU shall possess 8 addresses capable of being employed for various levels of group control. These addresses shall be configurable via a handheld configurator and/or a PC controller. A 9<sup>th</sup> unique address shall enable the EDU(s) to be independently controlled and configured over the network via a handheld configurator and/or a PC controller.
  - c. Low Voltage Communication Network Implementation.
    - The low voltage network shall employ a bus topology with daisy chained network connections between nodes over a CAT5 cable (4 UTP) or over a 2 UTP cable employing at least 1 pair at 16 AWG for power and 1 pair at 22 AWG for data.
    - 2) The low voltage network (+/- 13VDC) shall be powered by the nodes attached to it. These nodes could be line voltage powered EDU's attached to 120 VAC or 230 VAC. Alternatively, low voltage nodes shall be powered typically by a centralized low voltage power supply. If a CAT5 network cable is employed and the node draws less than 1W then the node may be powered by DC power supplied by an associated line voltage EDU.

- 3) Network Capacity: 4000 ft max, 250 nodes max
  - a) The number and size of a centralized DC supply shall vary depending upon the network requirements.
- 5. Operating Modes:
  - a. Uniform or Normal Modes of Operation:
    - 1) Uniform mode shall allow for shades to only move to defined intermediate stop positions to maintain maximum uniformity and organization.
    - 2) Normal Mode shall allow for shades to move to both intermediate stop positions, plus any position desired between the upper and lower limits as set by the installer.

#### 6. Wall Switches:

- Conference Center: Shades shall be operated by, 5, 7, or 10-button low voltage standard switches, or programmable intelligent switches [IS]. Standard switch shall be wired to a bus interface and the bus interface will be programmed to transmit an address for the local switch.
- b. Intelligent switches may be installed anywhere on the bus line. Each IS shall be capable of storing one control level address to be broadcast along the bus line.
- c. An address that is transmitted by either a switch or central controller shall be responded to by those EDU's with the same address in their control table.
- d. IS shall provide for interface with other low voltage input devices via a set of dry contact terminals located on the switch.
- e. Standard switch or IS may control an individual, sub-group or group of EDU's in accordance with the address in each EDU.

#### 2.3 <u>SHADE BANDS</u>

- A. Shade Bands: Construction of shade band includes the fabric, the enclosed hem weight, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
  - 1. Concealed Hembar: Shall be continuous extruded aluminum for entire width of shade band and with the following characteristics:
    - a. Hembar shall be heat sealed on all sides.

- b. Open ends shall not be accepted.
- 2. Shade Band and Shade Roller Attachment:
  - a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection.
  - b. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.
  - c. Mounting Spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
  - d. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets, does not meet the performance requirements of this specification and shall not be accepted.

#### 2.4 ROLLER SHADE FABRICATION

- A. Fabricate shade cloth to hang flat without buckling or distortion. Fabricate with heat-sealed trimmed edges to hang straight without curling or raveling. Fabricate unguided shadecloth to roll true and straight without shifting sideways more than 1/8 inch (3.18 mm) in either direction per 8 feet (2438 mm) of shade height due to warp distortion or weave design.
- B. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shade bands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shadecloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.
- C. For railroaded shade bands, provide seams in railroaded multi-width shade bands as required to meet size requirements and in accordance with seam alignment as acceptable to Architect. Seams shall be properly located. Furnish battens in place of plain seams when the width, height, or weight of the shade exceeds manufacturer's standards. In absence of such standards, assure proper use of seams or battens as required to, and assure the proper tracking of the railroaded multi-width shade bands
- D. Provide battens for railroaded shades when width-to-height (W:H) ratios meet or exceed manufacturer's standards. In absence of manufacturer's standards, be

responsible for proper use and placement of battens to assure proper tracking and roll of shade bands.

- E. Blackout shade bands, when used in side channels, shall have horizontally mounted, roll-formed stainless steel or tempered-steel battens not more than 3 feet (115 mm) on center extending fully into the side channels. Battens shall be concealed in an integrally colored fabric to match the inside and outside colors of the shade band, in accordance with manufacturer's published standards for spacing and requirements.
  - 1. Battens shall be roll formed of stainless steel or tempered steel and concave to match the contour of the roller tube.

#### 2.5 ROLLER SHADE COMPONENTS

- A. Access and Material Requirements:
  - 1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
  - 2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
  - 3. Use only Delran engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester shall not be accepted.
- B. Motorized Shade Hardware and Shade Brackets:
  - 1. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel, or heavier, thicker, as required to support 150 percent of the full weight of each shade. Plastic components without use of steel angle construction do not meet the intent of this specification and shall not be accepted.
  - 2. Provide shade hardware system that allows for field adjustment of EDU or replacement of any operable hardware component without requiring removal of brackets, regardless of mounting position (inside, or outside mount).
  - 3. Provide shade hardware system that allows for operation of multiple shade bands offset by a maximum of 8-45 degrees from the EDU axis between shade bands (4-22.5 degrees) on each side of the radial line, by a single shade EDU (multi-banded shade, subject to manufacturer's design criteria).

- 4. All bands within a single EDU group shall be aligned within 1/4 inch (6 mm).
- C. Manual Operated Chain Drive Hardware and Brackets:
  - 1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
  - 2. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
  - 3. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
  - 4. Provide shade hardware system that allows for operation of multiple shade bands (multi-banded shades) by a single chain operator, subject to manufacturer's design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.
  - 5. Provide shade hardware system that allows multi-banded manually operated shades to be capable of smooth operation when the axis is offset a maximum of 6 degrees on each side of the plane perpendicular to the radial line of the curve, for a 12 degrees total offset.
  - 6. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable.
  - 7. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
  - 8. Drive Bracket / Brake Assembly:
    - a. MechoShade Drive Bracket model M5 shall be fully integrated with all MechoShade accessories, including, but not limited to: SnapLoc fascia, room darkening side / sill channels, center supports and connectors for multi-banded shades.
    - b. M5 drive sprocket and brake assembly shall rotate and be supported on a welded 3/8 inch (9.525 mm) steel pin.
    - c. The brake shall be an over running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. (22 kg) in the stopped position.
    - d. The braking mechanism shall be applied to an oil-impregnated hub

on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently lubricated are not acceptable.

- e. The entire M5 assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.
- 9. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. (41 kg) minimum breaking strength. Nickel plate chain shall not be accepted.

#### 2.6 ROLLER SHADE SCHEDULE

- A. Roller Shade Schedule: Refer to the Drawings for locations.
  - 1. Shade Type (RS-S): Manual operating, chain drive, sunscreen roller shades in all exterior windows of rooms and spaces shown on the Drawings.
    - a. Fascias.
  - 2. Shade Type (RS-B): Manual operating, chain drive, blackout roller shades in all exterior windows of rooms and spaces shown on the Drawings.
    - a. Fascias.
  - 3. Shade Type (RS-SU): Manual operating, chain drive, sunscreen roller shades, bottom up operation in all exterior windows of rooms and spaces shown on the Drawings.
    - a. Shade pockets.
  - 4. Shade Type (RS-BU): Manual operating, chain drive, sunscreen roller shades, bottom up operation in all exterior windows of rooms and spaces shown on the Drawings.
    - a. Shade pockets.
  - 5. Shade Type (MS-D): Motorized interior, independently operated, solar and blackout double shades in all exterior windows of rooms and spaces shown on Drawings, and related EDU control systems. MS-D type shades shall have capability of being controlled by AV and, or lighting control system.
    - a. Shade pockets.

#### 2.7 SHADECLOTH

- A. Visually Transparent Single-Fabric Shadecloth: MechoSystems, ThermoVeil® group, single thickness, opaque non-raveling 0.030-inch (0.762 mm) thick vinyl fabric, woven from 0.018-inch (0.457 mm) diameter extruded vinyl yarn comprising of 21 percent polyester and 79 percent reinforced vinyl, in colors selected from manufacturer's available range.
  - 1. Dense Linear Weave: "1500 series", 3 percent open, dense linear-weave pattern.
  - 2. Color: See Finish Key on F-0.1
- B. Room Darkening (PVC Free) Shadecloth with Opaque Acrylic Backing: MechoSystems, "Chelsea 0250 series", comprising of 50% base polyester cloth, 50% foam backing.
  - 1. Color: See Finish Key on F-0.1
- C. Environmentally Certified Shadecloth: MechoSystems, EcoVeil group, 1550 Series, fabricated from TPO for both core yarn and jacket, single thickness, 0.018 opaque coated reinforced yarn, non-raveling 0.030 inch (0.762 mm) thick fabric.
  - 1. Dense Basket Weave: 3 percent open 2x2 basket weave
  - 2. Color: See Finish Key on F-0.1
  - 3. Warranty: 10-Year Limited.

#### 2.8 ROLLER SHADE ACCESSORIES

- A. Shade Pocket: For recessed mounting in acoustical tile or drywall ceilings as indicated on the drawings.
  - 1. Either extruded aluminum and or formed steel shade pocket, sized to accommodate roller shades, with exposed extruded aluminum closure mount, tile support and removable closure panel to provide access to shades.
- B. Fascia:
  - 1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
  - 2. Fascia shall be able to be installed across two or more shade bands in one piece.

- 3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
- 4. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.

#### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

#### 3.2 <u>PREPARATION</u>

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

#### 3.3 INSTALLATION

- A. Install roller shades level, plumb, square, and true according to manufacturer's written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow proper clearances for window operation hardware.
- B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
- C. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
- D. Engage Installer to train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

#### 3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 12 06 20

#### SECTION 12 32 16 - MANUFACTURED ARCHITECTURAL CASEWORK

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes furnishing and installing the following:
  - 1. Laminate clad cabinets (plastic-covered casework).
  - 2. Cabinet tops (countertops: stainless steel, plastic laminate, solid surface, and epoxy resin surfaces as indicated on the drawings).
  - 3. Backsplashes, filler panels and scribe pieces for complete installation.
- B. Related Sections: The following sections contain requirements that relate to this section:
  - 1. Section 06 44 00"Ornamental Woodwork" for exposed architectural woodwork and solid surface window sills / aprons.
  - 2. Furring, blocking, and other carpentry work that is not exposed to view is specified in Section 06 10 00 "Rough Carpentry".

#### 1.3 <u>DEFINITIONS</u>

- A. Exposed Surfaces: Surfaces visible when drawers and opaque doors are closed; behind clear glass doors; bottoms of casework 43 inches or more above finished floor.
- B. Semi-exposed Surfaces: Surfaces which become visible when opaque doors are open or drawers are extended; bottoms of casework are more than 30 inches and less than 42 inches above finished floor.
- C. Concealed Surfaces: Surfaces considered concealed when surfaces not visible after installation; bottoms of casework less than 30 inches above finished floor; tops of casework over 78 inches above finished floor and not visible from an upper level; stretchers, blocking, and components concealed by drawers.
- D. Flush Overlay: Door and drawer faces cover cabinet frame with space between faces sufficient for operating clearance.

#### 1.4 <u>SUBMITTALS</u>

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of product and process specified in this section and incorporated into items of architectural casework during fabrication, finishing, and installation.
- C. Shop drawings for casework and fittings showing plan layout, elevations, ends, cross-sections, service run spaces, location and type of service fittings, together with associated service supply connection required.
  - 1. Include details and location of anchorages and fitting to floors, walls, and base, including required blocking or back-blocking.
  - 2. Include layout of units with relation to surrounding walls, doors, windows, and other building components.
  - 3. Coordinate shop drawings with other work involved.
  - 4. Include manufacturer's recommendations for blocking and securing of casework units and fittings.
- D. Samples for initial selection purposes of the following in form of manufacturer's color charts consisting of actual units or sections of units showing full range of colors, textures, and patterns available for each type of material indicated.
  - 1. Plastic laminate.
  - 2. Exposed cabinet hardware, one unit of each type and finish.
- E. Product certificates signed by casework manufacturer certifying that products comply with specified requirements.
- F. Qualification data for firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners, and other information specified.

## 1.5 <u>QUALITY ASSURANCE</u>

- A. Manufacturer Qualifications: Firm experienced in successfully producing architectural casework similar to that indicated for this Project, with sufficient production capacity to produce required units without causing delay in the Work.
- B. Single-Source Manufacturing and Installation Responsibility: Engage a qualified Manufacturer to assume undivided responsibility for casework specified in this section, including fabrication, finishing, and installation.
- C. AWI Quality Standard: Comply with applicable requirements of "Architectural Casework Quality Standards" published by the Architectural Casework Institute (AWI) except as otherwise indicated.
- 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect casework during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration. Keep covered with polyethylene film or other protective coating.
- B. Do not deliver casework until painting, wet work, grinding, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."
  - 1. Follow procedures and schedules as provided by the General Contractor.

#### 1.7 **PROJECT CONDITIONS**

- A. Environmental Conditions: Do not install casework until optimum temperature and humidity conditions for casework have been attained and stabilized so that casework is within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.
- B. Field Measurements: Where casework is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before manufacturing casework; show recorded measurements on final shop drawings. Coordinate manufacturing schedule with if construction progress to avoid delay of Work.
  - 1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with manufacture of casework without field measurements. Coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.
- C. Field Measurements: Verify countertop size and shape prior to fabrication by field measurements taken after base units are installed.

#### PART 2 - PRODUCTS

#### 2.1 <u>PLASTIC LAMINATE</u>

- A. High pressure plastic laminate shall be used on all doors and drawer faces and shall meet all NEMA standards.
- B. Colors to be selected from full range of Wilsonart or Formica laminates, or as scheduled on drawings.

#### 2.2 <u>COUNTER TOP (PLASTIC LAMINATE)</u>

A. Horizontal grade plastic laminate on 45 pound particle board.

- Β. Melamine plastic laminate backing.
- C. Color to be as scheduled on the finish plans.

#### 2.3 COUNTER TOP (EPOXY RESIN)

CARVER, MA

- Provide 1 inch thick, molded from a modified epoxy resin. Exposed edges and A. corners are radiused. Curbed backsplashes are 4 inches high.
  - 1. Color: Black.
- Β. Sinks: 1 By Division 22 - Plumbing

#### 2.4 COUNTER TOP (STAINLESS STEEL)

- Provide stainless steel countertops and edge treatment where indicated on A. drawings. Provide sink cutouts as required.
- Β. All stainless steel countertops to be manufactured with integral backsplashes to form one continuous surface.

#### 2.5 COUNTER TOP (SOLID SURFACE)

- A. Provide solid surface countertops and edge treatment where indicated on drawings. Provide sink cutouts as required.
- Β. Solid surface product and color to be as scheduled on the finish plans.

#### 2.6 MELAMINE LAMINATED PARTICLE BOARD

- Thermofused impregnated decorative overlay bonded to 45 pound density A. industrial grade particle board.
- Particle board shall have a moisture content not to exceed 8%. Β.
- C. Interior melamine laminate color is white.
- D. White melamine laminate for cabinet interiors behind doors and drawers and interior of all open cabinets.

#### 2.7 LAMINATE EDGES

- A. Front edges of cabinet boxes to match door/drawer face in a PVC or high pressure laminate edgebanding.
- B. Door and drawer front edges to be:
  - PVC edge banding 3mm thick, in choice of colors. 1.

#### 2.8 <u>HARDWARE</u>

- A. Hinges: One pair per door up to and including 42 inch height. One and one-half pair over 42 inches in height.
  - 1. Fully concealed, spring loaded, self-closing hinge opens to 170 degree and fully adjustable in all dimensions,
- B. Pulls:
  - 1. 4" metal wire pull Brushed chrome finish
- C. Drawer guides:
  - 1. Standard drawers, side mounted, manufactured from zinc plated roll formed steel. Ball bearing/nylon roller action with positive stop, 100 lb. load rating.
- D. Adjustable shelf supports:
  - 1. Shelf support clip for adjustable cabinet shelves to be heavy duty steel pin surrounded by molded nylon.
- E. Cabinet Locks:
  - 1. Cabinet locks for cabinets and drawers to be keyed tumbler locks. Provide masterkeying per room.
  - 2. Furnish two (2) keys per lock installation.
  - 3. Manufacturers
    - a. Hafele
    - b. Knape & Vogt
    - c. Blum
- F. Counter Support Brackets:
  - Counter support brackets, surface mounted (unless noted otherwise), as manufactured by Rakks, Rangine Corporation, Millis, MA, (800)-826-6006, or equal. Provide for counter supports as indicated on the drawings (noted below) and to provide for unsupported counter width not to exceed 36". Provide with powder coated finish and 5/8 inch rubber grommet. Color to be selected from manufacturer's standard colors.
    - a. Model # EH-1212 (for counter tops up to 18" deep)
    - b. Model # EH-1818 (for counter tops up to 24" deep)
    - c. Model # EH-1824 (for counter tops up to 30" deep)

#### 2.9 CABINET CONSTRUCTION

- A. Bases
  - 1. Cabinet bases shall be integral to cabinet with loose front toe board for continuous field installation. Rubber or vinyl base furnished and installed by others.
- B. Cabinet Tops and Bottoms

- 1. Wall and tall cabinets (and base cabinet bottoms) <sup>3</sup>/<sub>4</sub>" thick melamine laminated particle board. White on inside and outside surfaces.
- 2. Base Cabinets to have two stretchers across top of cabinet, <sup>3</sup>/<sub>4</sub>" thick x 3-3/4" deep melamine laminated particle board. Cabinets over 27" wide shall have a third stretcher between door and drawer.
- 3. Exposed edges of cabinets shall match door/drawer face color, in high pressure laminate edgebanding.
- C. Cabinet Ends
  - 1. Exposed ends <sup>3</sup>/<sub>4</sub>" thick, laminated particle board. White melamine on inside surface and high pressure plastic laminate on outside surface.
  - 2. Concealed Ends <sup>3</sup>/<sub>4</sub>" thick melamine laminated particle board. White on inside and outside surface.
  - 3. Front edges shall match door/drawer face color, in high pressure laminate edgebanding.
  - 4. All standard cabinets sides 21" or higher to have holes drilled for adjustable shelves 1-1/4" on center.
- D. Fixed and Adjustable Shelves
  - 1. <sup>3</sup>/<sub>4</sub>" white melamine laminated particle board two sides. Front edge of shelves to be edge banded in PVC. 1" thick shelves for cabinets over 30" wide. Exposed shelving to have high pressure laminate finish to match door/drawer face color.
- E. Cabinet Backs
  - 1. Standard cabinet backs to be 3/4" particle board with white melamine laminate on inside surface and tan color melamine laminate on outside surface. All edges dadoed to fit into sides, tops and bottoms.
  - 2. Exposed exterior backs to be high pressure laminate to match door/drawer face.
- F. Doors and Drawer Fronts
  - 1. All doors and drawer fronts to be 11/16" thick, 45 lb density particle board with high pressure plastic laminate, .030 in thickness on faces and white high pressure cabinet liner on inside faces.
  - 2. Door and drawer front edges shall be edged to match face in 3" PVC edgebanding.
- G. Drawers
  - 1. Drawer fronts shall be applied to drawer sub front.
  - 2. Drawer sides, back and subfront to be 3/4", white melamine laminated particle board. All exposed edges are PVC edge banded, color to match laminate.
  - 3. Drawer sides, back and subfront to be dowel and glue assembly for a secure fit.
  - 4. Drawer bottom to be <sup>1</sup>/4" white melamine laminated particle board and is dadoed and glued into drawer sides, back and sub front.

- H. Countertops
  - 1. High pressure plastic laminate, .050 in thickness, bonded to <sup>3</sup>/<sub>4</sub>" thick particle board. Back to have melamine balancing sheet. Exposed edges shall match horizontal surface and shall be built up to a 1-1/2" thickness. Counter tops shall be square nosed with square edged back splash, butt joints.
  - 2. Refer to drawings for locations of stainless steel countertops. Stainless steel countertops to include integral backsplash and rolled front edge.
  - 3. Refer to drawings for locations of solid surface countertops.
- I. Workmanship
  - 1. All exterior vertical surfaces shall be finished with high pressure plastic laminate unless otherwise indicated.
  - 2. Cabinet parts shall be accurately machined and constructed with glue and dowel method.
  - 3. Cabinet ends shall be dadoed to receive bottoms, tops and backs. Backs shall be securely glued into sides, tops and bottoms.
  - 4. Drawer bottom shall be fully housed into drawer sides, back and sub front using dadoed construction. Drawer sides, backs and subfront shall be glue and dowel construction for a secure fit.
  - 5. All cases shall be square, plumb and true.

#### PART 3 - EXECUTION

#### 3.1 STORAGE AND PROTECTION

A. Casework shall be protected in transit. Store under cover in a ventilated building not exposed to extreme temperature and humidity changes. Do not install casework in building until concrete, masonry and plaster work is dry.

#### 3.2 WORKMANSHIP

- A. Erect casework straight, level and plumb and securely anchor in place. Scribe and closely fit to adjacent work. Cut and fit work around pipes, ducts, etc.
- B. Install all items complete and adjust all moving parts to operate properly.
- C. Leave surfaces clean and free from defects at time of final acceptance.

## 3.3 <u>CLEAN UP</u>

A. Installer to remove all cartons, debris, sawdust, scraps, etc. and leave spaces clean and all casework ready for use.

#### END OF SECTION 12 32 16

#### <u>32 6 13 – PRECAST CONCRETE CURB</u>

#### <u> PART 1 - GENERAL</u>

#### 1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

#### 1.2 SUMMARY

- A. Contractor shall provide and install bicycle rack(s) as detailed and in location shown on the drawings.
- B. Provide all facilities, labor, materials, equipment, transportation, supervision, and related work necessary to complete the work in this Specification, and as shown on the Drawings.
- C. All work shall be performed in accordance with applicable codes, permits and regulations, and the requirements of all local, state, and federal agencies having jurisdiction over the work.

#### 1.3 <u>RELATED SECTIONS</u>

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specifications Sections that directly relate to Work of this Section include, but are not limited to:
  - 1. Division 01, Section 01 71 23 Field Engineering.
  - 2. Division 31, Section 31 20 00 Site Earthwork.
  - 3. Division 32, Section 32 11 00 Pavement Base Courses.
  - 4. Division 32, Section 32 13 13 Cement Concrete Pavement.

#### 1.4 <u>REFERENCES AND DEFINITIONS</u>

A. Refer to Division 01, Section 01 42 16 Standard Sitework References & Definitions for definition of specific referenced standards as may be abbreviated in this section.

#### 1.5 QUALITY ASSURANCE

A. Refer to Division 01, Section 01 43 00 Quality Assurance for testing and quality standards and for site work defined elsewhere in this specification.

#### 1.6 <u>SUBMITTALS</u>

- A. Product data for bicycle racks, including anchoring system.
- B. Concrete mix for footings.

## PART 2- PRODUCTS

#### 2.1 <u>MATERIALS</u>

- A. Bicycle Rack shall be model #125-30, 7 bike, powder-coated steel unit as manufactured by Dumor, Inc., Mifflintown, PA, or approved equal. Color shall be by the Architect, as selected from the manufacturer's standard color selection.
- B. Concrete Mix: Concrete for footings shall meet MASSDOT M4, 5,000 psi Portland cement concrete.

#### PART 3- EXECUTION

#### 3.1 INSTALLATION

- A. Install bicycle racks as per manufacturer's instructions and as detailed.
- B. Protect bicycle rack from concrete spatter from footing installation and concrete walk pavement installation.

END OF SECTION 12 93 13

#### SECTION 13 47 00 - BULLET RESISTANT PROTECTION

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.

#### 1.2 <u>SUMMARY OF WORK</u>

- A. This Section includes all labor, materials and equipment required to furnish bullet resistant protection as shown on the Contract Documents and specified herein, including, but not limited to, the following:
  - 1. Bullet resistant service windows (fixed type), (2 total)
  - 2. Bullet resistant wood door and frame at **Doors 106B**
  - 3. Bullet resistant package pass (2 total)
  - 4. Bullet resistant fiberglass installed within **Public Lobby 106** to height of 8'-0" as indicated on the drawings.
  - 5. Intercom systems at service windows (2 total)
  - 6. Bullet resistant hinged window panels within **Dispatch 107** and **Break Room 111, (2 total)**
- B. Related Work Specified Elsewhere, including but not limited to:
  - 1. Section 06 10 00 "Rough Carpentry" for installation of bullet resistant protection products.

#### 1.3 <u>SUBMITTALS</u>

- A. Product Data: Submit manufacturer's product data and installation instructions.
- B. Shop Drawings: Submit detailed shop drawings for approval by the Architect.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack material above ground level on uniformly spaced supports to prevent deformation.

#### PART 2 - PRODUCTS

#### 2.1 <u>MANUFACTURER</u>

A. For the purpose of establishing performance criteria the Contract Documents have been based upon bullet resistant protection products as manufactured by Armortex., Schertz, Texas, (800) 880-836, or approved equal meeting the performance characteristics and ballistic levels listed herein.

## 2.2 <u>FIXED TRANSACTION WINDOWS (COMMUNICATIONS 107 / PUBLIC LOBBY</u> 106 & RECORDS 104 / PUBLIC LOBBY 106)

- A. Furnish <u>fixed</u> three-sided hollow metal bullet resistant transaction window complete with glazing as indicated on the drawings. The ballistic protection level shall be UL Level 3.
- B. The frame shall be of the "non-ricochet" type, lined with UL Listed Bullet Resistant Composite. Frame to be brake formed 16 ga. stainless steel. Glazing must be removable from the secure side and not require the removal of the frame from opening. Glazing material to be UL Listed Level 3 laminated glass. The bottom of the glazing is to be capped with no less than 20 ga. stainless steel with a # 3 finish.
- C. Size: As indicated on the drawings. (See **Type BR** frame type)

## 2.3 BULLET RESISTANT TRANSACTION DRAWERS

CARVER POLICE CARVER, MA

- A. Furnish a manually operated bullet resistant transaction drawer, Model SS10D-D.
- B. Device shall have a stainless steel front flange and drawer front. UL Listed Level 3 non-ricochet bullet resistant fiberglass barrier in front and rear of a moveable drawer assembly; supported on ball bearing slides. The drawer assembly shall have a horizontal travel of not less that 12" with a drawer width of 16" or more. Provide a positive locking device as an integral part of the actuating handle that secures the unit when fully extended or returned. The steel enclosure case shall be finish painted.
- C. For installation below fixed transaction window at **Records 104** and **Dispatch 107**
- D. Finish: Drawer, Release Handle, and Drawer Front to be 16 gauge stainless steel. Steel case to be 16 gauge painted steel.

#### 2.3 <u>BULLET RESISTANT WOOD DOOR</u>

- A. Furnish a door and frame assembly of the "non-ricochet type" utilizing UL Listed Bullet Resistant Fiberglass as the encapturing barrier.
- B. Type: VL 3684 Wood Door, Wood Veneer Species (White Maple, plain sliced).
- C. Protection Level: UL Level 3

- D. The door shall be 1 <sup>3</sup>/<sub>4</sub> inch thick solid core wood with unfinished, plain sliced maple face veneer and hardwood stiles and rails. Pre hang door with Roton Heavy Duty Continuous Gear Hinge on a 16 ga. brake formed primed steel frame lined with UL Listed bullet resistant fiberglass. Vision panel shall be UL listed bullet resistant glass of the same protection level as the door. Mortise and reinforce at the factory for required hardware. Knocked down or aluminum frame assemblies are unacceptable.
- E. Heavy Duty Continuous Gear Hinge to be supplied with removable Electric Through-Wire Hinge for coordination with Division 28, Integrated Technology and Division 8 – Hardware. Doors to be prepped for through wiring from electrified hinge to electrified lockset.
- F. Size: Refer to Door Schedule and drawings for size, hardware requirements, and glazing configuration.

#### 2.4 <u>BULLET RESISTANT FIBERGLASS</u>

CARVER POLICE CARVER, MA

- A. The panels shall be made of multiple layers of starch-oil woven roving ballistic grade fiberglass cloth impregnated with a thermoset polyester resin and compressed into flat rigid sheets. The production technique and materials used shall provide the controlled internal delimitation to permit the encapture of a penetrating projectile.
  - 1. Bullet Resistant Fiberglass panel: 5/16 inch maximum thickness, and 3.0 pounds per square foot maximum weight.
  - 2. Material shall be "Armortex O.F 200" manufactured by Amortex, Schrtz, Texas, (800)-880-8306, or approved equal.
  - 3. The Bullet Resistant Fiberglass must be UL Listed rated for Level 2.
  - 4. Install bullet resistant fiberglass to a height of 8'-0" a.f.f. along walls to form continuous bullet resistance between public and police areas as further detailed on the drawings.

#### 2.5 <u>HINGED WINDOW PANELS (DISPATCH 107 & BREAK ROOM 111)</u>

- A. Furnish <u>hinged</u> three-sided hollow metal bullet resistant transaction window complete with glazing as indicated on the drawings. The ballistic protection level shall be UL Level 3.
- B. The frame shall be of the "non-ricochet" type, lined with UL Listed Bullet Resistant Composite. Frame to be brake formed 16 ga. stainless steel. Glazing must be secured within a hinged panel with continuous geared hinge and lockable. Glazing material to be UL Listed Level 3 polycarbonate glazing.
- C. Size: As indicated on the drawings. (See **Type BROP** frame type)
- 2.6 <u>ACCESSORIES</u>

- A. Electronic two-way communication (TOTAL OF 2): To provide for electronic two-way, hands free audio communications between a partition. Compact 4" diameter speaker with gooseneck microphone, rugged aluminum construction, Class II bullet resistant insert, voice activated switch, background noise level monitoring, and linear volume control.
  - 1. Provide with A/C adapter for continual use at all installations as indicated on the drawings.
  - 2. Model SC-100, as manufactured by Haven Technology Corporation, Riverside, CA, or equal.

#### PART 3 - EXECUTION

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#### 3.1 <u>INSTALLATION</u>

- A. Install units per manufacturer's printed instructions.
- B. Carefully uncrate glass. Note even though this material is bullet resistive, it will chip from a careless tap of a hammer or wrecking bar. By all means during the glazing process, do not allow glass to rest on one of its corners.
- C. Remove glass from crate and lay it flat, removing wrapping paper if necessary. Crimp on lower glass channel with rubber strip insert around bottom edge of glass.
- D. Remove stops from head and jambs.
- E. Place rubber acoustical spacers around top and sides of glass approximately 22" apart. Place rubber pads within glazing recess in deal tray/voice panel sill.
- F. Note that glass is to be installed with the thinner outside lamination to be on the protected side; the thicker outside lamination being on the exterior.
- G. Carefully lift glass with channel on top of deal tray/voice panel sill, positioning the bottom onto the pads within the glazing recess.
- H. Rotate glass about recess to upright position. Replace stops and trim of excess from spacers with razor knife. Glass is not to be sealed into framing: this will inhibit natural voice transmission.

#### 3.2 BULLET RESISTANT FIBERGLASS

A. All joints shall be reinforced by a back-up layer of bullet resistive material. The bullet resistance of the joint, as reinforced, shall be at least equal to that of the panel. Minimum width of reinforcing layer at joint shall be 4 inches (2 inches on each panel or a 2 inch minimum overlap).

## CARVER POLICECARVER, MABULLET RESISTANT PROTECTION

B. Bullet resistant fiberglass shall be installed in accordance with the manufacturer's printed recommendations. Armor panels shall be adhered using an industrial adhesive, mastic, screws or bolts. Method of application shall maintain the bullet resistive rating at junctures with the concrete floor slab, the ceiling line, the bullet resistive frames, and all required penetrations.

END OF SECTION 13 47 00

## FIRE PROTECTION

#### SECTION 21 00 00 FIRE PROTECTION TABLE OF CONTENTS

PART 1	GENERAL	1
1.1	TIME, MANNER AND REQUIREMENTS FOR FILING SUB-BIDS	1
1.2	RELATED DOCUMENTS	2
1.3	GENERAL REQUIREMENTS AND REFERENCES	2
1.4	DEFINITIONS	3
1.5	SCOPE	4
1.6	RELATED WORK UNDER OTHER SECTIONS	5
1.7	REGULATORY REQUIREMENTS	5
1.8	SUBMITTALS	6
1.9	SURVEYS AND MEASUREMENTS	11
1.10	COORDINATION	11
1.11	ELECTRICAL COORDINATION	12
1.12	MECHANICAL AND ELECTRICAL COORDINATION DRAWINGS	12
1.13	INSTALLATION REQUIREMENTS	13
1.14	TYPICAL DETAILS	14
1.15	SLEEVES, INSERTS	14
1.16	FIRESTOPPING, SMOKEPROOFING & WATERPROOFING	14
1.17	CORING, DRILLING	14
1.18	ACCESSIBILITY	14
1.19	SUPPLEMENTARY SUPPORTING STEEL	14
1.20	TOOLS AND EQUIPMENT	15
1.21	PORTABLE AND DETACHABLE PARTS	15
1.22	RECORD DRAWINGS, PROJECT CLOSEOUT	15
1.23	GUARANIEE/WARRANIY	16
1.24	OPERATING, INSTRUCTION AND MAINTENANCE MANUALS	l /
1.25	QUALITY ASSUKANCE	18
1.20	DELIVERY, STORAGE AND HANDLING	19
1.2/	STAGING AND SCAFFOLDING	19
1.20	EATRA MATERIALS DESIGN CDITEDIA	20
1.29	EIDE DOATECTION WODKING DI ANS	20
1.50	FIRE FROTECTION WORKING FLANS	21
PART 2	PRODUCTS	
2.1	PIPE AND FITTINGS	23
2.2	UNDERGROUND FIRE SERVICE	23
2.3	WET PIPE SPRINKLER (175 psi)	25
2.4	DRY PIPE SPRINKLER	26
2.5	VALVES	27
2.6	HANGERS, ANCHORS, CLAMPS AND INSERTS	29
2.7	FIRE DEPARTMENT INLET CONNECTION	30

# CARVER POLICE CARVER, MA

CARVER, MA		E PROTECTION	21 00 00-ii
2.8	ELECTRIC FIRE PUMP		30
2.9	SPRINKLER HEADS		32
2.10	SPRINKLER CABINET		34
2.11	SIGNALING DEVICES		34
2.12	WATER PRESSURE GAUGES		35
2.13	SLEEVES AND PENETRATIONS		35
PART 3	BEXECUTION		
3.1	COORDINATION		36
3.2	SHUT DOWNS		36
3.3	TESTS		37
3.4	PIPE VALVE AND EQUIPMENT	IDENTIFICATION	38
3.5	ANCHORS AND INSERTS		39
3.6	TYPICAL DETAILS		39
3.7	CORING, DRILLING		39
3.8	SUPPLEMENTARY SUPPORTING	G STEEL	39
3.9	SPRINKLER INSTALLATION		39
3.10	WATER SERVICE		40
3.11	SEISMIC RESTRAINTS		41

#### SECTION 210000 - FIRE PROTECTION

#### (FILED SUB-BID REQUIRED)

#### PART 1 GENERAL

#### 1.1 <u>TIME, MANNER AND REQUIREMENTS FOR FILING SUB-BIDS</u>

- A. Sub-Bids shall be submitted in accordance with the provisions of General Laws, Chapter 149, Section 44A, inclusive, as amended.
- B. Sub-Bids for work under this Section shall be received electronically, until 2:00
  p.m. on Tuesday, October 29, 2019, at which time and place all Trade Contractor Bids shall be duly recorded.
- C. This project is being Electronically Bid (E-Bid). All bids shall be submitted online at <u>www.Projectdog.com</u>. Hard copy bids will not be accepted by the Awarding Authority. E-Bid tutorials and instructions are available within the specifications and online at <u>www.Projectdog.com</u>. For assistance, call Projectdog, Inc at (978)499-9014, M-F 8:30AM-5PM.
  - 1. All required bid forms must be submitted in **PDF** format only. The bidder must complete all required signatures either digitally (using Adobe Acrobat) or manually (print, sign and scan as a PDF file).
  - 2. Bid Bonds issued by a surety company shall be submitted on the E-Bid page. Bid bonds in the form of cash or check shall be completed and delivered as outlined on the Bid Bond Affidavit form.
  - 3. The bidder must enter bid price on the E-Bid form as a whole dollar value only with no punctuation. Sums shall be expressed in both words and figures on the bid form. Note: The E-Bid form will automatically match the word value to the numeric figure entered by the bidder.
  - 4. Bidders may save, submit or modify an E-Bid at any time prior to bid close. Once submitted, a bid cannot be edited. To modify a bid the bidder must retract the bid, make any necessary changes, and then submit the bid again. Upon submitting or retracting the bidder will receive a convenience email for informational purposes only. Bidders are encouraged to contact Projectdog, Inc at (978) 499-9014, M-F 8:30AM-5PM, if an email is not received.
  - 5. If a bid is submitted prior to an Addendum being issued, the bidder will receive an automated email for informational purposes only. The bidder must review the addendum, retract the bid, acknowledge all addenda, and submit the bid again. If a bidder fails to acknowledge addenda their bid may be rejected by the Awarding Authority.
  - 6. Timely submission of an E-Bid shall be the full responsibility of the Bidder. The server clock is the time of record. It is the bidder's responsibility to review and confirm online that a bid has been submitted and/or retracted and that the bid is 100% true, complete and accurate. All

bidders are required to review their submitted E-Bid via the "View My Bid Package" link.

- D. Sub-Bids filed with the Awarding Authority shall be accompanied by a Bid Deposit in the form of a certified check or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to the "**Town of Carver**". A bid bond shall be:
  - 1. In a form satisfactory to the Awarding Authority.
  - 2. With a surety company qualified to do business in the Commonwealth and satisfactory to the Awarding Authority.
  - 3. Conditioned upon the faithful performance by the principal of the agreements contained in the Bid. The amount of such bid deposit shall be five percent (5%) of the value of the Bid.
- E. Sub-Bids for work under this Section shall be for the complete work required as specified and as shown on the drawings.
- F. Sub-Bidders are directed to the Instructions to Bidders, and to the requirements that all bidders visit the site to determine the scope of work required under this Section.
- G. Sub-Bidders must comply with all provisions of Division 1, General Requirements, in the same manner as the General Contractor.

## 1.2 <u>RELATED DOCUMENTS</u>

- A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.
- B. Work Included: Provide labor, materials and equipment necessary to complete the work of this section, including, but not limited to, all work on the following drawings:
  - 1. FP-0.0 Fire Protection Legend and Details
  - 2. FP-1.0 Fire Protection Floor Plan
  - 3. FP-2.0 Fire Protection Attic Plan

## 1.3 <u>GENERAL REQUIREMENTS AND REFERENCES</u>

A. Include "General Requirements" and applicable parts of Division 1 as part of this section.

- B. Examine all other sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this section. Where paragraphs of this section conflict with similar paragraphs of Division 1, requirements of this section shall prevail.
- C. Coordinate work with that of all other trades affecting, or affected by work of this section. Cooperate with such trades to assure the steady progress of all work under the Contract.
- D. The Subcontractor shall be responsible for filing all documents and securing of all inspections and approvals necessary for the work of this section. The Awarding Authority shall be responsible for any permit fees charged to the project related to state or municipal inspections and approvals.
- E. The **Awarding Authority** shall pay all Utility Company and Municipal back charges for all materials furnished and work performed by them in conjunction with this Contract and pay same to the respective agency upon demand.

## 1.4 <u>DEFINITIONS</u>

- A. As used in this section, "provide," means "furnish and install", and "POS" means "Provided Under Other Sections".
- B. As used in the Contract Drawings and Specifications for Fire Protection work, certain non-technical words shall be understood to have specific meanings as follows, regardless of indications to the contrary in the General Conditions of other documents governing the Fire Protection work.
  - 1. "Furnish" means: Purchase and deliver to the project site complete with every necessary appurtenance and support all as part of the Fire Protection work. Purchasing shall include payment of all sales taxes and other surcharges as may be required to assure that purchased item(s) are free of all liens, claims, or encumbrances.
  - 2. "Install" means: Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project, all as part of the Fire Protection work.
  - 3. "Provide" means: "Furnish" and "Install".
  - 4. "New" means: Manufactured within the past two (2) years and never before used.
- C. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any fire protection item in the Contract Drawings or Specifications for Fire Protection work carries with it the

instruction to furnish, install and connect the item as part of the Fire Protection work, regardless of whether or not this instruction is explicitly stated.

D. It shall be understood that the Specifications and Drawings for Fire Protection work are complimentary and are to be taken together for a complete interpretation of the Fire Protection work.

#### 1.5 <u>SCOPE</u>

- A. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.
  - 1. Fire pump house package with fire pump and storage tank.
  - 2. Water supply from pump house to building.
  - 3. Wet pipe sprinkler system and all components.
  - 4. Dry pipe sprinkler system for attic and all components.
  - 5. Fire department inlet connections.
  - 6. Sprinkler heads, piping, fittings, hangers and valves.
  - 7. Gate valves, check valves, drain valves, fire department valves.
  - 8. Fire department valve cabinets.
  - 9. Preparation of complete and detailed Shop Drawings in accordance with NFPA No. 13.
  - 10. Preparation of complete and detailed Working Plans.
  - 11. Submitting Drawings and obtaining necessary approvals, permits and certificates.
  - 12. Tests.
  - 13. Securing hydrant flow test data reports.
  - 14. Hydraulic calculations.
  - 15. Miscellaneous steel support.
  - 16. Combined sprinkler and standpipe system and all components.
  - 17. Assisting the Owner in preparing a fire protection impairment plan.
  - 18. Furnish and install water flow switches and tamper switches. Flow and tamper switches shall be wired to the fire alarm system under the Electrical section of this specification.
- B. Drawings and Specifications form complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation.
- C. Give notices, file plans, obtain permits and licenses, and obtain necessary approvals from Authorities Having Jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.

#### 1.6 <u>RELATED WORK UNDER OTHER SECTIONS</u>

- A. The following items are not included in this section and will be performed under the designated sections.
  - 1. Temporary Facilities.
  - 2. Earthwork: Excavation and backfill.
  - 3. Concrete:
    - a. Equipment foundations.
    - b. Housekeeping pads.
    - c. Rebar for items "a, and b" above.
  - 4. Masonry: All openings in masonry walls.
  - 5. Waterproofing, Dampproofing and Caulking.
  - 6. Roofing and Flashing.
  - 7. Painting: All painting.
  - 8. Finished Carpentry and Millwork.
  - 9. Steel Doors and Frames.
  - 10. Finished Hardware.
  - 11. Electrical.
  - 12. Plumbing.
  - 13. HVAC.
  - 14. Electric power wiring for all equipment.
  - 15. Fire alarm system and controls.
  - 16. Utilities beyond 10'-0" from the building.
  - 17. Installation of access panels.
  - 18. Electric heat tracing.
  - 19. Concrete basins and pits.

#### 1.7 <u>REGULATORY REQUIREMENTS</u>

- A. Comply with all applicable Federal and State laws, and all Local Codes, By-laws and Ordinances.
- B. Where provisions of the Contract Documents conflict with any codes, rules or regulations, the latter shall govern. Where the contract requirements are in excess of applicable codes, rules or regulations, the contract provisions shall govern unless the Architect rules otherwise.
- C. Request inspections from Authorities Having Jurisdiction, and obtain all permits and inspection certificates as applicable and/or required. All permits and certificates shall be turned over to the Owners at the completion of the work. Copies of permits shall be given to the resident engineer prior to the start of work.
- D. Unless otherwise specified or indicated, materials and workmanship and equipment performance shall conform with the adapted by the State edition of the following standards, codes, Specifications, requirements and regulations:

- 1. State Building Code.
- 2. National Electric Code (NEC).
- 3. Environmental Protection Agency (EPA).
- 4. Department of Environmental Protection (DEP).
- 5. Local Ordinances, Regulations of the Town of Carver, MA.
- 6. National Fire Protection Association (NFPA).
- 7. Owner's Insurance Underwriters.
- 8. American National Standards Institute (ANSI).
- 9. American Society of Mechanical Engineers (ASME).
- 10. American Society of Testing and Materials (ASTM).
- 11. American Welding Society (AWS).
- 12. Commercial Standards, U.S. Department of Commerce (CS).
- 13. Factory Mutual (FM).
- 14. Industrial Risk Insurers (IRI).
- 15. National Electrical Manufacturers Association (NEMA).
- 16. American Gas Association (AGA).
- 17. Underwriter's Laboratories, Inc. (UL).
- 18. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
- 19. Massachusetts or State Water Resource Authority (MWRA).
- 20. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS).
- 21. Architectural Access Board (AAB).
- 22. Americans with Disabilities Act (ADA).
- E. All Fire Protection work shall meet or exceed any other State and Local Codes and/or Authorities Having Jurisdiction including all other standards indicated herein.

## 1.8 <u>SUBMITTALS</u>

- A. This paragraph shall supplement Division 1.
- B. Definitions:
  - 1. Shop Drawings: Scaled detailed working Drawings (system layout) and equipment Specifications (cut sheets) indicating all information in accordance with requirements of the applicable NFPA Standards for the specific fire protection systems to be installed in accordance with the Registered Professional Engineer's plans and Specifications.
  - 2. Coordination Drawings: Detailed, large-scale layout Shop Drawings showing HVAC, Electrical, Plumbing and Fire Protection work superimposed to identify conflicts and ensure inter-coordination of Mechanical, Electrical, Architectural, Structural and other work.
- C. Submittals, Procedures and Format:

- Review submittal packages for compliance with Contract Documents and then submit to Architect for review. Submit transparency and two (2) blue or black-line reproductions of each Shop Drawing larger than 8-1/2" x 11". Submit eight (8) sets of each smaller shop drawing. After review, transparency original of each large Shop Drawing and six (6) sets of each small shop drawing will be returned with reviewer's marks. Electronically submitted shop drawings are acceptable.
- 2. Each Shop Drawing shall indicate in title block, and each Product Data package shall indicate on cover sheet, the following information:
  - a. Title.
  - b. Name and location of project.
  - c. Names of Architect, Engineer, Contractor and Subcontractor(s).
  - d. Names of Manufacturer, Supplier, Vendor, etc.
  - e. Date of submittal.
  - f. Whether original submittal or resubmitted.
  - g. Contractors' license number and expiration date.
- 3. Shop Drawings showing manufacturer's product data shall contain detailed dimensional Drawings, accurate and complete description of materials of construction, manufacturer's published performance characteristics and capacity ratings (performance data alone is not acceptable), electrical requirements and wiring diagrams.
- D. Acceptable Manufacturers:
  - 1. The Fire Protection design for this project is based on the single manufacturer listed in the specification, schedule or shown on the Contract Drawings. In these Specifications certain "Alternate Manufacturers" are listed as being acceptable. These are acceptable only if, as a minimum, they:
    - a. Meet all performance criteria listed in the schedules and outlined in the Specifications.
    - b. Have identical operating characteristics to those called for in the Specifications.
    - c. Fit within the available space it was designed for, including space for maintenance and component removal, with no modifications to either the space or the product. Clearances to walls, ceilings and other equipment will be at least equal to those shown on the Contract Documents. The fact that a manufacturer's name appears as acceptable shall not be taken to mean the Architect has determined that the manufacturer's products will fit within the available space. This determination is solely the responsibility of the Contractor.
    - d. For equipment mounted in areas where structural matters are a consideration, the products must have a weight no greater than the product listed in the schedules or Specifications.

- e. Products must adhere to all architectural considerations including, but not limited to, being the same size and of the same physical appearance as scheduled or specified products.
- E. Substitutions: Substitution of products by manufacturers other than those listed shall only be done in accordance with subparagraph "F" "Substitutions and Deviations".
- F. Substitutions and Deviations:
  - 1. Deviations from the Contract Documents and the substitution of materials or equipment relative to the "Acceptable Manufacturers" (referred to above) shall be requested individually in writing whether deviations result from field conditions, standard shop practice, or other cause. Submit letter with transmittal of Shop Drawings which flags the substitution or deviation to the attention of the Architect. The letter shall describe changes in the system shown and physical characteristics (connections to adjacent materials, electrical services, service access requirements, and other characteristics), and differences in operating characteristics.
  - 2. Without letters flagging the substitution or deviation to the Architect, it is possible that the Architect may not notice such substitution or deviation or may not realize its ramifications. Therefore, if such letters are not submitted to the Architect, the Contractor shall hold the Architect and his consultants harmless for any and all adverse consequences resulting from the deviations being implemented. Adverse consequences shall include, but not be limited to, excessive noise, excessive maintenance, shortened longevity, spatial coordination problems, and inadequate performance versus scheduled design. This shall apply regardless of whether the Architect has reviewed or approved Shop Drawings containing the deviation, and will be strictly enforced.
  - 3. Do not request substitute materials or equipment unless identical material or equipment has been operated successfully for at least three (3) consecutive years. Such materials and equipment shall be a regular cataloged item shown in the current catalog of the manufacturer. When deviation or substitution is permitted, coordinate fully with related changes to Architectural, Structural, Plumbing, Fire Protection, Mechanical, and other work. Ensure that related changes necessary for coordination of substituted items are made within the Contract Price. Assume full responsibility for safety, operation and performance of the altered system.
  - 4. Substitutions of equipment, systems, etc. requiring approval of local Authorities must comply with such regulations and be filed by the Contractor (should filing be necessary).

- 5. Consideration will not be given to claims that the substituted item meets the performance requirements with lesser construction. Performance, as delineated in schedules and in the Specifications, shall be interpreted as minimum performance.
- 6. Approval of proposed deviations or substitutions, if any, will be made at discretion of Architect.
- 7. If equipment is proposed for substitution that is not tested and rated according to industry-wide standards, the Architect shall have the right to have performance tests completed, at the Contractor's expense, to confirm the manufacturer's performance claims.
- G. Submittal Notations: Submittals will be returned from the Architect marked as illustrated below:

NO EXCEPTION TAKEN	ACCEPTED AS NOTED
NOT ACCEPTED	REVISE AND RESUBMIT

- 1. Checking is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Any action shown is subject to the requirements of the Contract Drawings and Specifications. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site; fabrication process and techniques of construction; coordination of his work with that of all other trades; and the satisfactory performance of his work.
- H. Schedule: Incorporated the Shop Drawing review period into the construction schedule so that work is not delayed. Contractor shall assume full responsibility for delays caused by not incorporating the following Shop Drawing review time requirements into his project schedule. Allow at least ten (10) working days, exclusive of transmittal time, for review each time shop a Shop Drawing is submitted or resubmitted with the exception that fifteen (15) working days, exclusive of transmittal time, are required for the following:
  - 1. Coordination Drawings, if required by this Specification.
  - 2. If more than five (5) Shop Drawings of this trade are received in one (1) calendar week.
- I. List of Proposed Equipment and Materials: Within four (4) weeks after Award of Contract and before ordering materials or equipment, submit a complete list of proposed materials and equipment and indicate manufacturer's names and

addresses. No consideration will be given to partial lists submitted out of sequence.

- J. Responsibility:
  - The intent of submittal review is to check for capacity, rating, and certain construction features. Contractor shall ensure that work meets requirements of the Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction; and for coordination of work of this and other Sections. Work shall comply with submittals marked "REVIEWED" to extent that they agree with the Contract Documents. Submittal review shall not diminish responsibility under this Contract for dimensional coordination, quantities, installation, wiring, supports and access for service, nor the Shop Drawing errors or deviations from requirements of the Contract Documents. The Architect's noting of some errors while overlooking others will not excuse the Contractor for proceeding in error. Contract Document requirements are not limited, waived, nor superseded in any way by review.
  - 2. Inform Subcontractors, Manufacturers, Suppliers, etc. of scope and limited nature of review process and enforce compliance with the Contract Documents.
- K. Material and equipment requiring Shop Drawing Submittals shall include but not be limited to:
  - 1. Wet pipe sprinkler system components including alarm valves, pipe, fittings, sprinkler heads, pressure gauges, etc.
  - 2. Dry pipe sprinkler system components including dry pipe valves, pipe, fittings, sprinkler heads, air compressor, pressure gauges, etc.
  - 3. Fire department connections.
  - 4. Sprinkler heads, pipe, fittings, hangers and valves.
  - 5. Valves including gate, fire department, drain and test type.
  - 6. Fire department valve cabinet.
  - 7. Access panels.
  - 8. Seismic restraints.
9. Sprinklers shall be referred to on drawings and shall be specifically identified by the listed manufacturer's style or series designation. Trade names and abbreviations are not permitted.

### 1.9 SURVEYS AND MEASUREMENTS

A. Base all required measurements, both horizontal and vertical, on reference points established by the General Contractor and be responsible for the correct laying out of the Fire Protection work. In the event of a discrepancy between actual measurements and those indicated, notify the General Contractor in writing. Do not proceed with the work required until written instructions have been issued by the General Contractor.

### 1.10 <u>COORDINATION</u>

- A. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of Mechanical and Electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with Structural and other trades and to meet Architectural requirements.
- B. Work shall be performed in cooperation with other trades on the project and so scheduled as to allow speedy and efficient completion of the work.
- C. Furnish to other trades advance information on locations and sizes of all frames, boxes, sleeves and openings needed for their work. Furnish information and Shop Drawings necessary to allow trades affected by the work to install their work properly and without delay.
- D. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Architect. Where the Fire Protection work shall interfere with the work of other trades, assist in coordinating the space conditions to make satisfactory adjustments before installation. Without extra cost to the Owner, make reasonable modifications to the work as required by normal Structural interferences. Pay the General Contractor for additional openings, or relocating and/or enlarging existing openings through concrete floors, walls, beams and roof required for any work which was not properly coordinated. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.
- E. If any Fire Protection work has been installed before coordination with other trades so as to cause interference with the work of such trades, all necessary adjustments and corrections shall be made by the fire protection trades involved without extra cost to the Owner.

- F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Architect for review and approval.
- G. Protect all materials and work of other trades from damage which may be caused by the Fire Protection work, and repair all damages without extra cost to the Owner.

### 1.11 ELECTRICAL COORDINATION

- A. Fire Protection Subcontractor shall furnish and install various electrical items relating to the fire protection equipment and control apparatus. The Electrical Subcontractor shall be required to connect power wiring to this equipment unless noted otherwise.
- B. The Fire Protection and Electrical Subcontractors shall coordinate their respective portions of the work, as well as the electrical characteristics of the fire protection equipment.
- C. All power wiring and local disconnect switches will be provided by the Electrical Subcontractor for the line voltage power.
- D. 120V and above power wiring sources extended and connected to fire protection control panels, transformers and switches shall be the responsibility of the Electrical Subcontractor.
- E. Flow and tamper switches shall be connected to the Building's fire alarm system by the Electrical Subcontractor.

### 1.12 MECHANICAL AND ELECTRICAL COORDINATION DRAWINGS

- A. Coordination Drawings:
  - 1. The Sheetmetal Subcontractor shall prepare a complete set of electronic Drawings at a scale not less than 3/8" equals 1'-0", showing structure and other information as needed for coordination. He shall show sheetmetal layout thereon. These will be the Coordination Drawings.
  - 2. The main paths of egress and for equipment removal, from main Mechanical and Electrical rooms must be clearly shown on the Coordination Drawings.
  - 3. Each of the below specialty trades shall add its work to these background Drawings with appropriate elevations and grid dimensions. Specialty trade information is required for fan rooms and mechanical rooms, horizontal exits from duct shafts, crossovers, and for spaces in and above ceilings where congestion of work may occur such as corridors, and even entire floors. Drawings shall indicate horizontal and vertical dimensions, to avoid interference with structural framing, ceilings, partitions, and other services.

- a. Specialty Trades:
  - 1) Plumbing System.
  - 2) HVAC Piping and Associated Control System.
  - 3) Electrical.
  - 4) Sheet Metal Work.
  - 5) Sprinkler System.
- 4. Each specialty trade shall sign and date each electronic Coordination Drawing. Return Drawings to the Sheetmetal Subcontractor, who shall route them sequentially to all specialty trades.
- 5. Where conflicts occur with placement of materials of various trades, the Sheetmetal Subcontractor will be responsible to coordinate the available space to accommodate all trades. Any resulting adjustments shall be initialed and dated by the specialty trade. The Sheetmetal Subcontractor shall then final date and sign each Coordination Drawing. If he cannot resolve conflicts, the decision of the General Contractor shall be final, subject to the approval of the Architect.
- 6. A Subcontractor who fails to promptly review and incorporate his work on the Coordination Drawings shall assume full responsibility of any installation conflicts affecting his work and of any schedule ramifications.
- 7. Sheetmetal Subcontractor shall make electronic copies of all Coordination Drawings. Fabrication shall not start until such transparencies of completed Drawings are received by the Architect/Engineer and have been reviewed.
- 8. Review of Coordination Drawings shall not diminish responsibility under this Contract for final coordination of installation and maintenance clearances of all systems and equipment with Architectural, Structural, Mechanical, and Electrical Contractors.

### 1.13 INSTALLATION REQUIREMENTS

- A. The arrangement of all Fire Protection work shown on the Contract Drawings is diagrammatic only and indicates the minimum requirements of the work. Conditions at the building including actual measurements shall determine the details of the installation. All work shall be laid out and installed so as to require the least amount of cutting and patching.
- B. Check the Architectural plans and Specifications before ordering any material and equipment. Any discrepancies shall be brought to the attention of the Architect for his determination prior to proceeding with the work.

# 1.14 <u>TYPICAL DETAILS</u>

A. Typical details where shown on the Contract Drawings shall apply to each and every item of the project where such items are applicable. They are not repeated in full on the Contract Drawings, which in many cases are diagrammatic only, but with the intention that such details shall be incorporated in full. Any alternate method proposed for use by the Contractor shall have the prior approval of the Architect.

### 1.15 <u>SLEEVES, INSERTS</u>

Furnish and install all sleeves, inserts, anchor bolts and similar items to be set into masonry or concrete, as required for Fire Protection work as indicated in Division 01. Internal diameter of sleeve shall be 1/2" larger than the outside diameter of the pipe or insulation covered line passing through it.

### 1.16 FIRESTOPPING, SMOKEPROOFING & WATERPROOFING

A. All cutting, patching, firestopping and waterproofing shall be performed by the Fire Suppression Subcontractor. Refer to Sections 01 73 29 – CUTTING AND PATCHING, 07 00 01 – WATERPROOFING, DAMPPROOFING & CAULKING, and 07 84 13 PENETRATION FIRESTOPPING for project requirements.

### 1.17 CORING, DRILLING

A. Core, cut and/or drill all holes in walls and floors required for the installation of sleeves and supports for the Fire Protection work as indicated in Division 01.

### 1.18 <u>ACCESSIBILITY</u>

- A. Install all work such that parts requiring periodic inspection, operation, maintenance and repair are readily accessible.
- B. Furnish all access panels appropriate to particular conditions, to be installed by trades having responsibility for the construction of actual walls, floors or ceilings at required locations.

### 1.19 <u>SUPPLEMENTARY SUPPORTING STEEL</u>

- A. Provide all supplementary (non-structural) steelwork required for mounting or supporting equipment and materials.
- B. Steelwork shall be firmly connected to building construction as required. Locations and methods of attachment shall be approved by the Architect.
- C. Steelwork shall be of sufficient strength to allow only minimum deflection in conformity with manufacturer's published requirements.

- D. All supplementary steelwork shall be installed in a neat and workmanlike manner parallel to floor, wall and ceiling construction: all turns shall be made at forty-five and ninety degrees, and/or as dictated by construction and installation conditions.
- E. All manufactured steel parts and fittings shall be galvanized.

### 1.20 <u>TOOLS AND EQUIPMENT</u>

A. Provide all tools and equipment required for the fabrication and installation of the mechanical and electrical equipment at the site.

### 1.21 PORTABLE AND DETACHABLE PARTS

A. Contractors shall retain in their possession all portable and/or detachable parts and portions of materials, devices, equipment, etc. necessary for the proper operation and maintenance of the Fire Protection system until final completion of the work, at which time they shall be handed over to the Owners.

# 1.22 RECORD DRAWINGS, PROJECT CLOSEOUT

- A. As the work progresses and for the duration of Contract, maintain a complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately including work installed as a modification or addition to the original design. Work shall be updated on a weekly basis and shall be made available for review by Architect. Failure to perform this work shall be reason for withholding requisition payments. In addition, take photographs of all concealed equipment in gypsum board ceilings, shafts, and other concealed, inaccessible work. At completion of work, make copies of photographs with written explanation on back. These shall become part of Record Documents.
- B. At completion of the work prepare a complete set of electronic Record Drawings showing all systems as actually installed, including all fire alarms and electrical circuitry. The electronic copies will be made available for the Fire Protection Contractor's copying, at his expense, for the Record Drawings. The quantity of electronic copies which are made available shall in no way be interpreted as setting a limit to the number of Drawings necessary to show the required information. The Fire Protection Contractor's professional Draft Person shall transfer changes to electronic copies. Submit sets to Architect for comments as indicated in Division 01 01 77 00 CONTRACT CLOSEOUT.
- C. The Architect will not certify the accuracy of the Record Drawings. This is the sole responsibility of the Fire Protection and General Contractors.

- D. This trade shall submit the Record Drawings for approval by the Fire and Building Departments in a form acceptable to the departments, when required by the jurisdiction.
- E. Record Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer, make and model numbers of final equipment installation.

### 1.23 <u>GUARANTEE/WARRANTY</u>

- A. Guarantee and 24 hour service.
  - 1. Guarantee Work of this Section in writing for not less than one (1) year following the date of acceptance by the Owner. If the equipment is used for temporary service etc, prior to acceptance by the Owner, the bid price shall include an extended period of warranty covering the one (1) year of occupancy, starting from the date of acceptance by the Owner. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to the Architect's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.
  - 2. In addition to guarantee requirements of Division 1 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in Owner's name.
  - 3. Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by this Contractor without any reimbursement.
  - 4. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Architect.
  - 5. Provide 24 hour service beginning on the date the project is accepted by the Owner, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to the Owner. Service can be provided by this Contractor or a separate service organization. Choice of service organization shall be subject to Architect and Owner approval. Submit name and a phone number that will be answered on a 24 hour basis each day of the week, for the duration of the service.
  - 6. Submit copies of equipment and material warranties to Architect before final payment.
  - 7. At end of guarantee period, transfer manufacturer's equipment and material warranties still in force to Owner.

- 8. This paragraph shall not be interpreted to limit Owner's rights under applicable codes and laws and under this Contract.
- 9. Part 2 paragraphs of this Specification may specify warranty requirements that exceed those of this paragraph. Those paragraphs shall govern.
- 10. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of Work by Owner, and shall not initiate the guarantee period.
- 11. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to Owner's satisfaction then advise the Architect in writing, describe efforts to rectify situation, and provide analysis of cause of problem. The Architect and/or Engineer will direct course of action.

#### 1.24 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS

- A. Refer to Section 01 70 00 CONTRACT CLOSEOUT and 01 78 23 OPERATION AND MAINTENANCE DATA for submittal procedures pertaining to Operating and Maintenance Manuals.
- B. Each copy of the approved Operating and Maintenance Manual shall contain copies of approved Shop Drawings, equipment literature, cuts, bulletins, details, equipment and engineering data sheets and typewritten instructions relative to the care and maintenance for the operation of the equipment, all properly indexed. Each manual shall have the following minimum contents:
  - 1. Table of Contents.
  - 2. Introduction:
    - a. Explanation of manual and its purpose and use.
    - b. Description of systems.
    - c. Safety precautions necessary for equipment.
    - d. Illustrations, schematics and diagrams.
    - e. Installation drawing.
  - 3. Maintenance:
    - a. Maintenance and lubricating instructions.
    - b. Replacement charts.
    - c. Trouble-shooting charts for equipment components.
    - d. Testing instructions for each typical component.

- e. Two (2) typed sets of instructions for ordering spare parts. Each set shall include name, price, telephone number and address of where they may be obtained.
- 4. Manufacturer's Literature: The equipment for which Shop Drawings have been submitted and approved.

#### 1.25 QUALITY ASSURANCE

- A. The requirements of the State Building Code and Local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.
- B. All work shall comply with the adapted by the State editions of the codes as referenced herein.
- C. All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
  - 1. All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.
- D. Follow manufacturer's directions for articles furnished, in addition to directions shown on Drawings or specified herein.
- E. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to the Owner.
- F. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.
- G. Equipment and materials shall:
  - 1. Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed and labeled.
  - 2. Be without blemish or defect.
  - 3. By products which will meet with the acceptance of all Authorities Having Jurisdiction over the work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or other recognized testing laboratory, the product shall be so examined, tested and certified.

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- H. All items of equipment or material of one generic type shall be the product of one manufacturer throughout.
- I. For items which are to be installed but not purchased as part of the Fire Protection work, the Fire Protection work shall include:
  - 1. The coordination of their delivery.
  - 2. Their unloading from delivery trucks driven into any point on the property line at grade level.
  - 3. Their safe handling and field storage until the time of permanent placement in the project.
  - 4. The correction of any damage, defacement or corrosion to which they may have been subjected. Replacement, if necessary, shall be coordinated with the Contractor who originally purchased the item.
  - 5. Mounting in place, including the purchase and installation of all dunnage, supporting members, and fastenings, necessary to adapt them to architectural and structural conditions.
- J. Items which are to be installed but not purchased as part of the Fire Protection work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the electric work will be considered only if presented in writing within one (1) week of the date of delivery to the project of the items in question. The Fire Protection work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

### 1.26 DELIVERY, STORAGE AND HANDLING

A. All materials for the work of this section shall be delivered, stored and handled so as to preclude damage of any nature. Manufactured materials shall be delivered and stored in their original containers, plainly marked with the products' and manufacturer's name. Materials in broken containers or in packages showing watermarks or other evidence of damage shall not be used and shall be removed from the site.

### 1.27 STAGING AND SCAFFOLDING

A. Provide staging and scaffolding for all the work of this section complying with Division 1 requirements.

B. Refer to Section 01 50 00 – Temporary Facilities, Section 3.3 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES INSTALLATION for scaffolding to be furnished by the General Trades Contractor.

### 1.28 EXTRA MATERIALS

A. Furnish extra materials described in following product specification sections that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.

#### 1.29 DESIGN CRITERIA

- A. Provide wet-pipe sprinklers in all areas. Provide dry-type sprinkler system in all areas where ambient temperature is 40 deg. F or below.
- B. Design sprinkler system according to the following:
  - 1. Sprinkler Occupancy Hazard Classifications as follows:
    - a. Building Services Areas: Ordinary Hazard, Group 2.
    - b. Electrical Equipment Rooms: Ordinary Hazard, Group 1.
    - c. General Storage Areas: Ordinary Hazard, Group 2.
    - d. Sallyport: Ordinary Hazard, Group 2.
    - e. Mechanical Equipment Rooms: Ordinary Hazard, Group 2.
    - f. Office and Public Areas: Light Hazard.
    - g. Residential Living Areas: Light Hazard.
  - 2. Minimum Density for Automatic Sprinkler Piping Design as follows:
    - a. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
    - b. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
    - c. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area.
    - d. Special Occupancy Hazard: As determined by Authorities Having Jurisdiction.
  - 3. Maximum Protection Area per Sprinkler as follows:
    - a. Office space: 225 sq. ft.
    - b. Future Tenant Space: 130 sq. ft.
    - c. Storage Areas: 130 sq. ft.
    - d. Mechanical Equipment Rooms: 130 sq. ft.
    - e. Electrical Equipment Rooms: 130 sq. ft.
- C. Secure current fire pump test data once installation is complete.
- D. Run piping horizontally and at right angles to walls and ceilings. Center sprinkler heads with respect to ceiling components, such as ceiling grid, lighting fixtures, HVAC diffusers and speakers, as directed by Architect.

- E. Add a 10 psi safety factor to hydraulic calculations for a cushion against future pipe main deterioration. Pipe velocity in sprinkler piping shall not exceed 20 FPS.
- F. Provide dry sprinkler system for sprinklers in areas subject to freezing.
- G. Provide test connections at highest point of main portion of each sprinkler system, with 1" pipe and valve. Test pipe shall be connected to sprinkler pipe at least 1-1/4" in size and shall discharge outside building.
- H. Utilize Victaulic Testmaster 2 for inspectors test and draining the system.
- I. Provide sprinklers in all areas except where exempted by code or AHJ.

#### 1.30 FIRE PROTECTION WORKING PLANS

- A. Submit working plans to indicate actual sprinkler system and/or combination system piping layout. Working plans shall be signed and sealed by a professional engineer.
- B. Seismic restraints: All seismic restraints shall be indicated on working plans including locations and type of plan, details and calculations.
- C. Hydraulic calculations shall be signed and sealed by Professional Engineer. Submit working plans and hydraulic calculations to:
  - 1. Architect/Engineer.
  - 2. Insurance Underwriter.
  - 3. Building Department.
  - 4. Fire Department.
- D. Submit working plans and hydraulic calculations in one complete package. When it is not possible to submit entire system design in one package due to job conditions, submit plans of entire building indicating areas not yet defined. Submit working plans and hydraulic calculations to:
  - 1. Architect/Engineer.
  - 2. Insurance Underwriter.
  - 3. Building Department.
  - 4. Fire Department.
- E. Working plans shall be at least 1/8"=1' scale of sheets of uniform size. Working plans shall show all data required by NFPA No. 13, including but not limited to:
  - 1. Name of Owner and Occupant.
  - 2. Location, including street address.
  - 3. Point of compass.

- 4. Full height cross section, or schematic diagram, if required for clarity; including ceiling construction and method of protection for nonmetallic piping.
- 5. Location of partitions.
- 6. Location of fire walls.
- 7. Occupancy class of each area or room.
- 8. Location and size of concealed spaces, closets, attics, and bathrooms.
- 9. Any small enclosures in which no sprinklers are to be installed.
- 10. Fire pump house and storage tank location and capcities..
- 11. Other sources or water supply, with pressure or elevation.
- 12. Make, type, and nominal orifice size of sprinklers.
- 13. Temperature rating and location of high-temperature sprinklers.
- 14. Total area protected by each system on each floor.
- 15. Number of sprinklers on each riser per floor.
- 16. Total number of sprinklers on each dry pipe system, pre-action system, combined dry pipe pre-action system, or deluge system.
- 17. Approximate capacity in gallons of each dry pipe system.
- 18. Pipe type and schedule of wall thickness.
- 19. Nominal pipe size and cutting lengths of pipe (or center-to-center dimensions).
- a. Note: Where typical branch lines prevail, it will be necessary to size only one typical line.
- 20. Location and size of riser nipples.
- 21. Type of fittings and joints and location of all welds and bends. The Contractor shall specify on drawing any sections to be shop welded and the type of fittings or formations to be used.
- 22. Type and locations of hangers, sleeves, braces, and methods of securing sprinklers when applicable.
- 23. All control valves, check valves, drain pipes, and test connections.
- 24. Make, type, model, and size of alarm or dry pipe valve.
- 25. Make, type, model and size of pre-action or deluge valve.
- 26. Kind and location of alarm bells.
- 27. Size and location of hose outlets, hand hose, and related equipment.
- 28. Underground pipe size, length, location, weight, material, point of connection to city main; the type of valves, meters, and valve pits; and the depth that the top of the pipe is laid below grade.
- 29. Piping provisions for flushing.
- 30. For hydraulic designed systems, the information on the hydraulic data nameplate.
- 31. A graphic representation of the scale used on all plans.
- 32. Name and Address of Contractor.
- 33. Hydraulic reference points shown on the plan shall correspond with comparable reference points on the hydraulic calculation sheets.
- 34. The minimum rate of water application (density), the design area of water application, in-rack sprinkler demand, and the water required for hose streams both inside and outside.

- 35. The total quantity of water and the pressure required noted at a common reference point for each system.
- 36. Relative elevations of sprinklers, junction points, and supply or reference points.
- 37. If room design method is used, all unprotected wall openings throughout the floor protected.
- 38. Calculation of loads for sizing, and details of sway bracing.
- F. Working plans will be subject to Architect's final approval. Submit to Architect after review by other Authorities. If necessary to submit plans to Architect before review by other Authorities, identify Authorities that have not reviewed plans and resubmit for final approval when review by all parties is complete.
- G. Sprinkler pipe sizing shall be based on hydraulic calculations.
- H. Fire protection contractor shall provide piping layout on measured Drawings. For renovation projects, this shall require Contractor to field survey existing building and prepare reproducible Drawings on which to show building background and all Fire Protection work.
- I. Working Plans shall show all hangers and supports from floors, walls, underside of slabs and structural steel members. Where piping cannot be supported from walls or slabs, contractor shall provide additional structural steel bracing to support pipe.
- J. Working Plans shall be submitted with the shop drawing cover sheet from Section 15000. Any deviations from original plans and Specifications shall be noted. Any hydraulic deviations shall be noted.

### PART 2 PRODUCTS

# 2.1 <u>PIPE AND FITTINGS</u>

A. Piping shall meet applicable ANSI or ASTM standard requirements and shall have manufacturer's name and standard marked on each length. Joints shall meet applicable ANSI or ASTM standards requirements. Where ANSI or ASTM standard does not exist, joints and fittings shall bear UL listing symbol.

# 2.2 <u>UNDERGROUND FIRE SERVICE</u>

Ductile Iron	2" and Smaller	2-1/2" and Larger
Pipe	Type "K" copper water tube	Ductile iron AWWA C151.
	conforming to ASTM B88	Cement lining ANSI A21.4 and
	annealed.	AWWA C104. The outside

		coating shall be a bituminous
		coating of 1ml minimum
		thickness. The pipe shall be
		clearly marked with the letters
		"Ductile" of "DI" and shall
		indicate weight, class and
		casting period.
Fittings	ANSI/ASME B16.22 wrought	Ductile iron 250 psi rating
	copper and bronze pressure	conforming to AWWA C-11,
	fittings.	cement lining AWWA C-104.
	-	The fittings shall be clearly
		marked with the letters
		"Ductile" or "DI" and shall
		have an outside bituminous
		coating of 1 ml.
Joints	ANSI/AWS A5.8 BcuP silver	Push on joint shall conform to a
	braze.	single rubber gasket joint per
		ANSI A21.11 and AWWA
		C111. Flange joints and pipe
		flanges shall conform to ANSI
		B16.1. Flanged joints are to be
		fitted such that the contact faces
		bear uniformly on the gasket
		and are made with uniform bolt
		stress.
Flanges		Flanges shall be plain faced,
		CI150 and shall match the
		piping system and fittings on
		which they are installed.
Gaskets/Bolts		Gaskets shall be full-face rubber
		1/8" thick. Bolts and nuts shall
		conform to ANSI B18.2.1 and
		B18.2.2, respectively.

### A. Notes:

- 1. This contractor shall make submittal to the Water Authority having jurisdiction and secure all local permits and approval for the underground water piping system prior to submitting Shop Drawings to the engineer. The shop drawing submittal to the engineer shall include an approval notification from the local water authority.
- 2. Receiving, Storage and Handling: Pipe shall be unloaded using slings, hooks, pipe tongs or skids. Care should be taken to avoid injury to coating or lining. Store lubricant for rubber joints in a sanitary condition and as an aid in

disinfection of the main. Rubber gaskets shall be used on a first in, first out basis and stored in a cool, dark location.

- 3. Thrust restraint shall be installed at all changes in direction, tees, deadends and where changes in pipe size occur by the use of concrete thrust blocks, restrained joints and tie rods.
- 4. Excavation, shoring and dewatering will be done under Division 2.

# 2.3 <u>WET PIPE SPRINKLER (175 psi)</u>

Carbon Steel	2" and Smaller	2-1/2" and Larger
Pipe	Welded and seamless black steel pipe conforming to ASTM A53, ASTM A795 or ANSI/ASTM A135, Schedule	Welded and seamless black steel pipe conforming to ASTM A795 or ANSI/ASTM A135, Schedule 10
	40.	
Fittings	Cast iron fittings. ANSI/ASME B16.1 and B16.4	Mechanical grooved couplings with ductile iron housing clamps to engage and lock, "C" shaped composition sealing gasket, steel bolts, nuts and Vic plug gasket (pre-tube).
Joints	Thread. Apply joint compound or Teflon tape to male pipe threads on threaded systems.	Weld or roll groove. Welding procedures shall conform to the requirements of AWS D.10.9, level AR3.
Flanges	Flanges shall be plain faced and shall be CI-150 and shall conform to ANSI B.16.5.	Flanges shall be plain faced and shall be CI-150 and shall conform to ANSI B16.5.
Gaskets/Bolts	Gaskets shall be full face rubber 1/8" thick. Bolts and nuts shall conform to ANSI B18.2.1 and B18.2.2, respectively.	Gaskets shall be full face rubber 1/8" thick. Bolts and nuts shall conform to ANSI B18.2.1 and B18.2.2, respectively.

- A. Notes: Pipe material and fittings shall meet the standards set forth for pipe and tube in the National Fire Code NFPA 13, Section 6.3.
- B. Grooved joint couplings shall consist of two (2) ductile iron housing segments, pressure responsive elastomer gasket, and ASTM A449 zinc-electroplated steel bolts and nuts.
  - 1. Rigid: Coupling housings with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with NFPA-

13. Couplings shall be fully installed at a visual pad-to-pad offset contact. Couplings that require gapping of bolt pads or specific torque ratings for proper installation are not permitted. Installation-Ready, for direct stab installation without field disassembly. Basis of Design: Victaulic Style 009H and 107N.

2. Flexible: Use in locations where vibration attenuation and stress relief are required. Basis of Design: Victaulic Style 177 Installation-Ready, and Style 77.

# 2.4 DRY PIPE SPRINKLER

Galvanized		
Steel	2" and Smaller	2 - 2-1/2" and Larger
Pipe	Welded and seamless black	Welded and seamless black
	steel pipe conforming to	steel pipe conforming to ASTM
	ASTM A53 Schedule 40.	A53 Schedule 40 or Schedule
	Galvanized to ASTM A795.	10. Galvanized to ASTM
		A795.
Fittings	Galvanized cast iron Class 150	Galvanized cast iron class 150
	fittings ANSI/ASTM B16.1	fittings ANSI/ASME B.16.1
	and screw fittings per	and screw fittings per
	ANSI/ASME B.16.4.	ANSI/ASME B.16.4, ASME
	Mechanical grooved couplings	31.1, 31.3. Mechanical grooved
	with malleable iron housing	couplings with ductile iron
	clamps to engage and lock,	housing clamps to engage and
	"C" shaped composition	lock, "C" shaped composition
	sealing gasket, steel bolts, nuts	sealing gasket, steel bolts, nuts,
	and washers.	Vic plus pre-tube gasket.
Joints	Roll grooved, cut grooved or	Roll groove or thread. Apply
	thread. Apply joint compound	joint compound or Teflon tape
	or Teflon to male pipe threads	to male pipe threads on threaded
	on threaded systems.	systems.
Flanges		Flanges shall be plain face and
		shall be C1-150 and shall
		conform to ANSI B16.5.
Gaskets/Bolts		Gaskets shall be full face rubber
		1/8" thick. Bolts and nuts shall
		conform to ANSI B18.2.1 and
		B18.2.2, respectively.

- A. Notes:
  - 1. Pipe material fittings shall meet the standards set forth for pipe and tube in the NFPA 13, Section 2-3.

- 2. Holes drilled or cut into the pipe system for fittings such as Mechanical tees, shall be re-galvanized after the hole drilling process.
- 3. Galvanic protection shall be reapplied after all cut groove processes.
- 4. Rubber gaskets or rubber flange gasket and couplings with rubber or neoprene gaskets are not allowed where ambient temperatures exceed 150°F unless listed for this service.
- B. Grooved joint couplings shall consist of two (2) ductile iron housing segments, pressure responsive elastomer gasket, and ASTM A449 zinc-electroplated steel bolts and nuts.
  - Rigid: Coupling housings with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with NFPA-13. Couplings shall be fully installed at visual pad-to-pad offset contact. Couplings that require gapping of bolt pads or specific torque ratings for proper installation are not permitted. Installation-Ready, for direct stab installation without field disassembly. Basis of Design: Victaulic Style 009H and 107N.
  - 2. Flexible: Use in locations where vibration attenuation and stress relief are required. Basis of Design: Victaulic Style 177 Installation-Ready, and Style 77.

# 2.5 <u>VALVES</u>

- A. Valves shall be of materials and weights required by NFPA standards.
- B. Valves that control mains inside building shall be approved OS&Y, 175 psi, unless noted otherwise, Basis of Design: Victaulic Series 771. Valves shall be normally open and shall accommodate tamper switches wired under Electrical Section. Victaulic Series 705 grooved end butterfly valves with pressure responsive seat, stainless steel stem (stem shall be offset from the disc centerline to provide complete 360-degree circumferential seating), and weatherproof actuator housing with built-in tamper switches UL/FM approved to 300 psi is acceptable.
- C. Check valves shall be approved pattern, 250 psi, installed vertically or horizontally, Victaulic Series 717. Alarm valves shall be 300 psi UL/FM Victaulic Series 751 or approved equal suitable for variable pressure operation and wet pipe system.
- D. Valves shall be UL-listed and FM-approved. Valves 2A and smaller shall be bronze body iron sized threaded end, Victaulic style 717, UL/FM approved 250 psi; valves 2-1/2" and larger shall be ductile iron body grooved end, Victaulic

series 705-butterfly valve UL/FM approved at 300 psi. Valves at fire pump shall be iron body butterfly.

- E. Sprinkler Alarm Valves:
  - 1. Sprinkler alarm valves and trim are described in the following charts: See Drawings for valve location and quantities.

Description	175 psig working pressure, ductile iron body, grooved ends, grooved seat alarm port, external bypass, brass seat and removable cover clapper shall be hinged at front of valve for swing out design and ease of maintenance. Valve internal components shall be replaceable with valve in the installed position. Size report 1 1/2" to 9"
Manufacturers and Model No.	Victaulic Series 751 alarm check valve.
Trim Required	Victaulic Variable Pressure trim kit with retarding chamber, water pressure gauges to indicate the inlet and outlet pressures and water motor and electric pressure switch with approved connected alarms. All installed trim must by UL-listed and FM-approved for use with the Wet Valve. Pre-trimmed from the factory is preferred.
Prefabrication	All components ready for maintenance and inspection.
Requirements	Provide drip check valve, drain cup, alarm test shut-off valve, drain check valve. Provide the standard trim kit with gages.
Certification/Approvals	UL listed.
	FM approved. Accepted by the Local Authority Having Jurisdiction.
Guarantee	
Start-up and Service	Test and set valve to the satisfaction of the Authority Having Jurisdiction. Instruct Owner's representative for valve actuation and maintain.
Capacities	See hydraulic data. For valve service over 175 psig working pressure see WPV-2.
Acceptable Manufacturers	Viking Corporation Reliable Automatic Sprinkler Co. Victaulic Co.

# Dry Pipe Valve

Description	Latching low differential valve utilizing external activator	
	air pressure to provide a positive differential and	
	mechanical seal. Provide a complete trim kit with a water	

	motor alarm and electrical switches. Provide an
	accelerator with the system (as needed). Valve shall be
	externally resettable, and all internal components shall be
	replaceable with valve in the installed position. Required
	air pressure shall be 13-psi (90-kPa).
Manufacturers and Model	Victaulic series 768-NXT dry pipe valve.
No.	
Accelerator	As required.
Air Compressor	Maintenance air compressor. Coordinate and match
	voltage requirements with field electrical service.
Prefabrication	All components ready for maintenance and inspection.
Requirements	Provide drip check valve, drain cup, alarm test shut-off
	valve, drain check valve. Provide the standard trim kit
	with gauges. Provide air compressor, dry actuator, air low
	pressure switch and system accelerator (if needed).
Certification/Approvals	UL listed.
	FM approved.
	Accepted by the Local Authority Having Jurisdiction.
Guarantee	
Start-up and Service	Test and set valve to the satisfaction of the authority
	having jurisdiction. Instruct Owner's Representative on
	dry valve operation and reset procedure.
Capacities	See Drawings.
Acceptable Manufacturers	Viking Corporation
	Reliable Sprinkler Company
	Victaulic Co.

### 2.6 <u>HANGERS, ANCHORS, CLAMPS AND INSERTS</u>

- A. Hangers shall meet NFPA Standards. Provide adjustable swivel rings for piping 3" and smaller and adjustable clevis hangers for 4" and larger piping. Support piping from building structure to maintain required grade and pitch of pipe lines, prevent vibration, secure piping in place. Secure hangers to insets where practical. Hanger rods shall have machine threads.
- B. Provide vertical brackets and guides for pipe risers at each floor and where horizontal piping is racked along walls. Trapeze hangers may be used where conditions permit.
- C. Hanger rods shall be connected to beam clamp, or UL-listed concrete inserts. Beam clamps shall have retaining straps.
- D. Hanger spacing shall meet requirements of state and local codes.
- E. Pipe supports, vertical and horizontal, shall not bear on sleeves.

- F. All support devices shall conform to seismic standards.
- G. Provide seismic restraint calculations.

### 2.7 FIRE DEPARTMENT INLET CONNECTION

- A. Provide polished brass inlet connections where shown on Drawings, of size and type indicated, with brass caps and chains. Provide integral lettering as required by local Fire Department to indicate use for sprinklers and fire standpipe. Threads shall match local Fire Department.
- B. On branch line to inlet connection, provide approved straightway check valve installed in horizontal position. Piping shall be arranged to drain between check valve and fire department inlet connection by approved ball drip connection piped to nearest drain or through wall.
- C. Fire Department flush inlet connection shall be Potter-Roemer Figure No. 5023 (4" x 2-1/2" x 2-1/2") chrome-plated. Square plate with lettering [AUTO SPRINKLER] with caps and chains. Threads shall match local Fire Department standards.
- D. At the low point near each fire department connection, provide a 90-degree elbow with drain connection to allow for localized system drainage to prevent freezing. Basis of Design: Victualic FireLock #10-DR.

### 2.8 <u>ELECTRIC FIRE PUMP</u>

- A. Furnish and install as shown on the plans one Vertical In-Line Fire pump or equal, listed by UL and approved by FM having the capacity of 250 GPM at a pressure boost of 80 psi. The pump shall have a bronze impeller, bronze case ring, packing bland and shaft sleeve. The pump suction and discharge flange shall be 125 psi bolt pattern. The pump shall be fitted with a Teflon lantern ring when the suction pressure is 30 psi or less. The pump shall be directly connected to a 20 HP, 3500 RPM, vertical solid shaft, open drip proof, JP frame motor suitable for 3/60 208 volts and a 1.5 service factor.
- B. The pump shall be subject to an operation test at rated speed. A performance curve showing flow, total head, brake horsepower and efficiency is to be plotted. Certified curves shall be supplied to the customer. The pump shall be hydrostatically tested at two times the shut-off pressure or 250 psi, whichever is greater.
- C. Acceptable manufacturers:
  - 1. Aurora Pump
  - 2. Patterson Pump
  - 3. FloFab Pump

- 4. Substitutions: None Permitted
- D. Wye Delta Closed Transition Controller:
  - 1. The main fire pump controller shall be a factory assembled, wired and tested unit and shall conform to all the requirements of NFPA 20 latest edition. The controller shall be manufactured in the United States and UL listed and FM approved.
  - 2. The controller shall be combined manual and automatic type designed for Wye Delta Closed Transition, reduced voltage controller as manufactured by Tornatech or equal. Substitutions are not permitted. The controller shall have the same horsepower, voltage, phase and frequency as the fire pump housed in a minimum NEMA 12 enclosure.
  - 3. All controller components shall be front mounted, wired and front accessible for maintenance. The minimum withstand rating of the controller shall not be less than 100,000 amps RMS symmetrical. The controller shall include a motor rated combination isolating disconnect switch/circuit breaker, mechanically interlocked and operated with a single externally mounted handle. The controller shall be a locking type handle and externally mounted operators including start push button, stop push button and emergency run mechanism. The start and emergency run shall be separate. The power available and phase failure indicators shall be wired through contacts on the phase monitor to give true power on indication. Loss of power in any phase shall cause the power available indicator to go out. Individual phase failure and phase reversal and pump operating alarm contacts shall be wired to terminals. These contacts shall be both normally open and normally closed and be electrically isolated for wiring to either remote alarm panel as supplied by the manufacturer or for use with remote telephone dropout type alarm systems, or both.
  - 4. The control circuit transformer shall have built in molded terminals and shall be fused protected from external loads. The fuse shall be built into the transformer. The controller shall include a grounding lug, bonding and spacing required for use as UL Listed service entrance equipment.
  - 5. A UL and FM labeled factory built in alarm panel provided on the controller requiring only 120 volt supervisory power. The alarm shall give an audible for pump operating, phase reversal, phase failure and supervisory power available. The alarm shall be electrically isolated for the remote alarm contacts so that separate remote alarms can be used. The controller shall be furnished with controller mounted three phase ammeter and three phase voltmeter to be able to test with the door closed.

- 6. The manufacturer shall test the entire controller prior to shipment. The test shall include, but not be restricted to each function the controller will be required to perform. Tests shall include high potential test of the controller power circuits at not less than two times the rated voltage plus 1000 volts.
- E. Furnish and install within fire pump house a Flofab Pump Model SJ1-17 Vertical Multi-stage jockey pump. The pump shall have the capacity of 5 GPM @ 90 psi. The pump is to be coupled with a 3550 RPM, 1 HP, 1 phase, 208 voltage with ODP enclosure using a rigid split coupling. Motor bearings shall be sized to allow 20,000 minimum hour B10 calculated life. The pump shall be constructed of 304 stainless steel impellers and diffusers, a high temperature mechanical seal with Carbon vs. Silicon Carbide, EPDM elastomers throughout, Tungsten Carbide against Ceramic pump bushings and a cast iron motor bracket. Flanges will be ductile iron in Slip ring design. The jockey pump shall be the same manufacturer as the main fire pump and meet all of the above Specifications.
- F. Furnish a jockey pump controller rated for 1HP, 208 voltage with a HOA switch, fused disconnect, mercoid pressure switch, motor overload, minimum run timer, control circuit transformer, and power available pilot light, all in a NEMA 2 enclosure. The jockey pump controller shall be the same manufacturer as the main controller and meet all of the above Specifications.
- G. The fire pump unit shall include the following accessories:
  - 1. Eccentric suction reducer.
  - 2. Concentric discharge increaser.
  - 3. Suction and discharge gages.
  - 4. Casing relief valve.
  - 5. Automatic air release valve.
  - 6. 6" test header with 1 set of 2-1/2" valves, caps and chains.
  - 7. Ball drip valve.
- H. Testing:
  - 1. A factory certified pump performance test shall be done prior to shipment of the unit. Results to be furnished to the Engineer.
  - 2. The pump manufacturer shall assume unit responsibility and shall provide the services of a factory trained representative to assist in the final field acceptance test in the presence of authority having jurisdiction, Engineer and Owner. Results of the test shall be furnished to the Engineer and Owner upon completion.

### 2.9 <u>SPRINKLER HEADS</u>

A. Provide UL-listed and/or FM-approved, (quick response for light hazard) sprinkler heads.

### CARVER POLICE CARVER, MA

- B. Heads shall have ordinary degree temperature ratings, except in areas subject to abnormal heating conditions, where sprinkler heads shall have temperature ratings high enough to prevent accidental discharge. Minimum fusing temperature shall be 155°F.
- C. Sprinklers shall be glass bulb type, with hex shaped wrench boss integrally cast into the sprinkler body to reduce the risk of damage during installation. (Wrenches shall be provided by the sprinkler manufacturer that directly engage the cast wrench boss). Basis of Design: Victaulic.
- D. Sprinkler heads shall be by Victaulic, Tyco, or Reliable.
- E. The following table indicates head types:

Sprinkler Head Specifications

Upright Sprinkler	Finish:	Bronze
	Temperature Rating:	155°F (212°F Mechanical
	Link:	Rooms)
	Response	Glass bulb
	Application:	QR
	Approvals:	UL, FM, Local Authority
		Having
	Equivalent to:	Jurisdiction
		Victaulic V27 or V34
Concealed	Finish:	White (coordinate with
	Cover Plate:	Architect)
	Temperature Rating:	White
	Link:	155°F
	Response	Glass bulb
	Application:	QR
	Approvals:	UL, FM, Local Authority
		Having
	Equivalent to:	Jurisdiction
		Victaulic V38
Pendent/Institutional	Finish:	Stainless Steel
	Cover Plate:	Stainless Steel
	Temperature Rating:	165°F
	Link:	Fuseable Link
	Response Application	QR
	Approvals:	UL, FM, Local Authority
		Having Jurisdiction
	Equivalent to:	Tyco Raven 5.6K

FIRE PROTECTION

Recess Pendent	Finish:	Bronze	
	Temperature Rating:	155°F	
	Link:	Glass bulb	
	Response	QR	
	Application:	UL, FM, Local Authority	
	Approvals:	Having	
		Jurisdiction	
	Equivalent to:	Victaulic V27 or V34	
Sidewall	Finish:	Chrome	
	Cover Plate:	Chrome	
	Temperature Rating:	155°F	
	Link:	Glass bulb	
	Orifice Coefficient:	5.6	
	Response	Standard	
	Application:	UL, FM, Local Authority	
	Approvals:	Having	
		Jurisdiction	
	Equivalent to:	Victaulic V27 or V34 HSW	

F. Flexible Stainless Steel Sprinkler Drop Systems may be used to locate sprinklers as required by final finished ceiling tiles and walls. The drop shall include a UL approved Series AH2 braided hose with a bend radius to 2-inch to allow for proper installation in confined spaces. The hose shall be listed for (4) bends at 31" length. Union joints shall be provided for ease of installation. The flexible drop shall attach to the ceiling grid using a one-piece open gate Series AB1 or AB2 bracket. The bracket shall allow installation before the ceiling tile is in place. The braided drop system is UL listed and FM Approved for sprinkler services to 175 psi (1206 kPa). Basis of Design: Victaulic Vic-Flex.

### 2.10 SPRINKLER CABINET

A. Provide enameled steel sprinkler cabinet with approved number of sprinkler heads as required by NFPA. Provide appropriate sprinkler wrench with each type of head in each cabinet.

### 2.11 SIGNALING DEVICES

- A. Tamper Switches to be:
  - 1. "Potter" OSYSU-2 with two sets of SPDT contacts for installation on S+OS&Y valves or equivalent tamper switch.
  - 2. "Potter" PCVS-2 with two sets of SPDT contacts for installation on PIV and butterfly valves or equivalent tamper switch.

#### CARVER POLICE CARVER, MA

- 3. Milwaukee BB-SCK02 with two sets of SPDT contacts for installation on built-in tamper switches for butterfly valves.
- B. Water flow switches to be "Potter" WSR-F with retard and two sets of SPDT contacts or equivalent.
- C. Pressure switches to be "Potter" PS100-2A with two sets of SPDT contacts.
- D. High/low pressure switches to be Potter PS40-2A with two sets of SPDT contacts. One set of contacts to operate on decrease of pressure and the other to operate on increase of pressure.
- E. Electric bell to be "Potter" PBA-AC.

# 2.12 WATER PRESSURE GAUGES

- A. Water pressure gauges of the double spring Bourdon type, as manufactured by U.S. Gauge American, Mueller, Trerice, Ashcroft or approved equal, shall be installed at the top of standpipe risers and at fire pump and alarm check valves. The gauges shall have 3-1/2" diameter face with brass case and shall be Underwriter's approved.
- B. Gauges shall be controlled by a valve with arrangements for drainage. An outlet, at least one quarter of an inch in size, plugged for the installation of the inspector's gauge shall be located between each valve and gauge.
- C. Dial graduations reading in "psig" shall be such that the normal operating pressure of the system installed shall be indicated near the middle of the scale.
- D. The accuracy of the gauges shall be within one (1) percent of the scale range.

### 2.13 SLEEVES AND PENETRATIONS

- A. Pipe Sleeve Materials:
  - 1. Sleeves through floors and through exterior, structural and fire-rated construction shall be galvanized Schedule 40 steel pipe.
  - 2. Sleeves through partitions and non-fire-rated construction shall be 26 gauge galvanized steel with lock longitudinal seams or approved plastic pipe.
  - 3. Provide waterproofing membrane locking devices at floors. Provide 150 lb. Slip-on welding flanges at exterior wall penetrations.
- B. Fire stop penetration seals in fire-rated construction shall conform to ASTM E814 and shall be ceramic fiber (Proset Systems Firefill); mineral fiber (Manville Thermo-mat); or silicone foam (Dow RTV 3-6548). Provide mineral fiberboard,

matting or putty for damming and forming. Finish seals flush to wall surface and fill gaps with silicone adhesive sealant caulking (Dow 96-081 RTV or approved equal). Provide 1" thick ceramic fiber board on both sides of penetrations in 2 and 3 hour rated walls and floors less than 8" thick. All penetration seals shall be installed in accordance with listing requirements.

- C. Packing for sleeves that do not require maintenance of fire rating shall be oakum, silicate, foam, ceramic fiber or mineral fiber with approved sealant. Pack or foam to within one inch of both wall surfaces. Seal penetration packing with approved caulking and paintable waterproof mastic surface finish or silicone caulking.
- D. Wall and floor penetration fire stops shall be UL listed, FM approved.

# PART 3 EXECUTION

### 3.1 <u>COORDINATION</u>

- A. Cooperate and coordinate with work of other Sections in executing work of this Section.
- B. Verify conditions and take field measurements as required to ensure work shall fit actual conditions. Field corrections to fabricate work and adjustments to adjacent work where required for proper installation of work shall be subject to Architect's approval. Corrections and adjustments shall be permitted only when not detrimental to appearance and function of work.

#### 3.2 <u>SHUT DOWNS</u>

- A. Work with Owner in maintaining integrity of new fire protection system. Coordinate and minimize any and all shut downs of fire protection system as follows:
  - 1. Give proper notice to Owner when making shutdowns, a minimum of two full weeks.
  - 2. Perform all duties required by Owner when making a shut down.
  - 3. Fill out a shut down notice form answering all items requested such as time and location of shut down, systems affected, areas affected, etc. when requesting a shut down.
  - 4. Provide fire watch as required during a shut down.
  - 5. Duration of shut downs shall be kept to a minimum.

#### CARVER POLICE CARVER, MA

- 6. In no case shall the fire protection system be shut down during off-hours of work day without a fire watch.
- 7. System shall be returned to normal operating conditions at end of work day.

# 3.3 <u>TESTS</u>

- A. Test sprinkler system as required by NFPA Insurance Underwriters, Factory Mutual and agencies that have jurisdiction.
- B. Test water flow detecting devices including associated alarm circuits through inspection test connection.
- C. Test fire pump in accordance with NFPA 20.
- D. Test sprinkler system under pressure of 200 psi for two hours. Correct defects and leaks. Caulking will not be allowed.
- E. Submit written approval of tests from Authorities Having Jurisdiction over installation to Owner before Final Acceptance of work.
- F. Submit written approval of tests from Authorities Having Jurisdiction over installation to Owner before Final Acceptance of work.
- G. Do not backfill before testing and approval.
- H. Notify Architect and various departments and bureaus 48 hours before tests are to be made.
- I. Operating test of sufficient duration shall be made for systems, equipment, fixtures and accessories to Owner's satisfaction.
- J. General:
  - 1. Test sprinkler system and make watertight before painting and concealment. Make partial tests as required, during progress of work. Tests shall be witnessed by: General Contractor, Insurance Underwriter's Representative, Municipal Inspector and a representative of the Architect.
  - 2. Sprinkler system shall be tested to hydrostatic test of 200 psi in accordance with NFPA requirements.
  - 3. If inspection or test show defects, such defective work or material shall be replaced and inspection and tests shall be repeated. Repairs to piping shall be made with new material.

# CARVER POLICE CARVER, MA

#### 3.4 <u>PIPE VALVE AND EQUIPMENT IDENTIFICATION</u>

- A. Provide color-coded pipe identification markers. Pipe markers shall be snap-on laminated plastic with acrylic coating. Pipe markers shall be applied after painting.
- B. Provide arrow marker with each pipe content marker to indicate direction of flow. If flow can be in either direction, use double-headed arrow marker.
- C. Mains shall be labeled at points of entrance and exit from mechanical room, next to valves, on risers, at tee fittings, at points of entrance and exit from building, at least once in each room and at intervals not longer than 20 feet.
- D. In general, 2" high legend shall be used for pipe lines 4" diameter and larger than <sup>3</sup>/<sub>4</sub>" high legend shall be used for pipe lines 3" diameter and smaller.
- E. Markers shall be Seton Setmark or approved equal.
- F. Color banding shall meet latest ANSI and OSHA requirements.
- G. Markers shall have legend with "black" letters:

Service	Legend	<b>Background Color</b>
Sprinkler	Sprinkler	Red
Fire	Fire	Red

- H. Valve Tags:
  - 1. All valves on pipes of every description shall have neat, circular brass valve tags of at least 1.5 inches in diameter, attached with brass hook to each valve stem. Stamp on these valve tags in letter as large as practical, the number of the valve and the service such as "S.P." for sprinkler. The numbers of each service shall be consecutive.
  - 2. All valves on equipment, tanks and pumps shall be numbered by 3 inch diameter red metal discs with white numbers 2 inches high secured to stem of valves by means of brass hooks or small solid link brass chain.
- I. Equipment:
  - 1. Nameplates shall be made of black surface, white core laminated "Bakelite" with indented letters.
  - 2. Nameplates shall be a minimum of 3 inches long by 1.5 inches high and bear the equipment name as designated in these Specifications.

3. Equipment identification designations shall be taken from equipment schedules as indicated on the Contract Drawings or specified herein.

#### 3.5 ANCHORS AND INSERTS

- A. Inserts shall be UL listed and FM approved and shall be steel of type to receive machine bolt head or nut after installation. Inserts shall permit adjustment of bolt in one horizontal direction and shall develop strength of bolt when installed in properly cured concrete.
- B. Provide anchors as necessary for attachment of equipment supports and hangers.

#### 3.6 <u>TYPICAL DETAILS</u>

A. Typical details where shown on the Contract Drawings shall apply to each and every item of the project where such items are applicable. They are not repeated in full on the Contract Drawings, which in many cases are diagrammatic only, but with the intention that such details shall be incorporated in full. Any alternate method proposed for use by the Contractor shall have the prior approval of the Owner.

#### 3.7 <u>CORING, DRILLING</u>

A. Core, cut and/or drill all holes in walls and floors required for the installation of sleeves and supports for the Fire Protection work.

#### 3.8 <u>SUPPLEMENTARY SUPPORTING STEEL</u>

- A. Provide all supplementary steelwork required for mounting or supporting equipment and materials.
- B. Steelwork shall be firmly connected to building construction as required.
- C. Steelwork shall be of sufficient strength to allow only minimum deflection in conformity with manufacturer's published requirements.
- D. All supplementary steelwork shall be installed in a neat and workmanlike manner parallel to floor, wall and ceiling construction; all turns shall be made at forty-five and ninety degrees, and/or as dictated by construction and installation conditions.
- E. All manufactured steel parts and fittings shall be galvanized; manufacturer shall be Unistrut or equivalent.

### 3.9 SPRINKLER INSTALLATION

A. Grooved Joints: Install in accordance with the manufacturer's latest published installation instructions. Pipe ends shall be clean and free from indentations,

projections and roll marks in the area from pipe end to (and including) groove. Gasket shall be manufactured by the coupling manufacturer and verified as suitable for the intended service. A factory trained representative (direct employee) of the coupling manufacturer shall provide on-site training for contractor's field personnel in the use of grooving tools, application of groove, and product installation. The representative shall periodically visit the job site and review installation to ensure best practices in grooved joint installation are being followed. Contractor shall remove and replace any improperly installed products.

- B. Signaling devices shall consist of the following:
  - 1. Electric micro switch locks on zone valves and water flow control switches on each floor supply be wired to fire alarm panel and Building Automation System.
  - 2. Alarm devices provided on alarm valves and pipes by Sprinkler Contractor.
  - 3. Fire alarm zone panels and wiring by Electrical Contractor and System Automation Contractor.
  - 4. Complete coordination shall be exercised between Sprinkler Contractor and Electrical Contractor to ensure electrical connections are compatible with fire alarm system described under Electrical Section.
- C. Electric micro switch locks on zone valves and water flow control switches on each floor supply wired to fire alarm panel and Building Automation Sprinkler.
- D. Alarm devices provided on alarm valves and pipes by Sprinkler Contractor.
- E. Fire alarm zone panels and wiring by Electrical Contractor.
- F. Complete coordination exercised between Sprinkler Contractor and Electrical Contractor to ensure electrical connections are compatible with fire alarm system described under Section 26 00 00.

# 3.10 WATER SERVICE

- A. Provide water service piping. Provide offsets required to avoid conflicts with ledge and other unforeseen circumstances. Work associated with street main tapping and water service piping to building shall meet requirement of Local Authority. When work is not in progress, plug open ends of pipe to ensure that foreign matter does not enter piping system.
- B. Provide thrust blocks and tie rods for fittings used to change direction of water service piping. Where adequate bearing cannot be obtained for thrust blocks, provide tie rods.

- C. Coordinate with pipe bedding provided under Division 2. Keep excavation open until system has been inspected, tested and approved.
- D. Test water service piping at 200 psi for two (2) hours. Leakage shall not exceed 2 quarts per hour per 100 joints regardless of pipe diameter. Before connection to building water system, flush and disinfect water service.

### 3.11 SEISMIC RESTRAINTS

A. All piping, equipment and devices shall be seismically supported as required by Local and State Codes, and NFPA.

END OF SECTION 21 00 00

# SECTION 22 00 00 PLUMBING TABLE OF CONTENTS

PART	1 GENERAL	1
1.1	TIME, MANNER AND REQUIREMENTS FOR FILING SUB-BIDS	1
1.2	RELATED DOCUMENTS	2
1.3	GENERAL REQUIREMENTS AND REFERENCES	2
1.4	DEFINITIONS	
1.5	SCOPE	4
1.6	RELATED WORK UNDER OTHER SECTIONS	5
1.7	REGULATORY REQUIREMENTS	5
1.8	SUBMITTALS	6
1.9	SURVEYS AND MEASUREMENTS	
1.10	COORDINATION	10
1.11	MECHANICAL AND ELECTRICAL COORDINATION	11
1.12	2 MECHANICAL AND ELECTRICAL COORDINATION DRAWINGS	12
1.13	INSTALLATION REQUIREMENTS	13
1.14	TYPICAL DETAILS	13
1.15	SLEEVES, INSERTS	13
1.16	FIRESTOPPING, SMOKEPROOFING AND WATERPROOFING	13
1.17	CORING, DRILLING	14
1.18	ACCESSIBILITY	14
1.19	SUPPLEMENTARY SUPPORTING STEEL	14
1.20	TOOLS AND EQUIPMENT	14
1.21	PORTABLE AND DETACHABLE PARTS	14
1.22	2 RECORD DRAWINGS, PROJECT CLOSEOUT	14
1.23	GUARANTEE/WARRANTY	15
1.24	OPERATING, INSTRUCTION AND MAINTENANCE MANUALS	16
1.25	QUALITY ASSURANCE	17
1.26	DELIVERY, STORAGE AND HANDLING	
PART	2 PRODUCTS	
2.1	PIPE MATERIALS	
2.2	COPPER PIPE (FOR CW, HWR, HW SYSTEMS)	19
2.3	SANITARY WASTE AND VENT, STORM DRAIN (CAST IRON)	
2.4	PRESSURE, FLOW AND TEMPERATURE CONTROL DEVICES	
2.5	INSULATION	
2.6	PIPE SUPPORTS	
2.7	SLEEVES, INSERTS, FIRE STOPPING AND ESCUTCHEONS	
2.8	TRAPS AND STRAINERS	
2.9	THERMOMETERS AND PRESSURE GAUGES	
2.10	WALL HYDRANTS AND HOSE BIBBS	
2.11	WATER HAMMER ARRESTERS	
2.12	PLUMBING FIXTURES AND TRIM	

# CARVER POLICE CARVER, MA

2.13	EQUIPMENT – GENERAL	30
2.14	WATER HEATERS	30
2.15	PUMPS	31
PART	3 EXECUTION	. 31
2 1	COORDINATION	0.1
3.1	COORDINATION	. 31
3.2	EXPANSION PROVISIONS	. 31
3.3	PIPE IDENTIFICATION	. 31
3.4	TAGS, VALVES, EQUIPMENT AND INSTRUMENTS	. 32
3.5	FLASHING AND COUNTER FLASHING	. 33
3.6	JOINTS AND CONNECTIONS	. 33
3.7	INTERIOR WATER SUPPLY SYSTEM	. 33
3.8	INTERIOR SANITARY WASTE, STORM, DRAINAGE AND VENT PIPING	. 34
3.9	WATER ENTRANCE	. 35
3.10	WATER METER	35
3.11	FIXTURE ROUGHINGS	. 36
3.12	EOUIPMENT ROUGHINGS AND CONNECTIONS	36
3.13	INSTALLATION OF SPECIALTY ITEMS.	37
3.14	INSTALLATION OF FIXTURES	37
3 1 5	CROSS CONNECTION PROTECTION	38
3 16	CI FANING	38
3.10	UDISINEECTION OF WATER SYSTEMS INITERIOR AND EXTERIOR	30
2.10	TESTING AND ADJUSTING CENEDAL	20
3.18	) IESTINU AND ADJUSTINU – UENEKAL TESTNIC, DIDNIC SVSTEMS	. 37
3.19	1 1ESTING: PIPING SYSTEMS	. 42
3.20	) SEISMIC RESTRAINTS	. 43

#### PLUMBING

### SECTION 22 00 00 – PLUMBING

#### (FILED SUB-BID REQUIRED)

#### PART 1 GENERAL

#### 1.1 TIME, MANNER AND REQUIREMENTS FOR FILING SUB-BIDS

- A. Sub-Bids shall be submitted in accordance with the provisions of General Laws, Chapter 149, Section 44A, inclusive, as amended.
- B. Sub-Bids for work under this Section shall be received electronically, until 2:00
  p.m. on Tuesday, October 29, 2019, at which time and place all Trade Contractor Bids shall be duly recorded.
- C. This project is being Electronically Bid (E-Bid). All bids shall be submitted online at <u>www.Projectdog.com</u>. Hard copy bids will not be accepted by the Awarding Authority. E-Bid tutorials and instructions are available within the specifications and online at <u>www.Projectdog.com</u>. For assistance, call Projectdog, Inc at (978)499-9014, M-F 8:30AM-5PM.
  - 1. All required bid forms must be submitted in **PDF** format only. The bidder must complete all required signatures either digitally (using Adobe Acrobat) or manually (print, sign and scan as a PDF file).
  - 2. Bid Bonds issued by a surety company shall be submitted on the E-Bid page. Bid bonds in the form of cash or check shall be completed and delivered as outlined on the Bid Bond Affidavit form.
  - 3. The bidder must enter bid price on the E-Bid form as a whole dollar value only with no punctuation. Sums shall be expressed in both words and figures on the bid form. Note: The E-Bid form will automatically match the word value to the numeric figure entered by the bidder.
  - 4. Bidders may save, submit or modify an E-Bid at any time prior to bid close. Once submitted, a bid cannot be edited. To modify a bid the bidder must retract the bid, make any necessary changes, and then submit the bid again. Upon submitting or retracting the bidder will receive a convenience email for informational purposes only. Bidders are encouraged to contact Projectdog, Inc at (978) 499-9014, M-F 8:30AM-5PM, if an email is not received.
  - 5. If a bid is submitted prior to an Addendum being issued, the bidder will receive an automated email for informational purposes only. The bidder must review the addendum, retract the bid, acknowledge all addenda, and submit the bid again. If a bidder fails to acknowledge addenda their bid may be rejected by the Awarding Authority.
  - 6. Timely submission of an E-Bid shall be the full responsibility of the Bidder. The server clock is the time of record. It is the bidder's responsibility to review and confirm online that a bid has been submitted and/or retracted and that the bid is 100% true, complete and accurate. All bidders are required to review their submitted E-Bid via the **"View My Bid Package"** link.

- D. Sub-Bids filed with the Awarding Authority shall be accompanied by a Bid Deposit in the form of a certified check or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to the "**Town of Carver**". A bid bond shall be:
  - 1. In a form satisfactory to the Awarding Authority.
  - 2. With a surety company qualified to do business in the Commonwealth and satisfactory to the Awarding Authority.
  - 3. Conditioned upon the faithful performance by the principal of the agreements contained in the Bid. The amount of such bid deposit shall be five percent (5%) of the value of the Bid.
- E. Sub-Bids for work under this Section shall be for the complete work required as specified and as shown on the drawings.
- F. Sub-Bidders are directed to the Instructions to Bidders, and to the requirements that all bidders visit the site to determine the scope of work required under this Section.
- G. Sub-Bidders must comply with all provisions of Division 1, General Requirements, in the same manner as the General Contractor.

# 1.2 RELATED DOCUMENTS

- A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.
- B. Work Included: Provide labor, materials and equipment necessary to complete the work of this section, including, but not limited to, all work on the following drawings:
  - 1. P-0.0 Plumbing Legend and Schedules
  - 2. P-0.1 Plumbing Details
  - 3. P-1.0 Plumbing Underslab Plan
  - 4. P-2.0 Plumbing Floor Plan
  - 5. P-3.0 Plumbing Floor Plan (Outbuilding)

### 1.3 GENERAL REQUIREMENTS AND REFERENCES

- A. Include "General Requirements" and applicable parts of Division 1 as part of this section.
- B. Examine all other sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this

section. Where paragraphs of this section conflict with similar paragraphs of Division 1, requirements of this section shall prevail.

- C. Coordinate work with that of all other trades affecting, or affected by work of this section. Cooperate with such trades to assure the steady progress of all work under the Contract.
- D. The Plumbing Subcontractor shall be responsible for filing all documents and securing of all inspections and approvals necessary for the work of this section.
- E. The **Awarding Authority** shall pay all Utility Company and Municipal back charges for all materials furnished and work performed by them in conjunction with this Contract and pay same to the respective agency upon demand.

### 1.4 <u>DEFINITIONS</u>

- A. As used in this section, "provide" means "furnish and install", and "POS" means "Provided Under Other Sections".
- B. As used in the Contract Drawings and Specifications for Plumbing work, certain non-technical words shall be understood to have specific meanings as follows, regardless of indications to the contrary in the General Conditions of other documents governing the Plumbing work.
  - 1. "Furnish" means: Purchase and deliver to the project site complete with every necessary appurtenance and support, all as part of the Plumbing work. Purchasing shall include payment of all sales taxes and other surcharges as may be required to assure that purchased item(s) are free of all liens, claims, or encumbrances.
  - 2. "Install" means: Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project, all as part of the Plumbing work.
  - 3. "Provide" means: "Furnish" and "Install".
  - 4. "New" means: Manufactured within the past two (2) years and never before used.
- C. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any plumbing item in the Contract Drawings or Specifications for Plumbing work carries with it the instruction to furnish, install and connect the item as part of the Plumbing work, regardless of whether or not this instruction is explicitly stated.
- D. It shall be understood that the Specifications and Drawings for Plumbing work are complimentary and are to be taken together for a complete interpretation of the Plumbing work except that indications on the Contract Drawings, which refer to
an individual element of work, take precedence over the Specifications where they conflict.

### 1.5 <u>SCOPE</u>

- A. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.
  - 1. Domestic water piping system.
  - 2. Exterior water service piping for domestic water beginning 10'-0" outside exterior wall of the building.
  - 3. Backflow preventers.
  - 4. Domestic water heaters.
  - 5. Interior sanitary waste and vent piping system.
  - 6. Interior sanitary drainage system extended to a point 10'-0" outside the interior face of the foundation wall of the building.
  - 7. Garage waste and vent drainage system with Tight tank.
  - 8. Circulation Pumps.
  - 9. Interior rainwater drainage system to a point 10'-0" outside wall of the building.
  - 10. Plumbing fixtures and trim.
  - 11. Roof and floor drains.
  - 12. Hose bibs and wall hydrants.
  - 13. Insulation.
  - 14. Valves.
  - 15. Water hammer arresters.
  - 16. Fittings unions, flanges and couplings.
  - 17. Flashing of floor drains.
  - 18. Hangers, plates and inserts.
  - 19. Cleaning, testing and disinfection of piping systems.
  - 20. All supplementary steel for piping and equipment support.
  - 21. Guarantees.
  - 22. Drilling for installation of inserts.
  - 23. Core drilling.
  - 24. Fire seal off all penetrations in floors and walls to the rating of the barrier.
- B. Drawings and Specifications form complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation.
- C. Give notices, file plans, obtain permits and licenses, and obtain necessary approvals from Authorities Having Jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.

D. The following Drawings are included for reference and coordination and additional requirements for work in this section:

### 1.6 <u>RELATED WORK UNDER OTHER SECTIONS</u>

- A. The following items are not included in this section and will be performed under other sections.
  - 1. Temporary Facilities.
  - 2. Earthwork: Excavation and backfill.
  - 3. Concrete:
    - a. Equipment foundations.
    - b. Housekeeping pads.
  - 4. Masonry: All openings in masonry walls.
  - 5. Waterproofing, Dampproofing and Caulking.
  - 6. Roofing and Flashing.
  - 7. Painting: All painting except as specified herein.
  - 8. Finish Carpentry and Millwork.
  - 9. Steel Doors and Frames.
  - 10. Finish Hardware.
  - 11. Elevators and Lifts.
  - 12. Fire Protection.
  - 13. Electrical.
  - 14. HVAC.
  - 15. Foundation drains.
  - 16. Site drainage.
  - 17. Furnishing of toilet accessories such as toilet paper holders, mirrors and soap dispensers.
  - 18. Utility structures.

### 1.7 <u>REGULATORY REQUIREMENTS</u>

- A. Comply with all applicable Federal and State laws, and all Local codes, By-laws and Ordinances.
- B. Where provisions of the Contract Documents conflict with any codes, rules or regulations, the latter shall govern. Where the contract requirements are in excess of applicable codes, rules or regulations, the contract provisions shall govern unless the Architect rules otherwise.
- C. Request inspections from Authorities Having Jurisdiction, obtain all permits and inspection certificates as applicable and/or required. All permits and certificates shall be turned over to the Owners at the completion of the work. Copies of permits shall be given to the resident engineer prior to the start of work.
  <u>Awarding Authority</u> shall be responsible to pay all fees for permitting, inspections, and utility company backcharges related to new construction.

- D. Unless otherwise specified or indicated, materials and workmanship and equipment performance shall conform with the latest edition of the following standards, codes, Specifications, requirements and regulations:
  - 1. Local and State Building, Plumbing, Mechanical, Electrical, Fire and Health Department Codes.
  - 2. American Gas Association (AGA).
  - 3. National Fire Protection Association (NFPA).
  - 4. American Insurance Association (AIA), formerly National Board of Fire Underwriters.
  - 5. Occupational Safety and Health Act (OSHA).
  - 6. Factory Mutual Association (FM).
  - 7. Underwriter's Laboratories (UL).
- E. All Plumbing work shall meet or exceed any other state and local codes and/or Authorities Having Jurisdiction including all other standards indicated herein.

# 1.8 <u>SUBMITTALS</u>

- A. This paragraph shall supplement Division 1.
- B. Definitions:
  - 1. Shop Drawings: Information prepared by the Contractor to illustrate portions of the work in more detail than shown in the Contract Documents.
  - 2. Coordination Drawings: Detailed, large-scale layout Shop Drawings showing HVAC, Electrical, Plumbing and Fire Protection work superimposed to identify conflicts and ensure inter-coordination of Mechanical, Electrical, Architectural, Structural and other work.
- C. Submittals Procedures and Format:
  - Review submittal packages for compliance with Contract Documents and then submit to Architect for review. Submit transparency and two (2) blue or black-line reproductions of each Shop Drawing larger than 8-1/2" x 11". Submit eight (8) sets of each smaller shop drawing. After review, transparency original of each large Shop Drawing and six (6) sets of each small shop drawing will be returned with reviewer's marks. Electronically submitted shop drawings are acceptable.
  - 2. Each Shop Drawing shall indicate in title block, and each Product Data package shall indicate on cover sheet, the following information:
    - a. Title.
    - b. Name and location of project.
    - c. Names of Architect, Engineer, Contractor and Subcontractor(s).
    - d. Names of Manufacturer, Supplier, Vendor, etc.

- e. Date of submittal.
- f. Whether original submittal or resubmitted.
- 3. Shop Drawings showing manufacturer's product data shall contain detailed dimensional Drawings, accurate and complete description of materials of construction, manufacturer's published performance characteristics and capacity ratings (performance data alone is not acceptable), plumbing requirements and wiring diagrams. Drawings shall clearly indicate location (terminal block or wire number), voltage and function for all field terminations, and other information necessary to demonstrate compliance with all requirements of Contract Documents.
- D. Acceptable Manufacturers:
  - The Architect's Plumbing design for each project is based on the single manufacturer listed in the schedule or shown on the Contract Drawings. In Division 15 of these Specifications certain "Alternate Manufacturers" are listed as being acceptable. These are acceptable only if, as a minimum, they:
    - a. Accepted by Architect and Engineer.
    - b. Meet all performance criteria listed in the schedules and outlined in the Specifications.
    - c. Have equivalent operating characteristics to those called for in the Specifications.
    - d. Fit within the available space it was designed for, including space for maintenance and component removal, with no modifications to either the space or the product. Clearances to walls, ceilings and other equipment will be at least equal to those shown on the Contract Documents. The fact that a manufacturer's name appears as acceptable shall not be taken to mean the Architect has determined that the manufacturer's products will fit within the available space. This determination is solely the responsibility of the Contractor.
    - e. For equipment mounted in areas where structural matters are a consideration, the products must have a weight no greater than the product listed in the schedules or Specifications.
    - f. Products must adhere to all architectural considerations including, but not limited to, being the same size and of the same physical appearance as scheduled or specified products.
- E. Substitutions: Substitution of products by manufacturers other than those listed shall only be done in accordance with subparagraph "F" "Substitutions and Deviations".
- F. Substitutions and Deviations:
  - 1. Deviations from the Contract Documents and the substitution of materials or equipment relative to the "Acceptable Manufacturers" referred to

above, shall be requested individually in writing whether deviations result from field conditions, standard shop practice, or other cause. Submit letter with transmittal of Shop Drawings which flags the substitution or deviation to the attention of the Architect. The letter shall describe changes in the system shown and physical characteristics (connections to adjacent materials, plumbing services, service access requirements, and other characteristics), and differences in operating characteristics or cycles.

- 2. Without letters flagging the substitution or deviation to the Architect, it is possible that the Architect may not notice such substitution or deviation or may not realize its ramifications. Therefore, if such letters are not submitted to the Architect, the Contractor shall hold the Architect and his consultants harmless for any and all adverse consequences resulting from the deviations being implemented. Adverse consequences shall include, but not be limited to, excessive noise, excessive maintenance, shortened longevity, spatial coordination problems, and inadequate performance versus scheduled design. This shall apply regardless of whether the Architect has reviewed or approved Shop Drawings containing the deviation, and will be strictly enforced.
- 3. Do not request substitute materials or equipment unless identical material or equipment has been operated successfully for at least three (3) consecutive years. Such materials and equipment shall be a regular cataloged item shown in the current catalog of the manufacturer. When deviation or substitution is permitted, coordinate fully with related changes to Architectural, Structural, Plumbing, Fire Protection, Mechanical, and other work. Ensure that related changes necessary for coordination of substituted items are made within the Contract Price. Assume full responsibility for safety, operation and performance of the altered system.
- 4. Substitutions of equipment, systems, etc. requiring approval of local Authorities must comply with such regulations and be filed by the Contractor (should filing be necessary).
- 5. Consideration will not be given to claims that the substituted item meets the performance requirements with lesser construction. Performance, as delineated in schedules and in the Specifications, shall be interpreted as minimum performance.
- 6. Approval of proposed deviations or substitutions, if any, will be made at discretion of Architect.
- 7. If equipment is proposed for substitution that is not tested and rated according to industry-wide standards, the Architect shall have the right to have performance tests completed, at the Contractor's expense, to confirm the manufacturer's performance claims.
- G. Submittal Notations: Submittals will be returned from the Architect marked as illustrated below:

NO EXCEPTION TAKEN

ACCEPTED AS NOTED

NOT ACCEPTED

**REVISE AND RESUBMIT** 

- 1. Checking is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Any action shown is subject to the requirements of the Contract Drawings and Specifications. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site; fabrication process and techniques of construction; coordination of his work with that of all other trades; and the satisfactory performance of his work.
- H. Schedule: Incorporated the Shop Drawing review period into the construction schedule so that work is not delayed. Contractor shall assume full responsibility for delays caused by not incorporating the following Shop Drawing review time requirements into his project schedule. Allow at least ten (10) working days, exclusive of transmittal time, for review each time a Shop Drawing is submitted or resubmitted with the exception that fifteen (15) working days, exclusive of transmittal time, are required for the following:
- I. Schedule:
  - 1. Copies of all backflow preventer permits.
  - 2. Certification of domestic water system disinfection.
  - 3. Coordination Drawings, if required by this Specification.
  - 4. Adjustment and balancing certification.
  - 5. If more than five (5) Shop Drawings of this trade are received in one (1) calendar week.
- J. List of Proposed Equipment and Materials: Within four (4) weeks after Award of Contract and before ordering materials or equipment, submit a complete list of proposed materials and equipment and indicate manufacturer's names and addresses. No consideration will be given to partial lists submitted out of sequence.
- K. Responsibility:
  - 1. The intent of submittal review is to check for capacity, rating, and certain construction features. Contractor shall ensure that work meets requirements of the Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction; and for coordination of work of this and other Sections. Work shall comply with submittals marked "REVIEWED" to extent that they agree with the Contract Documents. Submittal review shall not diminish responsibility under this Contract for

dimensional coordination, quantities, installation, wiring, supports and access for service, nor the Shop Drawing errors or deviations from requirements of the Contract Documents. The Architect's noting of some errors while overlooking others will not excuse the Contractor for proceeding in error. Contract Documents requirements are not limited, waived, nor superseded in any way by review.

- 2. Inform Subcontractors, Manufacturers, Suppliers, etc. of scope and limited nature of review process and enforce compliance with the Contract Documents.
- L. Material and equipment requiring Shop Drawing Submittals shall include but not be limited to:
  - 1. Plumbing fixtures and trim.
  - 2. Water heaters.
  - 3. Roof and floor drains.
  - 4. Hose bibs and wall hydrants.
  - 5. Piping.
  - 6. Tight Tank
  - 7. Fittings, unions, flanges and couplings.
  - 8. Insulation.
  - 9. Sleeve packing.
  - 10. Valves
  - 11. Water hammer arresters.
  - 12. Flashing of floor drains.
  - 13. Backflow preventers.
  - 14. Hangers, plates and inserts.
  - 15. Receptors for condensate drainage.
  - 16. Circulation pumps.
  - 17. Fire-rated penetration assembles (ASTM E814, UL 1479).
  - 18. Access panels.
  - 19. Shop Drawings shall be submitted as a single bound package, organized and titled.

# 1.9 SURVEYS AND MEASUREMENTS

A. Base all required measurements, both horizontal and vertical, on reference points established by the General Contractor and be responsible for the correct laying out of the Plumbing work. In the event of a discrepancy between actual measurements and those indicated, notify the General Contractor in writing. Do not proceed with the work required until written instructions have been issued by the General Contractor.

# 1.10 <u>COORDINATION</u>

A. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of Mechanical and Electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with Structural and other trades and to meet Architectural requirements.

- B. Work shall be performed in cooperation with other trades on the project and so scheduled as to allow speedy and efficient completion of the work.
- C. Furnish to other trades advance information on locations and sizes of all frames, boxes, sleeves and openings needed for their work. Furnish information and Shop Drawings necessary to allow trades affected by the work to install their work properly and without delay.
- D. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Architect. Where the Plumbing work shall interfere with the work of other trades, assist in coordinating the space conditions to make satisfactory adjustments before installation. Without extra cost to the Owner, make reasonable modifications to the work as required by normal Structural interferences. Pay the General Contractor for additional openings, or relocating and/or enlarging existing openings through concrete floors, walls, beams and roof required for any work which was not properly coordinated. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.
- E. If any Plumbing work has been installed before coordination with other trades so as to cause interference with the work of such trades, all necessary adjustments and corrections shall be made by the plumbing trades involved without extra cost to the Owner.
- F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Architect for review and approval.
- G. Protect all materials and work of other trades from damage which may be caused by the Plumbing work, and repair all damages without extra cost to the Owner.

# 1.11 MECHANICAL AND ELECTRICAL COORDINATION

- A. Plumbing Subcontractor shall furnish and install various electrical items relating to the plumbing equipment and control apparatus. The Electrical Subcontractor shall be required to connect power wiring to this equipment unless noted otherwise.
- B. The Plumbing and Electrical Subcontractors shall coordinate their respective portions of the work, as well as the electrical characteristics of the plumbing equipment.
- C. All power wiring and local disconnect switches will be provided by the Electrical Subcontractor for the line voltage power. All control and interlocking wiring shall be the responsibility of the Plumbing Subcontractor.

- D. 120V and above power wiring sources extended and connected to heating and ventilating control panels, transformers and switches shall be the responsibility of the Electrical Subcontractor. All low voltage thermostats, zone valve and any switch wiring shall be the responsibility of the HVAC Subcontractor.
- E. Temperature control and equipment wiring shall be installed by the Plumbing Subcontractor.
- F. Pipe heat tracing shall be furnished and installed by the Electrical Subcontractor. Power connections shall be by the Electrical Subcontractor.
- G. The Electrical Subcontractor will provide all magnetic starters except those furnished as an integral part of packaged equipment.

# 1.12 MECHANICAL AND ELECTRICAL COORDINATION DRAWINGS

- A. Coordination Drawings:
  - 1. The Sheetmetal Subcontractor shall prepare a complete set of electronic Drawings at a scale not less than 3/8" equals 1'-0", showing structure and other information as needed for coordination. He shall show sheetmetal layout thereon. These will be the Coordination Drawings.
  - 2. The main paths of egress and for equipment removal, from main Mechanical and Electrical rooms must be clearly shown on the Coordination Drawings.
  - 3. Each of the below specialty trades shall add its work to these background Drawings with appropriate elevations and grid dimensions. Specialty trade information is required for fan rooms and mechanical rooms, horizontal exits from duct shafts, crossovers, and for spaces in and above ceilings where congestion of work may occur such as corridors, and even entire floors. Drawings shall indicate horizontal and vertical dimensions, to avoid interference with structural framing, ceilings, partitions, and other services.
    - a. Specialty Trades:
      - 1) Plumbing System.
      - 2) HVAC Piping and Associated Control System.
      - 3) Electrical.
      - 4) Sheet Metal Work.
      - 5) Sprinkler System.
  - 4. Each specialty trade shall sign and date each electronic Coordination Drawing. Return Drawings to the Sheetmetal Subcontractor, who shall route them sequentially to all specialty trades.
  - 5. Where conflicts occur with placement of materials of various trades, the Sheetmetal Subcontractor will be responsible to coordinate the available space to accommodate all trades. Any resulting adjustments shall be initialed and dated by the specialty trade. The Sheetmetal Subcontractor shall then final date and sign each Coordination Drawing. If he cannot

resolve conflicts, the decision of the General Contractor shall be final, subject to the approval of the Architect.

- 6. A Subcontractor who fails to promptly review and incorporate his work on the Coordination Drawings shall assume full responsibility of any installation conflicts affecting his work and of any schedule ramifications.
- 7. The Sheetmetal Subcontractor shall make electronic copies of all Coordination Drawings. Fabrication shall not start until such transparencies of completed Drawings are received by the Architect/Engineer and have been reviewed.
- 8. Review of Coordination Drawings shall not diminish responsibility under this Contract for final coordination of installation and maintenance clearances of all systems and equipment with Architectural, Structural, Mechanical, and Electrical Contractors.

# 1.13 INSTALLATION REQUIREMENTS

- A. The arrangement of all Plumbing work shown on the Contract Drawings is diagrammatic only and indicates the minimum requirements of the work. Conditions at the building including actual measurements shall determine the details of the installation. All work shall be laid out and installed so as to require the least amount of cutting and patching.
- B. Review the Architectural Drawings and Specifications before ordering any material and equipment. Any discrepancies shall be brought to the attention of the Architect for his determination prior to proceeding with the work.

# 1.14 <u>TYPICAL DETAILS</u>

A. Typical details where shown on the Contract Drawings shall apply to each and every item of the project where such items are applicable. They are not repeated in full on the Contract Drawings, which in many cases are diagrammatic only, but with the intention that such details shall be incorporated in full. Any alternate method proposed for use by the Contractor shall have the prior approval of the Architect.

# 1.15 <u>SLEEVES, INSERTS</u>

A. Furnish and install all sleeves, inserts, anchor bolts and similar items to be set into masonry or concrete, as required for Plumbing work. Internal diameter of sleeve ball shall be 1/2" larger than the outside diameter of the pipe or insulation covered line passing through it.

# 1.16 FIRESTOPPING, SMOKEPROOFING AND WATERPROOFING

A. All cutting, patching, firestopping, smoke proofing, and waterproofing shall be performed by the Fire Suppression Filed Sub-bidder. Refer to 07 84 00 FIRESTOPPING for project requirements.

### 1.17 <u>CORING, DRILLING</u>

A. Core, cut and/or drill all small holes 4.5" diameter or less in walls and floors required for the installation of sleeves and supports for the Plumbing work.

### 1.18 <u>ACCESSIBILITY</u>

- A. Install all work such that parts requiring periodic inspection, operation, maintenance and repair are readily accessible.
- B. Furnish all access panels appropriate to particular conditions, to be installed by trades having responsibility for the construction of actual walls, floors or ceilings at required locations.

### 1.19 SUPPLEMENTARY SUPPORTING STEEL

- A. Provide all supplementary (non-structural) steelwork required for mounting or supporting equipment and materials.
- B. Steelwork shall be firmly connected to building construction as required. Locations and methods of attachment shall be approved by the Architect.
- C. Steelwork shall be of sufficient strength to allow only minimum deflection in conformity with manufacturer's published requirements.
- D. All supplementary steelwork shall be installed in a neat and workmanlike manner parallel to floor, wall and ceiling construction: all turns shall be made at forty-five and ninety degrees, and/or as dictated by construction and installation conditions.
- E. All manufactured steel parts and fittings shall be galvanized.

#### 1.20 TOOLS AND EQUIPMENT

A. Provide all tools and equipment required for the fabrication and installation of the plumbing equipment at the site.

#### 1.21 PORTABLE AND DETACHABLE PARTS

A. Contractors shall retain in their possession all portable and/or detachable parts and portions of materials, devices, equipment, etc. necessary for the proper operation and maintenance of the Mechanical and Electrical systems until final completion of the work, at which time they shall be handed over to the Owners.

#### 1.22 RECORD DRAWINGS, PROJECT CLOSEOUT

A. As work progresses and for the duration of Contract, maintain a complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately

including work installed as a modification or addition to the original design. Work shall be updated on a weekly basis and shall be made available for review by Architect. Failure to perform this work shall be reason for withholding requisition payments. In addition, take photographs of all concealed equipment in gypsum board ceilings, shafts, and other concealed, inaccessible work. At completion of work, make copies of photographs with written explanation on back. These shall become part of Record Documents.

- B. At the completion of work, prepare a complete set of electronic Record Drawings showing all systems as actually installed. The electronic copies will be made available for the Plumbing Contractor's copying, at his expense. The quantity of copies which are made available shall in no way be interpreted as setting a limit to the number of Drawings necessary to show the required information. The Plumbing Contractor's professional Draft Person shall transfer changes to electronic copies. Submit three (3) electronic sets of prints to Architect for comments as to compliance with this section.
- C. The Architect will not certify the accuracy of the Record Drawings. This is the sole responsibility of the Plumbing Contractor.
- D. This trade shall submit the Record Drawings for approval by the Fire and Building Departments in a form acceptable to the departments, when required by the jurisdiction.
- E. Record Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer, make and model numbers of final equipment installation.

# 1.23 <u>GUARANTEE/WARRANTY</u>

- A. Guarantee and 24 Hour Service:
  - 1. Guarantee Work of this Section in writing for not less than one (1) year following the date of acceptance by the Owner. If the equipment is used for temporary power etc, prior to acceptance by the Owner, the bid price shall include an extended period of warranty covering the one (1) year of occupancy, starting from the date of acceptance by the Owner. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to the Architect's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.
  - 2. In addition to guarantee requirements of Division 1 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in Owner's name.
  - 3. Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by this Contractor without any reimbursement.

- 4. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Architect.
- 5. Provide 24 hour service beginning on the date the project is accepted by the Owner, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to the Owner. Service can be provided by this Contractor or a separate service organization. Choice of service organization shall be subject to Architect and Owner approval. Submit name and a phone number that will be answered on a 24 hour basis each day of the week, for the duration of the service.
- 6. Submit copies of equipment and material warranties to Architect before final payment.
- 7. At end of guarantee period, transfer manufacturer's equipment and material warranties still in force to Owner.
- 8. This paragraph shall not be interpreted to limit Owner's rights under applicable codes and laws and under this Contract.
- 9. PART 2 paragraphs of this Specification may specify warranty requirements that exceed those of this paragraph. Those paragraphs shall govern.
- 10. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of Work by Owner, and shall not initiate the guarantee period.
- 11. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to Owner's satisfaction, advise the Architect in writing, describe efforts to rectify situation, and provide analysis of cause of problem. The Architect and/or Engineer will direct course of action.

# 1.24 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS

- A. Refer to Section 01700 CONTRACT CLOSEOUT for submittal procedures pertaining to operating and maintenance manuals.
- B. Each copy of the approved operating and maintenance manual shall contain copies of the approved Shop Drawings, equipment literature, cuts, bulletins, details, equipment and engineering data sheets and typewritten instructions relative to the care and maintenance for the operation of the equipment, all properly indexed. Each manual shall have the following minimum contents:
  - 1. Table of Contents.
  - 2. Introduction:
    - a. Explanation of manual and its purpose and use.
    - b. Description of the plumbing systems.
    - c. Safety precautions necessary for equipment.
    - d. Illustrations, schematics and diagrams.
    - e. Installation drawing.
  - 3. Maintenance:
    - a. Maintenance and lubricating instructions.

- b. Replacement charts.
- c. Trouble-shooting charts for equipment components.
- d. Testing instructions for each typical component.
- e. Two (2) typed sets of instructions for ordering spare parts. Each set shall include name, price, telephone number and address of where they may be obtained.
- 4. Manufacturer's Literature:
  - a. The equipment for which Shop Drawings have been submitted and approved.

### 1.25 **QUALITY ASSURANCE**

- A. The requirements of the State Building Code and Local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.
- B. All work shall comply with the latest editions of the codes as referenced herein.
- C. Follow manufacturer's directions for articles furnished, in addition to directions shown on the Contract Drawings or specified herein.
- D. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to the Owner.
- E. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.
- F. Equipment and materials shall:
  - 1. Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed and labeled.
  - 2. Be without blemish or defect.
  - 3. Not be used for temporary purposes.
  - 4. Be in accordance with the latest applicable ASME standards.
- G. Products shall meet with the acceptance of all Authorities Having Jurisdiction over the work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or other recognized testing laboratory, the product shall be so examined, tested and certified.
- H. All items of equipment or material of one generic type shall be the product of one manufacturer throughout.
- I. For items which are to be installed but not purchased as part of the Electrical work, the Electrical work shall include:
  - 1. The coordination of their delivery.

- 2. Their unloading from delivery trucks driven into any point on the property line at grade level.
- 3. Their safe handling and field storage until the time of permanent placement in the project.
- 4. The correction of any damage, defacement or corrosion to which they may have been subjected. Replacement, if necessary, shall be coordinated with the Contractor who originally purchased the item.
- 5. Field erection and internal wiring as necessary for their proper operation.
- 6. Mounting in place, including the purchase and installation of all dunnage, supporting members, and fastenings, necessary to adapt them to architectural and structural conditions.
- 7. Their connection to building wiring including the purchase and installation of all termination junction boxes necessary to adapt and connect them to this wiring. Included also shall be the purchase and installation of any substitute lugs or other wiring terminations as may be necessary to adapt their terminals to the building wiring as called for and to the connection methods set forth in these Specifications.
- J. Items which are to be installed but not purchased as part of the Plumbing work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the Plumbing work will be considered only if presented in writing within one (1) week of the date of delivery to the project of the items in question. The Plumbing work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

# 1.26 DELIVERY, STORAGE AND HANDLING

A. All materials for the work of this section shall be delivered, stored and handled so as to preclude damage of any nature. Manufactured materials shall be delivered and stored in their original containers, plainly marked with the products' and manufacturer's name. Materials in broken containers or in packages showing watermarks or other evidence of damage shall not be used and shall be removed from the site.

# PART 2 PRODUCTS

# 2.1 <u>PIPE MATERIALS</u>

A. The table below indicates pipe class for each service. Refer to the following pages for expanded Specifications for the respective class.

### PIPE MATERIALS SPEC INDEX

		Maximum		
		Operating	Service Limits	Pipe
Service	Code	(psig)	(Temperature °F)	Material
Domestic Cold Water	CW	150 below	250	Copper

#### PLUMBING

		grade		
Domestic Hot Return	HWR	150 below	250	Copper
		grade		
Domestic Hot Water	HW	150 below	250	Copper
		grade		
Tempered Water	TW	100	250	Copper
Sanitary Waste &	S	Gravity	120	Cast Iron
Vent/Garage Waste				
Storm Drain	D	Gravity	80	Cast Iron

- B. Each valve type shall be the product of a single manufacturer. Each system shall be provided with valves as required by Code and shown on the Contract Drawings and shall be installed to facilitate operation, replacement and repair.
- C. Provide access panels for concealed valves behind non-removable ceilings or walls.
- D. Provide shut-off valves on supply piping to individual pieces of equipment.
- E. Provide pipe dope, Teflon tape, wax rings, neoprene gaskets and other jointing compounds as required by best standard practice and only on service as recommended by manufacturer.
- F. Apply putties and jointing compounds for plumbing fixtures and trim as recommended by manufacturers.
- G. Valves on insulated piping system shall be equipped with extended handles to accommodate insulation thickness.

	1/2" to 3"	4" and Larger
Pipe	Seamless copper water tube,	Seamless copper water tube,
	B-88. See Note 1.	ASTM B-8. See Notes 2 & 5.
Fittings	Wrought copper, solder-joint. ASTM B-16.22.	Ductile iron coupling with copper alkyd enamel paint coating, ASTM A-536. Grade "E" EPDM elastomer gasket. ASTM D-2000. Equal to Victaulic Style 606 coupling. ASTM B-75 copper alloy fittings ASTM B-584

#### 2.2 <u>COPPER PIPE (FOR CW, HWR, HW SYSTEMS)</u>

		grooved end cast bronze fittings for 6" nine size
Joints	ASTM B-32 solder filled material, Alloy Sb5 "95/5." ASTM B-813 liquid or paste flux. Soldering procedures shall comply with ASTM B- 828.	Rolled groove prepared and assembled in accordance with manufacturers instructions.
Mechanical Joints	Cast copper alloy unions, hexagonal stock with ball-and- socket joint, solder joint ends. ASME B-6.18.	ANSI Class 150 flange adapter equal to Victaulic Style 641 for connections to flanged equipment. ANSI B- 16.1 flange dimensions. Watts G-4000-FDA series.
Valves Gate	Use ball valve.	Use ball valve.
Ball	All bronze, 3 piece, full port, PTFE seats, solder end connections. 600 psig WOG. Apollo 82-200, Milwaukee BA-350, Watts B-6801.	Class 125, cast iron body, epoxy coated. Full port, flanged ends, stainless steel ball and stem. ANSI B16.1 flange dimensions. Watts G- 4000 FDA series.
Check	Bronze body and clapper, solder ends, 200 WOG. Jenkins 4093, WOG. Milwaukee 1509, Stockham B- 309.	Iron body, bronze mounted, flanged ends, 200 Jenkins 625-C, Milwaukee F-2974-M, Stockham G-931.
Balancing	All bronze, 2 piece, RPTFE seats, solder end connections. 600 psig WOG. Apollo 70- 100, Milwaukee BA-150, Watts B-6001. CamLock handle.	Cast iron lug body butterfly valve. Bronze disc, replaceable EPT liner and stainless steel stem, 200 psig CWP.

# A. Notes:

- 1. Below grade water piping 3" and smaller be Type K copper with bituminous coating copper brazed joints, BcuP filler alloy. ANSI/AWS A5.8 procedures shall be per ANSI/AWS B2.2.
- 2. Below grade water piping 4" and larger shall be ductile iron with AWWA C104 cement lined Class AWWA C151 piping with push-on joints.
- 3. Contact between dissimilar metals shall be made with dielectric couplings or dielectric flanges. Contact between ferrous and stud bolts and bronze flanges shall be electrically insulated with non-metallic washers.
- 4. Provide mechanical joint connections to all equipment such as water heaters, pumps, compressors, etc.
- 5. Above grade water piping 8" and larger shall be Schedule 40 galvanized steel piping with galvanized fittings and grooved joints.

# 2.3 SANITARY WASTE AND VENT, STORM DRAIN (CAST IRON)

	Above Grade	Below Grade
Piping	3" and Larger: Hubless cast	2" and Larger: Hub and
	iron soil pipe, service weight.	spigot cast iron soil pipe,
	ASTM-A-888, CISPI 130.	extra heavy. ASTM A-74 or
		service weight if Code
	2-1/2" and Smaller: Hubless	approved. Piping shall be
	cast iron soil pipe, service	asphalt or coal tar pitch
	weight. ASTM A-88, CISPI	coated.
	130 or type M copper tubing.	
	ASTM B8872. See Note 1.	
Fittings	3" and Larger: Hubless cast	2" and Larger: Hub and
	iron fittings, service weight.	spigot cast iron fittings, extra
	ASTM-A-888, CISPI 801.	heavy. ASTM A-74.
		Asphalt or coal tar pitch
	2-1/2" and Larger: Hubless	coated. DWV pattern.
	cast iron fittings, service	
	weight, ASTM A-888, CISPI	
	301 or wrought copper DWV	
	fittings. See Note 1.	~
Joints	Hubless Cast Iron: Heavy-	Caulked with leak and
	duty stainless steel band	oakum or neoprene
	coupling with neoprene	compression gaskets
	gasket. Bank torque of 80	conforming to ASTM C-564.
	foot/pounds 15 psig pressure	
	rating. Husky SD 4000 or	
	CLAMP-ALL HI-TORQUE	
	80.	
Backwater Valve	Cast iron gravity flow type,	
	bronze mounted, hub end.	
	Exterior shall be mastic	
	coated, bolted or extended	
	cover in accordance with	
	installation parameters. J.R.	
	Smith Co. /012-/022,	
	JUSAM 6/500, Zurn	
	Industries Z-1095.	

#### A. Notes:

- 1. Copper tube and fittings shall not be used on urinal wastes.
- 2. CISPI 310 no-hub couplings will not be accepted as equal to manufacturer's listed.

#### 2.4 PRESSURE, FLOW AND TEMPERATURE CONTROL DEVICES

- A. Thermostatic Mixing Valves:
  - 1. Pre-piped thermostatic mixing valve, inlet check valves, isolation valves, dial thermometer and mounting hardware.
  - 2. Acceptable manufacturers: Powers, Leonard or Lawler.
- B. Pressure and Temperature Relief Valves on Water Heaters:
  - Combination pressure and temperature (P&T) relief valves shall be automatic, ASME-rated, AGA and CGA-certified, ANSI standard, bronze body. Pressure relieving setting shall be 150% of the working pressure of the unit to a maximum of 150 psi; temperature relieving setting shall be 120° F. Temperature relieving capacity shall be selected on AGA-CGA rating.
  - 2. Valves shall be by Watts Regulator Co. Approved equivalent valves by Robertshaw or Cash-Acme may be provided.
- C. Vacuum Relief Valves on Cold Water Inlet to Water Heaters and Tanks:
  - 1. Relief valves shall be bronze body composition disc with 200 psi working pressure and 250° F temperature rating.
  - 2. Valves shall be by Watts Regulator Co. Approved equivalent valves by Taco or B&G may be provided.
- D. Vacuum Breakers:
  - 1. Atmospheric vacuum breakers shall be all-bronze, for temperature up to 210° F: Watts 800 or equivalent by Neptune or Febco.

# 2.5 <u>INSULATION</u>

- A. Insulation shall be by Owens-Corning, Certain-Teed or Manville.
- B. Insulation shall be installed by insulation firm regularly specializing in this work and employing men particularly skilled therein. No covering applied by plumber's "helpers" will be acceptable.
- C. Insulation installation shall meet manufacturer's recommendations. No insulation shall be applied until piping has passed tests as required by Authorities Having Jurisdiction.
- D. Insulation, jackets and adhesives shall be flame-retardant and shall have ASTM E-84 fire hazard ratings of 25 flame spread, 50 smoke developed and 50 fuel contributed.
  - 1. Interior Applications Jackets:

- a. Type a Vapor Barrier Jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints. Jacket shall be heavy duty fire retardant material with glass fiber reinforcing and self-sealing lap. Jacket will be factory applied to the insulation. Jacket shall have neat, white Kraft finish or white vinyl suitable for painting, with bead puncture resistance of 50 units minimum. Vapor barrier shall be .001" aluminum foil adhered to the inner surface of the jacket. Permeance shall not exceed 0.02 perms. Jacket shall be Owens-Corning Fiberglass "ASJ-SSL" or Manville Flamesafe "AP-T".
- b. Type b PVC Jackets: One piece, pre-molded type.
- E. Insulation and jacketing shall be in accordance with following:
  - 1. Type A: Glass fiber insulation; ANSI/ASTM C547; "k" value of 0.22 0.28 at 100° F non-combustible.
  - 2. Type B: Molded, flexible closed cell vinyl, ASTM D635; "k" value of 1.17 bacterial resistant.

Piping System	Туре	Insulation Thickness Inch (mm)	Jacket Type
1/2"	А	1	a, 0
Domestic Hot Water Supply/Return 1-1/2" and Larger	A	1-1/2"	a, b
Domestic Cold Water	Α	1"	a, b
Roof Drains and Horizontal Rainwater	Α	1"	a
Handicap Lav. Hot Water and Waste	В	1/8"	b

F. Schedule: The following piping systems require insulation:

- 1. Notes:
  - a. Insulation shall include drain sump body and all horizontal piping to and including the elbow down to vertical.
  - b. Unless noted otherwise, Section "F" pertains to all piping specified system. This note pertains to all piping scheduled above.
- G. Insulation of exterior piping and fittings shall be covered with 0.016" thick smooth aluminum jacket with longitudinal zee closures. Jacket shall be secured at both joints with 2" wide aluminum straps centered over butt joint of jacket. Provide <sup>1</sup>/<sub>2</sub>" wide aluminum bands on 12" centers. Fitting covers shall be manufactured for purpose intended and shall be of same material.
- H. Pipe hangers shall be outside insulation and shall incorporate 12", 26 gauge protection shields. Insulation on piping that passes through walls or partitions

shall pass continuously through sleeves, except at firewalls, smoke partitions and floor penetrations where space between sleeves and piping shall be fire stopped with approved packing.

### 2.6 <u>PIPE SUPPORTS</u>

- A. Provide adjustable clevis hangers for hanger sizes 4" and larger and cast brass split-ring hinged hangers or band type hangers for smaller. Support piping from building structure to maintain required grade and pitch of pipe lines, prevent vibration, secure piping in place and provide for expansion and contraction. Hangers on all insulated pipe shall be clevis type.
- B. Provide vertical brackets and guides for horizontal piping where it is racked along walls. Trapeze hangers may be used where conditions permit. Provide all necessary pipe clips, anchors and sundries for proper alignment and support of piping. Hangers for copper piping shall be coated for dielectric isolation.
- C. Hanger rods shall have machine threads. Beam clamps, concrete inserts and expansion shields shall be provided as required. No ramset or shot shields will be allowed.
- D. Hanger spacing shall meet requirements of State and Local Plumbing Codes. In no case shall horizontal piping be supported at intervals greater than 10'-0".
- E. Piping below basement or lowest level slab (that is, buried piping), need not be supported from structure if slab is not designed as structural slab. The Plumbing Contractor shall support all piping under structural slabs on grade.
- F. Pipe supports shall not bear on sleeves.
- G. Friction clamps shall be installed at base of plumbing risers and at each floor. Friction clamps shall not be supported from or rest on sleeves.
- H. Horizontal piping shall be suspended from building structure by mild steel rod connecting pipe hanger to inserts, beam clamps, angle brackets and lag screws as required by Building Construction in accordance with the following:

Rod Size	Pipe Size
3/8"	1/2" to 2"
1/2"	2-1/2" to 4"
5/8"	5" to 12"
3/4"	15"

I. Hangers on insulated lines shall be sized to fit the outside diameter of pipe insulation. Provide hangers for insulated piping with 12" long, 18 gauge galvanized insulation shields.

- J. Piping at equipment and control valves shall be supported to prevent strains or distortions in connected equipment and control valves. Piping at equipment shall be supported to allow for removal of equipment, valves and accessories with a minimum of dismantling and without requiring additional support after these items are removed.
- K. Piping installed under this Section shall be independently supported from building structure by means of beam attachments and not from piping, ductwork or conduit of other trades. Supplementary steel, including factory-fabricated channels, required to meet the requirements specified herein, shall be provided by the Plumbing Contractor.
- L. Maximum spacing of hangers on runs of steel, copper or brass pipe shall be as follows:

Schedule: Hanger Spacing in Feet/Pipe Material				
Pipe Size	Steel	Copper or Brass		
(Inches)	(Feet)	(Feet)		
1/2 to 1	7	5		
1 to 1/4	10	6		
1 to 1/2	10	8		
2 to 8	10	10		

- M. Maximum spacing of hangers on no hub cast iron soil pipe shall be 5' and hangers shall be provided at all changes in direction. Hanger rods to support piping from the structure or supplementary steel shall not exceed 4' in total length. Where pipe support assemblies exceed 4' in total length, Plumbing Contractor shall provide factory-fabricated channels and associated accessories.
- N. Hangers in areas exposed to weather or in unheated spaces shall be provided with a shop coat of rust inhibited paint. Hanger rods shall be hot dipped galvanized.
- O. Hangers and rods for under slab piping shall be hot dipped galvanized.

# 2.7 <u>SLEEVES, INSERTS, FIRE STOPPING AND ESCUTCHEONS</u>

- A. All pipes passing through floors, walls or partitions shall be provided with sleeves having an internal diameter one inch larger than the outside diameter of pipe. Pipe Sleeve Materials:
  - 1. Sleeves through floors and through exterior, structural and fire-rated construction, shall be hot dipped galvanized Schedule 40 steel pipe. Sleeves shall extend 1" above finished floor.
  - 2. Sleeves through partitions and non-fire-rated construction shall be 26 gauge galvanized steel with lock longitudinal seams or approved plastic pipe.

- 3. Provide waterproofing membrane locking devices at floors. Provide 150 lb. Slip-on welding flanges at exterior wall penetrations.
- B. Fire stop penetration seals in fire-rated construction shall be products of STI SpecSeal, 3M, Proset Systems Firefill or Dow and shall be installed in accordance with the latest requirements of ASTM E814 (UL 1479). Fire stop penetration sealants for non-metallic and insulated piping shall be intumescent (STI SpecSeal Series 100 Sealant or SpecSeal Collar or approved equal). Provide mineral fiberboard, matting or putty for damming and forming. Finish seals flush to wall surface and fill gaps with silicone adhesive sealant caulking (Dow 96-081 RTV or approved equal). Provide 1" thick ceramic fiberboard on both sides of penetrations in 2 and 3 hour rated walls and floors less than 8" thick.
- C. Packing for sleeves that do not require maintenance of fire rating shall be oakum, silicate foam, ceramic fiber or mineral fiber with approved sealant. Pack or foam to within one inch of both wall surfaces. Seal penetration packing with approved caulking and paintable waterproof mastic surface finish or silicone caulking.
- D. Waterproof Pipe Penetrations:
  - Sleeves through outside walls shall be provided with pipe to wall penetration closures equal to Link-Seal Thunderline Corporation. Seals shall be mechanical type of interlocking rubber links shaped to fill space between pipe and sleeve. Links shall be assembled with bolts to form a belt around the pipe with pressure plate under each bold head and nut. After seal assembly is positioned, tightening of bolts will provide watertight seal. This Contractor shall determine the required inside diameter of each individual sleeve before ordering, fabricating or installing. The inside diameter of each sleeve shall be sized as recommended by the manufacturer to fit the pipe and Link-Seal to assure a watertight joint.
  - 2. Prefabricated modular sleeves shall be Mason Industries (SWS) or approved equal stiffened galvanized steel sleeves with preformed closedcell elastomeric seal (non-fire rated) or preformed mineral fiber or silicone foam seal (fire rated).
  - 3. Provide waterproof 1" single ring set in silicone and bolted to floor or wall at chipped and drilled penetrations of existing slabs on grade and existing walls below grade.
- E. Inserts shall be individual or strip type or pressed steel construction with accommodation for removable nuts and threaded rods up to 3/4" diameter, permitting lateral adjustment. Individual inserts shall have an opening at the top to allow reinforcing rods up to 1/2" diameter to be passed through the insert body. Strip inserts shall have attached rods with hooked ends to allow fastening to reinforcing rods.
- F. Unless otherwise specified herein, escutcheons shall be cast brass chrome plated type and provided with a set screw to properly hold escutcheon in place.

#### 2.8 TRAPS AND STRAINERS

- A. Provide cleanouts in soil, waste and storm drainage piping on straight runs at changes in directions and at foot of stacks and other points where required by inspecting Authorities. Cleanouts shall suit construction in which they are to be installed.
- B. Maximum horizontal distance on straight runs between cleanouts in piping 4" and smaller shall be 50 feet. In piping 5" and larger, maximum horizontal distance between cleanouts shall be 100 feet.
- C. Cleanouts shall be same size as pipe 4" and smaller. Cleanouts for piping larger than 4" shall be sized per local code and in no circumstance shall they be less than 4" in diameter. No reduction in cleanout sizes for pipe 4" and smaller is permitted.
- D. Traps not integral with fixtures and in accessible locations shall have brass trap screw protected by water seal and will be regarded as cleanout.
- E. Bodies of cleanout ferrules in bell and spigot piping shall be standard pipe sizes conforming in thickness to that required for pipe and fittings and shall extend not less than 3/4" above hub of pipe.
  - 1. Cleanout plug shall be cast brass with raised nut 3/4" high.
  - 2. Cleanouts in copper waste piping shall be soldered brass cleanout fittings with extra heavy brass screw plugs of same size as line.
  - 3. Cleanouts in threaded waste piping shall be cast iron, drainage T pattern, 90 branch fitting with extra heavy brass screw plugs of same size as pipe.
  - 4. Floor cleanouts in finished areas shall be per schedules equivalent to J.R. Smith, Wade or Zurn.
  - 5. Floor cleanouts in unfinished areas shall be per schedules equivalent to J.R. Smith, Wade or Zurn.
- F. Provide test tees with cleanout plugs at foot vertical soil, waste, and roof conductor lines and at each floor. Cleanouts on vertical lines concealed behind finished walls shall extend to back of finish wall; provide wall plate. Obtain Architect's approval for wall plate locations and reroute piping if necessary.
- G. Cleanouts shall open in direction of flow of drainage line served or at right angles thereto.
- H. Keep cleanout plugs clean and unimpeded. Prevent covering with cement, plaster or other permanent finished materials.

# 2.9 <u>THERMOMETERS AND PRESSURE GAUGES</u>

A. Provide bronze Bourdon tube pressure gauges where shown on Drawings and where specified, by U.S. Gauge, Trerrice or Weksler, accurate to +1%.

- 1. Gauges shall have white faces with black-filled engraved lettering. Gauge bodies shall be set in phenolic cases. Provide pulsation dampers and gauge cocks to isolate each gauge.
- 2. Gauges shall be easily accessible and easily read. Gauges readable from floor at less than 5 feet shall be 4-1/2" dials. Other gauges shall have 6" dials. Gauges graduations shall meet limit requirements of normal operation. Gauges shall indicate at mid-scale.
- 3. Provide pressure gauges at the inlet and outlet of each pump.
- 4. Provide pressure gauges at each water entrance, downstream of the water meter and on each side of PRV stations.
- B. Provide separable well V-case thermometers by U.S. Gauge, Terrice or Weksler where shown on Drawings and where specified. Thermometers shall have 9" scale and white face with black-filled engraved letters. Thermometers shall be angular or straight stemmed, as conditions necessitate. Thermometer wells shall be bronze and shall be installed so as to ensure minimum restriction of water flow in pipe and shall be installed to be able to be viewed from the floor.
  - 1. Provide thermometer at the inlet and outlet of each water heater and where shown on Drawings. Thermometers shall have scale range of 30°-240° F with 2° scale division.
  - 2. Provide thermometer in hot water return system at each hot water recirculation pump and where shown on Drawings. Scale range shall be  $30^{\circ}-240^{\circ}$  F with  $2^{\circ}$  scale division.

# 2.10 WALL HYDRANTS AND HOSE BIBBS

- A. Provide wall hydrants as shown on the Contract Drawings. Provide hose bibs in every toilet core where more than one (1) flushing fixture is shown.
- B. Wall hydrant shall be recessed box anti-siphon, non-freeze, key-operated, 3/4". Hydrant shall be J.R. Smith or equivalent by Josam or Zurn. Coordinate cover and plate finish with Architect prior to ordering any units.
- C. Hose bib shall be chrome plated bronze or brass with replaceable hexagonal disc, hose thread spout and integral vacuum breaker in conformance to ANSI/ASSE 1011. Hose bib shall be equal to Chicago No. 952 or equivalent, T&S Brass or Watersaver.

# 2.11 WATER HAMMER ARRESTERS

- A. Provide water hammer arresters at fixtures with automatic solenoid or cylinder operated valves, automatic flush valves quick-closing valves or solenoid valves and where indicated on Drawings.
- B. Fixtures and equipment in battery installation may use single water hammer arrester properly sized for connected load.

- C. Provide proper access to water hammer arresters in chases, utilizing a minimum 12" x 12" access panel furnished by this Contractor.
- D. Water hammer arresters shall be installed in accordance with manufacturer's recommendations and not less than one (1) installed per core piping hot system and core piping cold system. Arresters shall be equal to J.R. Smith, Zurn or PPP.

#### 2.12 PLUMBING FIXTURES AND TRIM

- A. Refer to Architectural and Plumbing Drawings for quantities, locations and mounting heights of fixtures provided under this Section.
- B. Fixture trim, traps, faucets, escutcheons and waste pipes exposed to view in finished spaces shall be I.P.S. brass with polished chromium plating (CP) over nickel finish.
- C. Vitreous china fixtures shall be regular selection fused and vitrified to produce homogeneous material with close grain without pores. Surfaces that contact walls, floors and other fixtures shall be set true.
- D. Enameled surfaces on cast iron fixtures shall be of suitable thickness to provide the highest commercial grade. Exterior exposed surfaces not enameled shall be treated at factory with one (1) coat of filler.
- E. Affix manufacturer's guarantee label or trademark to fixture to indicate first quality. Acid-resisting enamel fixture shall bear manufacturer's symbol signifying resistance to acid.
- F. Set fixtures with wall outlet flanges at proper distance from floors and walls with closet setting compound or gasket.
- G. Catalog designations and manufacturer's names of vitreous china and enameled cast iron fixtures are specified to establish standards of quality for performance and materials. Equivalent fixtures by Kohler, American Standard or Eljer may be submitted for consideration.
- H. Vitreous china and enameled cast-iron fixtures shall be white throughout, unless specified otherwise. Closet seats shall match closet fixture color.
- I. Fixture Types: As listed on Drawings.
  - 1. Notes:
    - a. Standards:
      - 1) Floor Drains:
        - a) Cast Iron ASME A112.21.1M
        - b) Plastic ASTM A112.21.M
        - c) Cast Iron Trench Drains ASME A112.21.1M
      - 2) Cleanouts: Cast Iron ASME A112.36.2M
      - 3) Roof Drains: Cast Iron ASME A112.21.2M

4) Sleeve Systems: UL 1479

#### 2.13 <u>EQUIPMENT – GENERAL</u>

- A. The following mechanical equipment is to be supplied by a single manufacturer as part of this package unless otherwise noted.
- B. Equipment Tags:
  - 1. All equipment shall be tagged using black phenol background with a 1/4" white engraved lettering tag affixed to the piece. Tag shall be minimum of 2" high and 4" long for large equipment and shall include the tag number and the piece.
  - 2. Equipment Tag Sequence (Example):
    - a. G-CMP 1XXX where:
    - b. G Indicates system (Natural Gas)
    - c. CMP Indicates equipment (Booster Pump)
    - d. 1 -Indicates piece number (1, 2, 3...)
    - e. XXX Indicates building number (if applicable)
- C. All equipment furnished in the following pages shall be furnished with seismic anchoring points. Equipment supplied shall be constructed with a seismic rating.

#### 2.14 WATER HEATERS

- A. Provide water heaters of sizes and types indicated on the schedule sheets. Heaters shall be tested at 200 psi and rated for working pressure of 150 psi and shall bare stamp certifying testing and rating. Tanks with capacity greater than 120 gallons or input rating greater than 200,000 Btu/hr shall meet ASME Boiler and Pressure and Vessel Code requirements.
- B. Provide pressure and temperature relief valve and vacuum relief valve.
  - 1. Pressure and temperature relief valves shall be at least 3/4" and shall be rated and listed for heater input rating and as required by ANSI and ASME Standards. Temperature relief valves shall be installed within top 6" of tank.
  - 2. Vacuum relief valves shall meet ANSI standards requirements and shall be rated and listed for heater input rating and as required by ANSI and ASME Standards. Temperature relief valves shall be installed within top 6" of tank.
- C. Storage type heaters shall have minimum standby heat loss in accordance with requirements of State Energy Code. Tank and heaters which are not factory insulated and jacketed shall be field insulated.
- D. Heaters and tanks shall be of size and type as scheduled on Drawings.

### 2.15 <u>PUMPS</u>

- A. The following pumps are included:
  - 1. Hot water circulating pumps:
    - a. Hot water circulating pumps shall be all bronze, centrifugal of sizes indicated on the schedule sheets or equivalent by Armstrong, B&G or Grundfoss.
    - b. Provide Minneapolis-Honeywell or approved equivalent line voltage aquastat with separable socket to control each pump, approximately 15'-0" from pump, on suction side. Provide a disconnect switch for each pump. (Allow for constant circulation if thermostatic mixing valves are used on the water heater.)
    - c. Pump capacity and motor shall be indicated on the Contract Drawings. All motors to be high efficiency.

### PART 3 EXECUTION

### 3.1 <u>COORDINATION</u>

A. Cooperate and coordinate with work of other Sections in executing work of this Section.

#### 3.2 EXPANSION PROVISIONS

- A. Allow for expansion with offsets, loops, swing joints, expansion joints and other means, where necessary to protect piping systems as shown. Take-offs from mains to run outs shall not have less than a three (3) elbow swing.
- B. Anchor mains and risers with loops or offsets to structure to impart expansion toward loops and offsets. Anchors shall be forged wrought iron, secured to pipe and structure. Provide vibration isolation as required and as specified.
- C. Provide pipe alignment guides to guide expanding pipe to move freely from anchor points towards expansion joints, offsets and other expansion provisions.

#### 3.3 <u>PIPE IDENTIFICATION</u>

- A. Provide color-coded pipe identification markers on piping installed under this section. Pipe markers shall be snap-on laminated plastic protected by clean acrylic coating. Pipe markers shall be applied after Architectural painting where such is required.
- B. Provide arrow marker with each pipe content marker to indicate direction of flow. If flow can be in either direction, use double-headed arrow marker.

- C. Main shall be labeled at points of entrance and exit from mechanical room, adjacent to each valve, on each riser, at each tee fitting, at points of entrance and exit from building, at least once in each room and at intervals no longer than 20'.
- D. In general, 2" high legend shall be used for pipe lines 4" in diameter and larger, and 3/4" high legend shall be used for pipe lines 3" in diameter and smaller.
- E. Markers shall be Seton, MIS or approved equivalent.
- F. Color banding shall meet ANSI latest and OSHA requirements.
- G. Markers shall have legends and color coding with black letters:
  - 1. Markers are to be applied to all piping, regardless of under jacket colors per the following schedule:

		Background
Service	Legend	Color
Cold Water	Cold Water	Green
Hot Water	Domestic Hot Water	Yellow
Hot Water Return	Domestic Hot Water	Yellow
	Return	
Sanitary/Garage Waste	Sanitary Sewer	Green
Vent	Vent	Yellow
Rainwater	Storm Sewer	Green

- H. In Plumbing Room, Janitor's Closets and other areas without hung ceilings, colored PVC jackets shall be used per the following schedule:
  - 1. All insulated piping exposed in mechanical rooms shall be covered with a Ceel-Co plastic jacket. Color pattern and system identification legend shall be as in the following schedule:
  - 2. This plastic jacket shall include fitting covers and piping covers.
  - 3. Piping to be covered with this plastic jacket shall be insulated and finished as herein specified and then the plastic jacket shall be applied.

### 3.4 TAGS, VALVES, EQUIPMENT AND INSTRUMENTS

- A. Upon completion of work, attach engraved laminated plastic tags to all valves and instrumentation. Equipment shall bear a stamped stainless tag. Tags shall have black characters on white face, consecutively numbered and prefixed with letter "P" for general valves. Tags shall bear the number used in the P&IDs for those items so marked.
- B. Embossed or engraved aluminum or brass tags may be substituted if desired. Tags shall be at least 1/8" thick.

- C. Tags shall be at least 1" diameter with numerals at least 3/8" high and attached by "S" hooks and chains.
- D. Nameplates, catalog numbers and rating identifications shall be securely attached to electrical and mechanical equipment with screws or rivets. Adhesives or cements will not be permitted.
- E. Coordinate numbering system with existing piping tags as not to duplicate numbers.

### 3.5 FLASHING AND COUNTER FLASHING

- A. Floor drains shall be flashed watertight with 20 ounce sheet copper flashing which shall extend 8" beyond drain flashing flange.
- B. Provide counter flashing for roof penetrations required under this Section including vents and roof drains.
- C. Flashing of vents, roof drains and other penetrations of roof required under this Section shall be done under other Sections.

### 3.6 JOINTS AND CONNECTIONS

A. Joints and connections shall be permanent and shall be gas and water-tight. Jointing shall be types specified for serviced indicated. Joints and connections shall meet requirements of manufacturer's best recommended practice. All transitions between different piping materials shall be made using approved adapters. Adapters for transitions between two (2) types of piping materials shall be manufactured for purpose intended.

#### 3.7 INTERIOR WATER SUPPLY SYSTEM

- A. Provide a complete, new (domestic and/or protected) hot and cold water piping system as indicated on Drawings and as specified, including supplies to fixtures and indicated equipment. Piping shall be pitched at least 1" in 40 feet so that it can be drained completely at low points with drain valves. Piping shall be pitched up toward fixtures for proper air relief. Provide automatic air vents with outlet piped to floor and gate valve ahead of air vents, where offsets cannot be vented by means of fixture connections.
  - 1. Pipe used in piping assembly shall be clean and shall have ends square and reamed before putting into fittings.
  - 2. Cut tube to required length with hacksaw or tube cutter designed for copper work.
  - 3. Remove burrs from inside and outside of cut edge and clean end of tube with steel wool or sand cloth until discoloration is removed and metal is smooth and bright.
  - 4. Oxides shall be removed by sand cloth and brush.

- 5. Removal of oxides or discoloration of pipe and fittings by acids or selfcleaning flux is forbidden.
- 6. Apply a thin, uniform and complete coating of reliable brand of soldering flux (Nokorode or Crest) to cleaned surfaces of tube and fittings.
- 7. When joints are soldered, remove excess solder with a cloth or brush leaving a fillet of solder in chamber at end of the fitting.
- 8. Where quick closing valves such as solenoid or flush valves are being used, piping shall be protected from water hammer by shock absorbers. Shock absorbers shall be installed at all batteries of fixtures that are operated by flush valves. Shock absorbers shall be as manufactured by PPP, J.R. Smith, or Zurn, and shall conform to the Plumbing and Drainage Institute (PDI) published requirements.
- 9. Connections to tanks and equipment shall be made with unions.
- 10. Water services supplying the building shall flow through in-line strainers and shall have containment backflow protection as indicated.
- 11. Shut-off and control valves on main distribution and branch lines shall be located for easy access and operation. Branch piping shall be valved with access panels provided as required at locations shown on Drawings and determined in field.

# 3.8 INTERIOR SANITARY WASTE, STORM, DRAINAGE AND VENT PIPING

- A. Provide waste, drainage and vent lines shown in building as shown on Drawings. Vents shall extend through roof and shall increase to at least 4". Piping shall be assembled and installed without undue strains and stresses and provision shall be made for expansion, contraction and structural settlement.
- B. Interior horizontal sanitary waste and storm drainage piping shall be installed in practical alignment at uniform grade of at least 1/8" per foot, but 1/4" per foot where code dictates and as shown on Drawings.
- C. Vents from fixtures or line of fixtures, when connected to vent line serving other fixtures, shall be extended at least 6" above flood level rim of highest of fixtures to prevent use of vent line as waste. No vent terminal shall be directly beneath door, window or other ventilating opening of building, nor shall any vent be within 12 feet horizontally of such opening.
- D. Provide sleeves for pipe that pass through walls.
- E. Provide 3" air gap on equipment and drains that discharge to floor drains.
- F. Provide an air gap in which the vertical distance through the free atmosphere between the waste pipe and the floor rim of the receptacle into which it is discharging is a minimum of 2 pipe diameters greater.
- G. Piping shall be run straight and plumb and offsets shall be made at an angle of not less than 45.

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- H. Carefully lay out work in advance so pipes pass through openings and permit proper pitch to stacks. Due to extensive ventilation and lighting systems all trades shall coordinate work with work of other trades.
- I. Hub and spigot soil pipe shall be thoroughly assembled with joints of picked oilfree oakum packed tightly into space between pipes to a depth of 1-1/2". Remaining space shall be filled in by pouring with molten lead, caulked to ensure tight joints without straining bell. After caulking, lead shall be flush with ends of bell.
- J. No hub soil pipe shall be assembled with any hub heavy-duty stainless steel couplings and neoprene gaskets.
- K. Cleanouts:
  - 1. Provide cleanouts with brass caps and screws same size as pipe up to 4 inches and not less than 4 inches for larger piping at the ends of all branches on soil and waste piping and in such other portions of the piping where run is over 50 feet. Locate floor cleanouts as indicated on Drawings.

### 3.9 <u>WATER ENTRANCE</u>

- A. Run exterior water service piping for domestic water, beginning 10'-0" outside building wall, as shown on Drawings.
- B. When water pipe laying is not in progress, close ends of pipe with watertight plugs. If water enters pipe, flush and clean line.
- C. Keep excavation for underground water main open until system has been tested, inspected and approved.
- D. Piping shall be bedded as specified in Division 2.

#### 3.10 WATER METER

- A. Provide compound water meters that meet AWWA C701-70 requirements for cold water meters and the Municipal Water Authority.
- B. Registers shall be straight reading, hermetically sealed calibrated in cubic feet and shall meet Section 9.3 of AWWA standard requirements. Provide center swept test hands.
- C. Meter shall register at least 98% and no more than 102% of water actually passing through meter at any rate of flow, within range of 5 gpm to 200 gpm.
- D. Main casing shall be bronze. Bolts shall be stainless steel.

- E. Meter shall permit easy removal of interior parts without disturbing meter connections to pipeline.
- F. Provide magnetic couplings to transmit motion from measuring chamber to register unit.
- G. Provide remote register. Remote register plug/jack to conform to and be compatible with Owner' standard building automated system.
- H. Measuring chamber shall be removable from main line case for repair and recalibration.
- I. Meter shall be by Rockwell, Hersey or Neptune Products, and shall be approved by local water and sewer authority.

### 3.11 FIXTURE ROUGHINGS

- A. Install rough plumbing including fixture carriers and supports, valves and water hammer arresters within chase tolerances. Supply roughing through finish walls and at hose bibbs and shower heads shall be secure and free of movement. Locate valves and water hammer arresters within 12 inches of approved access panel location.
- B. Align exposed waste and supply pipe roughings with fixture connections within 1 inch tolerance. Provide flush valves in alignment with the fixture, without vertical or horizontal offsets. Obtain fixture manufacturer roughing data sheets for recommended roughing dimensions.
- C. Provide fixture templates for Casework Contractor for counter mounted sinks and lavatories.
  - 1. Rough handicapped use water closets to locate the flush valve handle on the wide side of the toilet stall.
- D. Secure fixture supports to floor slab construction with lag bolts and metal expansion shields to support at least 250 pounds on the front rim of the fixture for 5 minutes.
- E. Mounting heights shall be in accordance with all local and state codes and latest ADA Standards.
- F. Provide fixture rough-in piping connections, sizes in accordance with schedule on Drawings.

### 3.12 EQUIPMENT ROUGHINGS AND CONNECTIONS

A. Provide roughing and final connections for water and waste systems including indirect wastes, traps, tailpieces, stops and supplies, valves and unions for all equipment and fixtures including those supplied under other sections.

- B. Provide complete plumbing roughings with capped and valved service with union of flange to suit Owner furnished equipment.
- C. Refer to Architectural floor plans and Equipment schedules for all equipment provided under other sections or by Owner. Roughing for all equipment including floor drain locations shall be based on approved Shop Drawings. Install indirect waste discharge to spill into floor drain funnel. Floor drain grate and sediment bucket shall be removable.

### 3.13 INSTALLATION OF SPECIALTY ITEMS

- A. Install vacuum relief valves located above the top of the heater on cold water supply lines to water heaters.
- B. Gauges: Install gauges where indicated on the Contract Drawings and as specified. Install pressure gauges at water service entrance on inlet and outlet sides of strainers, filters, backflow preventers and pumps. Install temperature gauges on inlet and outlet side of water heaters and on recirculation line at least 10 feet upstream of circulation pumps. Gauges shall be legible from 4 feet to 6 feet above the floor.
- C. Trap Primers: Install trap primer and related piping through the floor and connect to primer connection on floor drains in all areas where maintaining the trap seal could be a problem.
- D. Water Hammer Arresters: Provide water hammer protection at all self-closing fixtures and equipment. Equip quick-closing valves such as flush valves and solenoids with water hammer arresters. Banks of plumbing fixtures may be protected with a single properly sized and located PDI certified arrester. Obtain approval for access panel location prior to installation.

#### 3.14 INSTALLATION OF FIXTURES

- A. Mount fixtures level at the elevations shown on Architectural Drawings. Refer to toilet room elevations and casework details.
- B. Install handicapped use fixtures in accordance with the requirements to the Architectural Access Board Code, latest ADA standards and ANSI A117.1. Insulate hot water supply and waste piping under lavatories.
  - 1. Where urinals are provided, install one urinal with the rim mounted 17 inches above the finish floor in compliance with the Handicapped Code.
- C. Grout walls and floor mounted fixtures watertight where the fixtures are in contact with walls and floors.
- D. Caulk deck-mounted trim at the time of assembly, including fixture and casework mounted. Caulk self-rimming sinks installed in casework.

### 3.15 CROSS CONNECTION PROTECTION

- A. All potable water piping outlets and connections to equipment or machinery shall be protected against backflow by means of an air-gap or approved backflow preventer.
- B. Backflow preventer type, application and installation shall comply with the Commonwealth of (Massachusetts), Department of Environmental Protection (DEP) Drinking Water Regulations 310 CMR 22.00.
- C. Mount backflow preventers horizontally, unless device is approved for vertical installation, at heights and with clearances as required by DEP regulations.
  - 1. Reduced pressure backflow preventers shall be installed between 36" to 48" above the floor with a minimum of 6" clear space all around.
- D. Submit plans to DEP and obtain permit for each reduced pressure or double check valve backflow preventer installation and submit copies of permit to Architect for record.
- E. Provide indirect waste piping with funnel to receive discharge from reduced pressure backflow preventer atmospheric vents and spill through air gap into floor drain.

# 3.16 <u>CLEANING</u>

- Clean systems thoroughly before testing. Fixtures, equipment, pipe, valves and fittings shall be free of grease, metal cuttings, dirt and other foreign material. Remove protective covers. Fixtures (including lavatories, water closets and urinals) shall be cleaned and ready for use.
- B. Repair stoppage, discoloration and damage to parts of building, finish and furnishings due to failure to properly clean piping system within Contract Price.
- C. After completion of project, clean the exterior surface of equipment included in this section, including concrete residue.
- D. After the completion of the work, all materials and equipment surfaces shall be thoroughly cleaned and polished in accordance with the finish of the material. All chromed surfaces shall be highly polished.
- E. Before the systems are tested and balanced, pipes and equipment shall be thoroughly cleaned so that no dirt, dust, or other foreign matter will be deposited in or carried through the systems.
- F. Water system shall be thoroughly flushed and cleansed of any and all deleterious materials at least once before system is placed in operation. At this time, these systems will be carefully checked for leaking and defects as hereinafter specified. An approved cleansing agent will be used in flushing.

- G. At all times, keep the premises clear of undue accumulation of rubbish.
- H. On completion of the work, remove all rubbish and debris resulting from this contract and dispose of same. At any time should the General Contractor be dissatisfied with the performance of clean-up responsibilities, he may elect, after proper notification, to undertake this operation and back charge this Subcontractor accordingly.
- I. All equipment shall be thoroughly cleaned and left in a satisfactory condition for proper operation at project completion.

### 3.17 DISINFECTION OF WATER SYSTEMS - INTERIOR AND EXTERIOR

- A. Water piping systems shall be thoroughly disinfected with a solution containing no less than 50 parts per million of available chlorine. Chlorinating materials shall be either liquid chlorine or sodium hypochlorite solution, and shall be introduced into the system and drawn to all points in the system. Disinfection solution shall be allowed to remain in system for 24 hours. During this time, valves and faucets shall be opened and closed several times. After disinfection, solution shall be flushed from the system with clear water until residual chlorine content is no greater than 0.2 parts per million.
  - 1. Notify all parties 48 hours prior to cleaning system.
  - 2. Bypass all building filters.
  - 3. Perform chlorination prior to heating the domestic hot water system. Run circulation pumps on the domestic HW system.
  - 4. Provide advance notice to all trades prior to procedure. Post warning signs throughout the job site.
  - 5. Collect samples randomly and at end user points.
- B. Work shall be supervised by Owner and performed by approved chemical testing laboratory and results sent to the Architect or Architect's representative for verification.
- C. Testing laboratory shall submit a summary of test procedure for approval prior to any work performed. Subcontractor shall provide valves required to disinfect water supply system in part as required by phasing of construction and to provide isolating valves and draw-off valves for proper containment, phasing and flushing.

# 3.18 <u>TESTING AND ADJUSTING – GENERAL</u>

- A. Scope:
  - 1. Test and adjust plumbing systems as specified and as required by Code.
  - 2. Testing, balancing and adjusting shall in no way relieve guarantee requirements.
- 3. Provide services of qualified personnel, equipment and apparatus required to perform tests.
- 4. All systems shall be thoroughly adjusted for perfect intended operation. All mechanical equipment shall be adjusted for flow, temperature, etc. of fluid. The entire hot water circulation system shall be thoroughly balanced so hot water draw from fixtures shall be as quickly available as possible. Pumps, relief valves and pressure reducing valves shall be adjusted as required. Submit in writing to the Engineer upon completion of this work that it is complete and ready for use.
- B. Before date of acceptance, furnish Architect with certificates of testing and inspection indicating approval of Authorities Having Jurisdiction and conformance with requirements of Contract Documents.
- C. General:
  - 1. Submit proposed test procedures, recording forms and test equipment for review before testing.
  - 2. Notify Architect and Authorities involved at least 48 hours before testing and inspection.
  - 3. Do not paint, cover or conceal work before testing, inspecting and obtaining approval; this includes backfilling and application of insulation.
  - 4. Costs of repairs and restoration of work of other trades and of existing building surfaces or material damaged during cleaning or testing shall be borne by trade performing cleaning or testing.
- D. No tests shall be started until systems have been cleaned as described under "Cleaning" paragraph. Provide temporary piping and connections for testing, flushing or draining systems to be tested.
  - 1. Repair or replace leaks, damage and defects that result from tests to likenew condition. Remove and replace defective materials with acceptable materials.
  - 2. Piping and joints shall be made tight without caulking. Continue tests until systems operate without adjustments and repair to equipment or piping.
  - 3. Provide testing instruments, force pumps, gauges, equipment and labor necessary to conduct tests. Instruments used for testing and balancing shall have been calibrated within six months before balancing. Instrument calibration shall be certified.'
  - 4. Submit six (6) copies of complete testing and balancing report to Architect for review.
- E. Final test shall be made after vertical and horizontal pipes and roughing-in have been run and before sewer or fixture connection is made.
  - 1. After soil, waste and storm lines, etc. have been installed outlets shall be temporarily plugged up.

#### CARVER. MA **PLUMBING** 22 00 00-41 2. Fill pipes with water to top of vertical lines and allow them to remain so filled for 24 hours. 3. Retesting after leaks are repaired shall be at no additional cost. F. Pressurized Piping Systems: Leak tests shall be conducted in accordance with ANSI applicable codes 1. and as specified herein. 2. Before piping of various systems has been covered or furred-in, piping systems shall be tested tight for 1 hour under hydrostatic pressure, 1-1/2times systems working pressures, but not greater than test pressure of 150 psig. 3. Tests shall be witnessed by Architect and pronounced satisfactory before pressure is removed or any water drained off. Equipment shall be valved off or removed during test if equipment 4. pressure rating is less than test pressure. 5. Retest systems after leaks are repaired within Contract Price. G. Gravity Systems: Test under water pressure at heads specified in Plumbing Codes. Fill pipe lines with water to top of 5 foot vertical section of pipe or to level of top of vent pipe; maintain head pressure for 30 minutes. H. Potable Water System Test: 1. Certification of the potable water system integrity shall be required where separate systems of potable and non-potable water are provided to supply plumbing fixtures. 2. Fill potable water system to capacity with clean clear water. Introduce water at top of piping system (Hot and Cold). During filling, introduce green food coloring dve into piping system. A floor-by-floor survey shall be conducted. Operate each outlet (Hot and Cold) connected to potable water system until coloring has been observed. A method of maintaining the level of water and coloring shall be employed in order to make up the drawn off amounts. A survey sheet shall indicate each floor and the room number sequentially. This survey is required to be performed after all pressure testing and 3. flushing of the piping system, but before sterilization. Further, it is required that all fixtures connected to the potable water system be installed prior to the test. I. Pumps shall be tested to check impeller trim and operating characteristics. Following data shall be recorded and submitted to Architect for review: 1. Flow at operating conditions where flow venturi or orifices are installed in system. 2. Shutoff pressure required to check impeller trim.

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- 3. Discharge pressure at operating conditions.
- 4. Suction pressure at operating conditions.
- 5. Motor amperage on each phase at operating conditions.
- J. Prove capacity and performance of each piece of equipment by field tests as specified herein various paragraphs. Equipment and instruments required for tests, as well as additional thermowells or gauge connections shall be installed at no additional cost to Owner.
  - 1. Qualified representative of Equipment Manufacturer shall be present. Architect may witness tests, if he so desires.
  - 2. Test requirements shall include, but not be limited to: Circulator Pumps.
- K. Examine PART 2 for supplemental testing requirements.

#### 3.19 <u>TESTING: PIPING SYSTEMS</u>

- A. General:
  - 1. Piping systems shall be subjected to testing water or air as noted and shall hold tight at the pressure head stated for the time interval required without adding air or water. While any system is being tested, required head or pressure shall be maintained until joints are inspected.
  - 2. Tests shall be witnessed by inspector having jurisdiction, and the Architect within 48 hour notice, given these Authorities.
  - 3. Equipment, material, and labor required for testing of various systems, or part thereof, shall be provided by Plumbing Contractor.
- B. Sanitary, Waste and Roof Water Conductor System:
  - 1. Water test shall be applied to drainage system either in their entirety or in sections as required, after rough piping has been installed.
  - 2. If applied to entire system, openings in piping system shall be tightly closed, except the highest opening and system filled with water to point of overflow.
  - 3. If system is tested in sections, each opening shall be tightly closed except highest opening in the section under test and each section shall be filled with water but no section shall be tested with less than a 10' head of water.
  - 4. In testing successive sections, at least upper 10' of next preceding section shall be tested so that no joint of piping in building, except the uppermost 10' of the system shall be submitted to a test of less than a 10' head of water.
  - 5. Water shall be kept in system for at least 15 minutes before inspection starts; the system shall then be made tight at all points.
- C. Points of drainage systems tested with air instead of water shall be tested by attaching an air compressor testing apparatus to suitable opening and, after closing all other inlets or outlets, forcing air into systems until a uniform gauge

pressure of 5 psi or sufficient pressure to balance a column of mercury 10" high. Pressure shall be held without introduction of additional air for a period of at least 15 minutes.

- D. All sanitary, waste and vent piping installed under the floor slab, in the area of work, shall be video camera scoped and recorded upon completion and prior to final acceptance. Any debris found in underground piping shall be flushed and removed as part of this contract. All video recordings and results shall be submitted to the Owner as part of the closeout documents.
- E. Interior Water Piping System: Upon completion of water supply systems or section thereof, as required, system shall be tested and proved tight under a water pressure of 150 psi. Gauge shall be located on lowest new floor and pressure shall hold for a period of one (1) hours without introducing additional water. Water used for testing shall be from a potable source of supply.
- F. Testing Summary:
  - 1. W&V with water to a 10 foot head for 30 minutes.
  - 2. Water with potable water to 150 psi for one hour.
- G. Additional Tests:
  - 1. Provide additional tests such as smoke pressure tests as required by regulations or as directed by Authorities making the inspection.
  - 2. Provide for any repeated test as directed by the Architect, to make all systems tight as required.
  - 3. Visual inspections of joints and valves shall be made as directed by the Architect.

### 3.20 SEISMIC RESTRAINTS

A. All piping, equipment and devices shall be seismically supported as required by the Building Code.

END OF SECTION 22 00 00

# SECTION 23 00 00 – HVAC TABLE OF CONTENTS

PART	1 GENERAL	1
1.1	TIME. MANNER AND REOUIREMENTS FOR FILING SUB-BIDS	1
1.2	RELATED DOCUMENTS	2
1.3	GENERAL REOUIREMENTS AND REFERENCES	3
1.4	DEFINITIONS	3
1.5	SCOPE	3
1.6	RELATED WORK UNDER OTHER SECTIONS	5
1.7	REGULATORY REQUIREMENTS.	6
1.8	SUBMITTALS	6
1.9	SURVEYS AND MEASUREMENTS	11
1.10	COORDINATION	11
1.11	MECHANICAL AND ELECTRICAL COORDINATION	11
1.12	MECHANICAL AND ELECTRICAL COORDINATION DRAWINGS	12
1.13	INSTALLATION REQUIREMENTS.	13
1.14	TYPICAL DETAILS	13
1.15	SLEEVES, INSERTS	14
1.16	ACCESSIBILITY	14
1.17	SUPPLEMENTARY SUPPORTING STEEL	14
1.18	TOOLS AND EQUIPMENT	14
1.19	PORTABLE AND DETACHABLE PARTS	14
1.20	RIGGING REQUIREMENTS	14
1.21	RECORD DRAWINGS, PROJECT CLOSEOUT	15
1.22	GUARANTEE/WARRANTY	15
1.23	OPERATING, INSTRUCTION AND MAINTENANCE MANUALS	17
1.24	SERVICE CHARACTERISTICS	18
1.25	QUALITY ASSURANCE	18
1.26	DELIVERY, STORAGE AND HANDLING	19
PART	2 PRODUCTS	20
2.1	DUCTWORK AND AIR DISTRIBUTION EQUIPMENT	20
2.2	DUCT INSULATION	29
2.3	PIPING AND FITTINGS	32
2.4	PIPE INSULATION	33
2.5	PIPE HANGERS AND SUPPORTS	34
2.6	SLEEVES AND PENETRATIONS	35
2.7	ESCUTCHEONS AND DUCT COLLARS	36
2.8	MOTORS, STARTERS AND WIRING	37
2.9	GAS FIRED UNIT HEATERS	38
2.10	ELECTRIC UNIT HEATERS	40
2.11	ELECTRIC WALL HEATERS	40
2.12	LOUVERS	41
2.13	ENERGY RECOVERY VENTILATOR WITH ENTHALPY WHEEL	41

# CARVER POLICE CARVER, MA

2.14 2.15 2.16 2.17 2.18	ENERGY RECOVERY VENTILATOR WITH STATIC CORE CENTRIFUGAL FANS VARIABLE REFRIGERANT FLOW SYSTEMS VIBRATION ISOLATION AND SEISMIC RESTRAINTS FOR HVAC SYSTEMS SEQUENCE OF OPERATIONS	42 45 46 57 80
PART	3 EXECUTION	. 81
3.1	COMMISSIONING OF EQUIPMENT AND SYSTEMS	. 81
3.2	SPECIAL RESPONSIBILITIES	. 82
3.3	MATERIALS AND WORKMANSHIP	. 85
3.4	TAGS	. 85
3.5	PIPE AND DUCT IDENTIFICATION	. 85
3.6	ACCESS AND ACCESS PANELS	. 86
3.7	PENETRATIONS AND SLEEVES	. 87
3.8	ANCHORS AND INSERTS	. 88
3.9	INSTALLATION OF EQUIPMENT	. 88
3.10	CLEANING	. 89
3.11	STARTUP, TESTING, ADJUSTING AND BALANCING FOR HVAC	. 89
3.12	VRF SYSTEM PROJECT SUPERVISION	. 97
3.13	VRF SYSTEM COMMISSIONING	. 99
3.14	VRF SYSTEM OWNER TRAINING AND TECHNICAL SUPPORT	104

# SECTION 230000 - HVAC

#### PART 1 GENERAL

#### 1.1 TIME, MANNER AND REQUIREMENTS FOR FILING SUB-BIDS

- A. Sub-Bids shall be submitted in accordance with the provisions of General Laws, Chapter 149, Section 44A, inclusive, as amended.
- B. Sub-Bids for work under this Section shall be received electronically, until 2:00
  p.m. on Tuesday, October 29, 2019, at which time and place all Trade Contractor Bids shall be duly recorded.
- C. This project is being Electronically Bid (E-Bid). All bids shall be submitted online at <u>www.Projectdog.com</u>. Hard copy bids will not be accepted by the Awarding Authority. E-Bid tutorials and instructions are available within the specifications and online at <u>www.Projectdog.com</u>. For assistance, call Projectdog, Inc at (978)499-9014, M-F 8:30AM-5PM.
  - 1. All required bid forms must be submitted in **PDF** format only. The bidder must complete all required signatures either digitally (using Adobe Acrobat) or manually (print, sign and scan as a PDF file).
  - 2. Bid Bonds issued by a surety company shall be submitted on the E-Bid page. Bid bonds in the form of cash or check shall be completed and delivered as outlined on the Bid Bond Affidavit form.
  - 3. The bidder must enter bid price on the E-Bid form as a whole dollar value only with no punctuation. Sums shall be expressed in both words and figures on the bid form. Note: The E-Bid form will automatically match the word value to the numeric figure entered by the bidder.
  - 4. Bidders may save, submit or modify an E-Bid at any time prior to bid close. Once submitted, a bid cannot be edited. To modify a bid the bidder must retract the bid, make any necessary changes, and then submit the bid again. Upon submitting or retracting the bidder will receive a convenience email for informational purposes only. Bidders are encouraged to contact Projectdog, Inc at (978) 499-9014, M-F 8:30AM-5PM, if an email is not received.
  - 5. If a bid is submitted prior to an Addendum being issued, the bidder will receive an automated email for informational purposes only. The bidder must review the addendum, retract the bid, acknowledge all addenda, and submit the bid again. If a bidder fails to acknowledge addenda their bid may be rejected by the Awarding Authority.
  - 6. Timely submission of an E-Bid shall be the full responsibility of the Bidder. The server clock is the time of record. It is the bidder's responsibility to review and confirm online that a bid has been submitted and/or retracted and that the bid is 100% true, complete and accurate. All

bidders are required to review their submitted E-Bid via the "View My Bid Package" link.

- D. Sub-Bids filed with the Awarding Authority shall be accompanied by a Bid Deposit in the form of a certified check or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to the "**Town of Carver**". A bid bond shall be:
  - 1. In a form satisfactory to the Awarding Authority.
  - 2. With a surety company qualified to do business in the Commonwealth and satisfactory to the Awarding Authority.
  - 3. Conditioned upon the faithful performance by the principal of the agreements contained in the Bid. The amount of such bid deposit shall be five percent (5%) of the value of the Bid.
- E. Sub-Bids for work under this Section shall be for the complete work required as specified and as shown on the drawings.
- F. Sub-Bidders are directed to the Instructions to Bidders, and to the requirements that all bidders visit the site to determine the scope of work required under this Section.
- G. Sub-Bidders must comply with all provisions of Division 1, General Requirements, in the same manner as the General Contractor.

# 1.2 RELATED DOCUMENTS

- A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.
- B. Work Included: Provide labor, materials and equipment necessary to complete the work of this section, including, but not limited to, all work on the following drawings:
  - 1. M-0.0 HVAC Schedules & Notes
  - 2. M-0.1 HVAC Schedules
  - 3. M-1.0 Mechanical Ductwork, Floor Plan
  - 4. M-1.1 Mechanical ductwork Attic Plan
  - 5. M-2.0 Mechanical Piping Floor Plan
  - 6. M-2.1 Mechanical Piping Attic Plan and Outbuilding
  - 7. M-3.0 HVAC Details
  - 8. M-3.1 HVAC Details
  - 9. M-3.2 VRF System Diagram

### 1.3 GENERAL REQUIREMENTS AND REFERENCES

- A. Include "General Requirements" and applicable parts of Division 1 as part of this section.
- B. Coordinate work with that of all other trades affecting, or affected by work of this section. Cooperate with such trades to assure the steady progress of all work under the Contract.
- C. The HVAC Subcontractor shall be responsible for filing all documents and securing of all inspections and approvals necessary for the work of this section.

#### 1.4 **DEFINITIONS**

- A. As used in this section, "provide" means "furnish and install", "POS" means "Provided Under Other Sections" and "HVAC" means "Heating, Ventilating and Air Conditioning".
- B. As used in the Drawings and Specifications for Mechanical Work, certain non-technical words shall be understood to have specific meanings as follows, regardless of indications to the contrary in the General Conditions of other documents governing the HVAC work.
  - 1. "Furnish" means: Purchase and deliver to the project site complete with every necessary appurtenance and support, all as part of the HVAC work. Purchasing shall include payment of all sales taxes and other surcharges as may be required to assure that purchased item(s) are free of all liens, claims, or encumbrances.
  - 2. "Install" means: Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project, all as part of the HVAC work.
  - 3. "Provide" means: "Furnish" and "Install".
  - 4. "New" means: Manufactured within the past two (2) years and never before used.
- C. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any HVAC item in the Drawings or Specifications for HVAC work carries with it the instruction to furnish, install and connect the item as part of the HVAC work, regardless of whether or not this instruction is explicitly stated.
- D. It shall be understood that the Specifications and Drawings for HVAC work are complimentary and are to be taken together for a complete interpretation of the HVAC work except that indications on the Drawings, which refer to an individual element of work, take precedence over the Specifications where they conflict.

### 1.5 SCOPE

A. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work

of this Section with work of other trades and provide a complete and fully functional installation.

- B. Drawings and Specifications form complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both. Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation.
- C. Give notices, file plans, obtain permits and licenses, and obtain necessary approvals from Authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents. The <u>Awarding Authority</u> shall be responsible for payment for all fees and backcharges associated with permitting, inspections, or utility company charges in support of new construction.
- D. Work shall include, but shall not be limited to, the following:
  - 1. Special coordination of chases and plenums as specified in Paragraph 3.2 (SPECIAL RESPONSIBILITIES).
  - 2. Hoisting and rigging required to complete the work of this Section.
  - 3. Sleeves, inserts and hangers.
  - 4. Flexible connections for fans and other vibrating and rotating equipment.
  - 5. Equipment bases and supports.
  - 6. Vibration isolation.
  - 7. Motors.
  - 8. Sheetmetal work.
  - 9. Complete air distribution system including low pressure ductwork, diffusers, registers, grilles, splitters, dampers, etc.
  - 10. Insulation for duct, piping equipment and tanks.
  - 11. Constant volume and variable air volume air handling units, including fans, coils, filters, motors and mixing boxes.
  - 12. Complete VRV system.
  - 13. Energy Recovery Ventilators.
  - 14. Gas fired unit heaters.
  - 15. Exhaust and ventilating air fans.
  - 16. Electric heaters.
  - 17. Prime painting.
  - 18. Pipe, duct, valve and equipment identification.
  - 19. Instruction manuals and startup instructions.
  - 20. Testing and balancing.
  - 21. Cleaning.
  - 22. Automatic temperature controls.
  - 23. Access panels.
  - 24. Piping, fittings, hangers, etc.

- E. Drawings are included for reference and coordination and additional requirements for work in these Sections: Architectural, Structural, Electrical, Plumbing, Fire Protection.
- F. Before submitting bid, visit and carefully examine site to identify existing conditions and difficulties that will affect work of this Section. No extra payment will be allowed for additional work caused by unfamiliarity with site conditions that are visible or readily construed by experienced observer.

### 1.6 RELATED WORK UNDER OTHER SECTIONS

- A. The following items are not included in this section and will be performed under the designated sections.
  - 1. Excavation and backfill.
  - 2. Concrete work, including concrete housekeeping pads and other pads and blocks for vibrating and rotating equipment.
  - 3. Cutting and patching of masonry, concrete, tile and other parts of structure, with the exception of drilling for hangers and providing holes and openings in metal decks.
  - 4. Flashing of ductwork and all roof and wall penetrations.
  - 5. Installation of access panels in floor, wall, furred space or above ceiling.
  - 6. Painting.
  - 7. Electric power wiring for all equipment.
  - 8. Structural supports necessary to distribute loading from equipment to roof or floor except as specified herein.
  - 9. Temporary light, power, water, heat, gas and sanitary facilities for use during construction and testing.
  - 10. Gypsum drywall enclosures of supply and return ductwork as shown on Drawings.
  - 11. Finish carpentry and millwork.
  - 12. Fire protection.
  - 13. Plumbing.
  - 14. Electrical.
  - 15. Kitchen equipment, including hood(s).

16. Armory gun cleaning hood.

#### 1.7 REGULATORY REQUIREMENTS

- A. Perform work strictly as required by rules, regulations, standards, codes, ordinances and laws of Local, State and Federal governments, and all other Authorities that have legal jurisdiction over the site. Materials and equipment shall be manufacturer installed and tested as specified in latest editions of applicable publications, standards, rulings and determinations of:
  - 1. Local and State Building, Plumbing, Mechanical, Electrical, Fire and Health Department Codes.
  - 2. American Gas Association (AGA).
  - 3. National Fire Protection Association (NFPA).
  - 4. American Insurance Association (A.I.A.) (formerly National Board of Fire Underwriters).
  - 5. Occupational Safety and Health Act (OSHA).
  - 6. Underwriters' Laboratories (UL).
- B. Material and equipment shall be listed by Underwriters' Laboratories (UL), and approved by ASME and AGA for intended service.
- C. When requirements cited in this Specification conflict with each other or with Contract Documents the most stringent shall govern work. The Architect may relax this requirement when such relaxation does not violate the rulings of Authorities that have jurisdiction. Approval for such relaxation shall be obtained in writing.
- D. Most recent editions of applicable Specifications and publications of the following organizations shall form part of the Contract Documents.
  - 1. American National Standards Institute (ANSI).
  - 2. American Society of Mechanical Engineers (ASME).
  - 3. National Electric Manufacturers Association (NEMA).
  - 4. American Society for Testing and Materials (ASTM).
  - 5. American Water Works Association (AWWA).
  - 6. American Society for Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
  - 7. Air Moving and Conditioning Association (AMCA).
  - 8. Sheetmetal and Air Conditioning Contractors National Association (SMACNA).
  - 9. Air Conditioning and Refrigeration Institute (ARI).
  - 10. Thermal Insulation Manufacturers Association (TIMA).

### 1.8 SUBMITTALS

- A. Definitions:
  - 1. Shop Drawings: Information prepared by the Contractor to illustrate portions of the

work in more detail than shown in the Contract Documents.

- 2. Coordination Drawings: Detailed, large-scale layout Shop Drawings showing HVAC, Electrical, Plumbing and Fire Protection work superimposed to identify conflicts and ensure inter-coordination of Mechanical, Electrical, Architectural, Structural and other work.
- 3. Manufacturer's Product Data: Information prepared by the manufacturer which depicts standard equipment.
- B. Submittals Procedures and Format:
  - 1. Review submittal packages for compliance with Contract Documents and then submit to Architect and Engineer for review. Submittal packages shall be sent electronically, either emailed or through utilization of a web based construction administration application such as Procore or Submittal Exchange. All reviews will be returned in kind, either by email or through the web based application with a cover sheet and applicable submittal notations per below.
  - 2. Each Shop Drawing shall indicate in title block, and each Product Data package shall indicate on cover sheet, the following information:
    - a. Title.
    - b. Name and location of project.
    - c. Names of Architect, Engineer, Contractor and Subcontractor(s).
    - d. Names of Manufacturer, Supplier, Vendor, etc.
    - e. Date of submittal.
    - f. Whether original submittal or resubmitted.
  - 3. Shop Drawings showing layouts of systems shall contain sufficient plans, elevations, sections, details and schematics to describe work clearly. They shall be <sup>1</sup>/<sub>4</sub>" = 1'-0" and shall indicate work of other Sections where physical clearances are critical and where interferences are possible. Provide larger scale details as necessary. Sheetmetal Drawings shall show elements of Architect's reflected ceiling plan, exposed ductwork, walls, partitions, diffusers, registers, grilles, fire dampers, sleeves and other aspects of construction as necessary for coordination.
- C. Acceptable Manufacturers:
  - 1. The Architect's Mechanical/Electrical design for each project is based on the single manufacturer listed in the schedule or shown on the Drawings. In Division 23 of these Specifications certain "Alternate Manufacturers" are listed as being acceptable. These are acceptable only if, as a minimum, they:
    - a. Meet all performance criteria listed in the schedules and outlined in the Specifications.
    - b. Have identical operating characteristics to those called for in the Specifications.
    - c. Fit within the available space it was designed for, including space for

maintenance and component removal, with no modifications to either the space or the product. Clearances to walls, ceilings and other equipment will be at least equal to those shown on the Contract Documents. The fact that a manufacturer's name appears as acceptable shall not be taken to mean the Architect or Engineer has determined that the manufacturer's products will fit within the available space. This determination is solely the responsibility of the Contractor.

- d. For equipment mounted in areas where structural matters are a consideration, the products must have a weight no greater than the product listed in the schedules or Specifications.
- e. Products must adhere to all architectural considerations including, but not limited to, being the same size and of the same physical appearance as scheduled or specified products.
- D. Substitutions: Substitution of products by manufacturers other than those listed shall only be done in accordance with subparagraph "E" "Substitutions and Deviations".
- E. Substitutions and Deviations:
  - Deviations from the Contract Documents and the substitution of materials or equipment relative to the "Acceptable Manufacturers" referred to above, shall be requested individually in writing whether deviations result from field conditions, standard shop practice, or other cause. Submit letter with transmittal of Shop Drawings which flags the substitution or deviation to the attention of the Architect. The letter shall describe changes in the system shown and physical characteristics (connections to adjacent materials, electrical services, service access requirements, and other characteristics), and differences in operating characteristics or cycles.
  - 2. Without letters flagging the substitution or deviation, it is possible that the Architect or Engineer may not notice such substitution or deviation or may not realize its ramifications. Therefore, if such letters are not submitted, the Contractor shall hold the Architect and his consultants harmless for any and all adverse consequences resulting from the deviations being implemented. Adverse consequences shall include, but not be limited to, excessive noise, excessive maintenance, shortened longevity, spatial coordination problems, and inadequate performance versus scheduled design. This shall apply regardless of whether the Architect has reviewed or approved Shop Drawings containing the deviation, and will be strictly enforced.
  - 3. Do not request substitute materials or equipment unless identical material or equipment has been operated successfully for at least three (3) consecutive years. Such materials and equipment shall be a regular cataloged item shown in the current catalog of the manufacturer. When deviation or substitution is permitted, coordinate fully with related changes to Architectural, Structural, Plumbing, Fire Protection, Electrical, and other work. Ensure that related changes necessary for coordination of substituted items are made within the Contract Price. Assume full responsibility for safety, operation and performance of the altered system.

- 4. Substitutions of equipment, systems, etc. requiring approval of local Authorities must comply with such regulations and be filed by the Contractor (should filing be necessary).
- 5. Consideration will not be given to claims that the substituted item meets the performance requirements with lesser construction. Performance, as delineated in schedules and in the Specifications, shall be interpreted as minimum performance.
- 6. Approval of proposed deviations or substitutions, if any, will be made at discretion of Architect or Engineer.
- 7. If equipment is proposed for substitution that is not tested and rated according to industry-wide standards, the Architect shall have the right to have performance tests completed, at the Contractor's expense, to confirm the manufacturer's performance claims.
- F. Submittal Notation will be returned from the Architect marked as illustrated below:

NO EXCEPTION TAKEN	ACCEPTED AS NOTED
NOT ACCEPTED	REVISE AND RESUBMIT

- 1. Checking is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Any action shown is subject to the requirements of the Drawings and Specifications. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site; fabrication process and techniques of construction; coordination of his work with that of all other trades; and the satisfactory performance of his work.
- G. Schedule: Incorporate the Shop Drawing review period into the construction schedule so that work is not delayed. Contractor shall assume full responsibility for delays caused by not incorporating the following Shop Drawing review time requirements into his project schedule. Allow at least ten (10) working days, exclusive of transmittal time, for review each time a Shop Drawing is submitted or resubmitted with the exception that fifteen (15) working days, exclusive of transmittal time, are required for the following:
  - 1. Automatic temperature controls.
  - 2. Coordination Drawings, if required by this Specification.
  - 3. If more than five (5) Shop Drawings of this trade are received in one (1) calendar week.
- H. List of Proposed Equipment and Materials: Within four (4) weeks after Award of Contract and before ordering materials or equipment, submit a complete list of proposed materials and equipment and indicate manufacturer's names and addresses. No

consideration will be given to partial lists submitted out of sequence.

- I. Responsibility:
  - The intent of submittal review is to check for capacity, rating, and certain construction features. Contractor shall ensure that work meets requirements of the Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction; and for coordination of work of this and other Sections. Work shall comply with submittals marked "REVIEWED" to extent that they agree with the Contract Documents. Submittal review shall not diminish responsibility under this Contract for dimensional coordination, quantities, installation, wiring, supports and access for service, nor the Shop Drawing errors or deviations from requirements of the Contract Documents. The Architect's noting of some errors while overlooking others will not excuse the Contractor for proceeding in error. Contract Document requirements are not limited, waived, nor superseded in any way by submittal review or acceptance.
  - 2. Inform Subcontractors, Manufacturers, Suppliers, etc. of scope and limited nature of review process and enforce compliance with the Contract Documents.
- J. Material and equipment requiring Shop Drawing and/or Manufacturer's Data Submittals shall include but not be limited to:
  - 1. Diffusers, registers, grilles, splitters, dampers and accessories.
  - 2. Louvers.
  - 3. Fans.
  - 4. Electric duct heaters.
  - 5. Filters.
  - 6. Energy recovery ventilators.
  - 7. Electric heaters.
  - 8. Complete VRV system
  - 9. Automatic controls.
  - 10. Insulation and acoustical lining.
  - 11. Vibration isolation.
  - 12. Gas fired unit heaters.
  - 13. Pipes, pipe hangers, sleeves and inserts.
  - 14. Equipment bases and supports.
  - 15. Identification for pipe, duct, valves and equipment.
  - 16. Complete ductwork Shop Drawings, construction details and duct construction standards.
  - 17. Access panels.
  - 18. Color selection charts and samples for equipment and systems in finished areas.
  - 19. Piping and duct insulation.
  - 20. Gas heaters, venting pipe and terminations.
  - 21. Condensate pumps.
  - 22. Outdoor condensing heat pump units \_\_\_\_\_\_ supports.

### 1.9 SURVEYS AND MEASUREMENTS

A. Base all required measurements, both horizontal and vertical, on reference points established by the General Contractor and be responsible for the correct laying out of the Mechanical work. In the event of a discrepancy between actual measurements and those indicated, notify the General Contractor in writing. Do not proceed with the work required until written instructions have been issued by the General Contractor.

### 1.10 COORDINATION

- A. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of Mechanical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with Structural and other trades and to meet project requirements.
- B. Work shall be performed in cooperation with other trades on the project and so scheduled as to allow speedy and efficient completion of the work.
- C. Furnish to other trades advance information on locations and sizes of all frames, boxes, sleeves and openings needed for their work. Furnish information and Shop Drawings necessary to allow trades affected by the work to install their work properly and without delay.
- D. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Architect. Where the HVAC work shall interfere with the work of other trades, assist in coordinating the space conditions to make satisfactory adjustments before installation. Without extra cost to the Owner, make reasonable modifications to the work as required by normal Structural interferences. The Mechanical Contractor shall be liable for any additional openings, or relocating and/or enlarging existing openings through concrete floors, walls, beams and roof required for any work which was not properly coordinated. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.
- E. If any HVAC work has been installed before coordination with other trades so as to cause interference with the work of such trades, all necessary adjustments and corrections shall be made by the trades involved without extra cost to the Owner.
- F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Architect for review and approval.
- G. Protect all materials and work of other trades from damage which may be caused by the Mechanical work, and repair all damages without extra cost to the Owners.

# 1.11 MECHANICAL AND ELECTRICAL COORDINATION

A. The HVAC Subcontractor shall furnish and install various electrical items relating to the

heating and ventilating equipment and control apparatus. The Electrical Subcontractor shall be required to connect power wiring to this equipment unless noted otherwise.

- B. The HVAC and Electrical Subcontractors shall coordinate their respective portions of the work, as well as the electrical characteristics of the heating, ventilating and air conditioning equipment.
- C. All power wiring and local disconnect switches will be provided by the Electrical Subcontractor for the line voltage power unless specifically noted in HVAC schedules. All control and interlocking wiring shall be the responsibility of the HVAC Subcontractor.
- D. 120V and above power wiring sources extended and connected to HVAC control panels, transformers and switches shall be the responsibility of the Electrical Subcontractor. All low voltage thermostats and any switch wiring shall be the responsibility of the HVAC Subcontractor.
- E. Temperature control and equipment wiring shall be installed by the HVAC Subcontractor.
- F. The Electrical Subcontractor will provide all magnetic starters except those furnished as an integral part of packaged equipment.

#### 1.12 MECHANICAL AND ELECTRICAL COORDINATION DRAWINGS

- A. Coordination Drawings:
  - 1. The Sheetmetal Subcontractor shall prepare a complete set of electronic Drawings at a scale not less than 3/8" equals 1'-0", showing structure and other information as needed for coordination. He shall show sheetmetal layout thereon. These will be the Coordination Drawings.
  - 2. The main paths of egress and for equipment removal, from main Mechanical and Electrical rooms must be clearly shown on the Coordination Drawings. All fire and smoke partitions must be highlighted on the Coordination Drawings for appropriate coordination.
  - 3. Each of the below specialty trades shall add its work to these background Drawings with appropriate elevations and grid dimensions. Specialty trade information is required for fan rooms and mechanical rooms, horizontal exits from duct shafts, crossovers, and for spaces in and above ceilings where congestion of work may occur such as corridors, and even entire floors. Drawings shall indicate horizontal and vertical dimensions, to avoid interference with structural framing, ceilings, partitions, and other services.
    - a. Specialty Trades:
      - 1) Plumbing System.
      - 2) HVAC Piping and Associated Control System.

- 3) Electrical.
- 4) Sheet Metal Work.
- 5) Sprinkler System.
- 4. Each specialty trade shall sign and date each electronic Coordination Drawing. Return Drawings to the Sheetmetal Subcontractor, who shall route them sequentially to all specialty trades.
- 5. Where conflicts occur with placement of materials of various trades, the Sheetmetal Subcontractor will be responsible to coordinate the available space to accommodate all trades. Any resulting adjustments shall be initialed and dated by the specialty trade. The Sheetmetal Subcontractor shall then final date and sign each Coordination Drawing. If he cannot resolve conflicts, the decision of the General Contractor shall be final, subject to the approval of the Architect.
- 6. A Subcontractor who fails to promptly review and incorporate his work on the Coordination Drawings shall assume full responsibility of any installation conflicts affecting his work and of any schedule ramifications.
- 7. The Sheetmetal Subcontractor shall make electronic copies of all Coordination Drawings. Fabrication shall not start until such electronic Drawings are received by the Architect/Engineer and have been reviewed.
- 8. Review of Coordination Drawings shall not diminish responsibility under this Contract for final coordination of installation and maintenance clearances of all systems and equipment with Architectural, Structural, Mechanical, and Electrical Contractors.

### 1.13 INSTALLATION REQUIREMENTS

- A. The arrangement of all HVAC work shown on the Drawings is diagrammatic only and indicates the minimum requirements and intent of the work. Conditions at the building including actual measurements shall determine the details of the installation. All work shall be laid out and installed so as to require the least amount of cutting and patching.
- B. Review the Architectural Drawings and Specifications before ordering any material and equipment. Any discrepancies shall be brought to the attention of the Architect and Engineer for their determination prior to proceeding with the work.

### 1.14 TYPICAL DETAILS

A. Typical details where shown on the Drawings shall apply to each and every item of the project where such items are applicable. They are not repeated in full on the Drawings, which in many cases are diagrammatic only, but with the intention that such details shall be incorporated in full. Any alternate method proposed for use by the Contractor shall have the prior approval of the Architect and Engineer.

#### 1.15 SLEEVES, INSERTS

A. Furnish and install all sleeves, inserts, anchor bolts and similar items to be set into masonry or concrete, as required for mechanical work. Internal diameter of sleeve ball shall be 1/2" larger than the outside diameter of the pipe or insulation covered line passing through it.

#### 1.16 ACCESSIBILITY

- A. Install all work such that parts requiring periodic inspection, operation, maintenance and repair are readily accessible.
- B. Furnish all access panels appropriate to particular conditions, to be installed by trades having responsibility for the construction of actual walls, floors or ceilings at required locations.

#### 1.17 SUPPLEMENTARY SUPPORTING STEEL

- A. Provide all supplementary (non-structural) steelwork required for mounting or supporting equipment and materials.
- B. Steelwork shall be firmly connected to building construction as required. Locations and methods of attachment shall be approved by the Architect.
- C. Steelwork shall be of sufficient strength to allow only minimum deflection in conformity with manufacturer's published requirements.
- D. All supplementary steelwork shall be installed in a neat and workmanlike manner parallel to floor, wall and ceiling construction: all turns shall be made at forty-five and ninety degrees, and/or as dictated by construction and installation conditions.
- E. All manufactured steel parts and fittings shall be galvanized.

### 1.18 TOOLS AND EQUIPMENT

A. Provide all tools and equipment required for the fabrication and installation of the mechanical equipment at the site.

### 1.19 PORTABLE AND DETACHABLE PARTS

A. Contractors shall retain in their possession all portable and/or detachable parts and portions of materials, devices, equipment, etc. necessary for the proper operation and maintenance of the Mechanical and Electrical systems until final completion of the work, at which time they shall be handed over to the Owners.

### 1.20 RIGGING REQUIREMENTS

A. The work to be done under this Section of the Specifications shall include all hoisting,

scaffolding and planking including the furnishing, set-up and maintenance of all derricks, hoisting machinery, cranes, helicopters, scaffolds, staging and planking as required for the work.

B. Provide installation and erection information including; lifting requirements, and any special rigging or installation requirements for all equipment under the submittals.

#### 1.21 RECORD DRAWINGS, PROJECT CLOSEOUT

- A. As work progresses and for the duration of Contract, maintain a complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately including work installed as a modification or addition to the original design. Work shall be updated on a weekly basis and shall be made available for review by Architect. Failure to perform this work shall be reason for withholding requisition payments. In addition, take photographs of all concealed equipment in gypsum board ceilings, shafts, and other concealed, inaccessible work. At completion of work, make copies of photographs with written explanation on back. These shall become part of Record Documents.
- B. At the completion of work, prepare a complete set of Record Drawings showing all systems as actually installed. The copies will be made available for the HVAC Contractor's copying, at his expense, to serve as backgrounds for the Record Drawings. The quantity of copies which are made available shall in no way be interpreted as setting a limit to the number of Drawings necessary to show the required information. The HVAC Contractor's professional Draft Person shall transfer changes to electronic CAD files. Submit three (3) sets of electronic copies to Architect for comments as to compliance with this section.
- C. The Architect or Engineer will not certify the accuracy of the Record Drawings. This is the sole responsibility of the Mechanical Contractor.
- D. This trade shall submit the Record Drawings for approval by the Fire and Building Departments in a form acceptable to the departments, when required by the jurisdiction.
- E. Record Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer, make and model numbers of final equipment installation.

#### 1.22 GUARANTEE/WARRANTY

- A. Guarantee and 24 hour service.
  - 1. Guarantee Work of this Section in writing for not less than one (1) year following the date of acceptance by the Owner. If the equipment is used for temporary heat, cooling, etc, prior to acceptance by the Owner, the bid price shall include an extended period of warranty covering the one (1) year of occupancy, starting from the date of acceptance by the Owner. The guarantee shall repair or replace defective materials,

equipment, workmanship and installation that develop within this period, promptly and to the Architect's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee at no additional cost to the Owner.

- 2. In addition to guarantee requirements of Division 1 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in Owner's name.
- 3. Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by this Contractor without any additional cost to the Owner.
- 4. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Architect.
- 5. Provide 24 hour service beginning on the date the project is accepted by the Owner, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to the Owner. Service can be provided by this Contractor or a separate service organization. Choice of service organization shall be subject to Architect and Owner approval. Submit name and a phone number that will be answered on a 24 hour basis each day of the week, for the duration of the service.
- 6. Submit copies of equipment and material warranties to Architect before final payment.
- 7. At end of guarantee period, transfer manufacturer's equipment and material warranties still in force to Owner.
- 8. This paragraph shall not be interpreted to limit Owner's rights under applicable codes and laws and under this Contract.
- 9. PART 2 paragraphs of this Specification may specify warranty requirements that exceed those of this paragraph. Those paragraphs shall govern.
- 10. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of Work by Owner, and shall not initiate the guarantee period.
- 11. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to Owner's satisfaction, advise the Architect in writing, describe efforts to rectify situation, and provide analysis of cause of problem. The Architect and/or Engineer will direct course of action.

### 1.23 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS

- A. Obtain at time of purchase of equipment, three copies of operation, lubrication and maintenance manuals for all items. Assemble literature in coordinated manuals with additional information describing combined operation of field-assembled units, including as-built wiring diagrams. The manual shall contain the names and addresses of manufacturers and local representatives who stock or furnish repair parts for items or equipment. Divide manuals into three sections or books as follows:
  - 1. Directions for and sequence of operation of each item of HVAC system, e.g. air handling units and controls. Sequence shall list valves, switches and other devices used to start, stop and control system. Detail procedure to be followed in case of malfunctions. Include detailed approved flow diagrams of temperature control, heating, cooling, fan systems, etc. as appropriate for systems provided. Include approved valve directory showing each valve number, location of each valve and equipment or fixture controlled by valve.
  - 2. Detailed maintenance and troubleshooting manuals containing data furnished by manufacturer for complete maintenance. Include copy of balancing report.
  - 3. Lubrication instructions detailing type of lubricant, amount and intervals recommended by manufacturer for each item of equipment. Include additional instructions necessary for implementation of first class lubrication program. Include approved summary of lubrication instructions in chart form, where appropriate.
- B. Furnish three copies of manuals to the Architect for approval and distribution to the Owner. Deliver manuals no less than 30 days prior to acceptance of equipment to permit the Owner's personnel to become familiar with equipment and operation prior to acceptance.
- C. Provide framed and glazed charts as follows: mount as directed by the Architect.
  - 1. Flow diagrams from first part of manual as described above.
  - 2. Valve directory.
  - 3. Lubrication chart from third part of manual.
- D. Operating Instructions: Upon completion of installation or when the Owner accepts portions of building and equipment for operational use, instruct the Owner's operating personnel in any or all parts of the various systems. Instructions shall be performed by factory authorized personnel. The Owner shall determine which systems require additional instructions. The duration of instructions shall take equipment through complete cycle of operation (at least five working days). Make adjustments under operating conditions.
- E. Each contractor shall be responsible for his work and equipment until finally inspected, tested and accepted. Carefully store materials and equipment which are not immediately installed after delivery to site. Close open ends of work with temporary covers or plug

during construction to prevent entry of obstructing material.

- F. Each separate contractor shall protect the work and material of other trades that might be damaged by his work or workmen and make good all damage thus caused.
- 1.24 SERVICE CHARACTERISTICS
  - A. Building Voltage Low Level: 120/208.
  - B. All equipment and wiring shall be suitable for the applied voltage.
  - C. All motors rated 1/2 horsepower and above shall be 208V, 3-phase.

#### 1.25 QUALITY ASSURANCE

- A. The requirements of the State Building Code and Local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.
- B. All work shall comply with the latest editions of the codes as referenced herein.
- C. Follow manufacturer's directions for articles furnished, in addition to directions shown on Drawings or specified herein.
- D. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to the Owner.
- E. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.
- F. Equipment and materials shall:
  - 1. Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed and labeled.
  - 2. Be without blemish or defect.
  - 3. Not be used for temporary purposes.
  - 4. Be in accordance with the latest applicable ASHRAE standards.
- G. Purchase products which will meet with the acceptance of all Authorities Having Jurisdiction over the work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or other recognized testing laboratory, the product shall be so examined, tested and certified.

- H. Except for plans, all items of equipment or material of one generic type shall be the product of one manufacturer throughout.
- I. For items which are to be installed but not purchased as part of the HVAC work, the Mechanical Contractor work shall include:
  - 1. The coordination of their delivery.
  - 2. Their unloading from delivery trucks driven into any point on the property line at grade level.
  - 3. Their safe handling and field storage until the time of permanent placement in the project.
  - 4. The correction of any damage, defacement or corrosion to which they may have been subjected. Replacement, if necessary, shall be coordinated with the Contractor who originally purchased the item.
  - 5. Field erection and internal wiring as necessary for their proper operation.
  - 6. Mounting in place, including the purchase and installation of all dunnage, supporting members, and fastenings, necessary to adapt them to architectural and structural conditions.
- J. Items which are to be installed, but not purchased as part of the HVAC work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the HVAC work will be considered only if presented in writing within one (1) week of the date of delivery to the project of the items in question. The mechanical work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

# 1.26 DELIVERY, STORAGE AND HANDLING

A. All materials for the work of this section shall be delivered, stored and handled so as to preclude damage of any nature. Manufactured materials shall be delivered and stored in their original containers, plainly marked with the products' and manufacturer's name. Materials in broken containers or in packages showing watermarks or other evidence of damage shall not be used and shall be removed from the site.

### PART 2 PRODUCTS

#### 2.1 DUCTWORK AND AIR DISTRIBUTION EQUIPMENT

- A. Reference Standards:
  - 1. Material, construction and installation shall meet requirements of most recent editions of the following standards and references, except for more stringent requirements specified or shown on the Drawings:

Standard	As Applicable To
SMACNA HVAC Duct	Sheetmetal Ductwork; Duct Liners;
Construction Standards Metal and	Adhesives; Fasteners; Flexible Ductwork
Flexible	
SMACNA HVAC Air Duct Leakage	Duct Leakage Testing
Test Manual	
SMACNA Ducted Electric Heat	Electric Duct Heaters
Guide for Air Handling Systems	
ADC and TIMA Flexible Duct	Flexible Ductwork
Performance Standards	
NFPA 90A	Fire Dampers; Fire Resistance Standards
	for Ducts and Liners

#### B. General:

- 1. Provide supporting and hanging devices necessary to install the entire HVAC system including ductwork and equipment, and to prevent vibration.
- 2. Provide vertical and horizontal supports as required by code to meet minimum applicable earthquake resistance standards.
- 3. Ductwork shall be free from vibration under all conditions of operation. Dimensions shown on the Drawings for lined ductwork are net inside dimensions. Increase ductwork dimensions to accommodate lining requirements.
- 4. Pipe or conduit crossing duct: No pipe, conduit, hanger, Architectural element nor structural member shall pass through ductwork.
- 5. When making offsets and transformations necessary to accommodate structural conditions, preserve full cross-sectional area of the ductwork as shown on the Drawings.
- 6. Ductwork shall have pressure-velocity classifications as follows:

HVAC

Duct	Static		SMACN	SMACNA	
Construction	Pressure		A Seal	Leakage	
Class	Rating	Pressure	Class	Class	Velocity
2"	2"	Pos. or	В	12	2500 fpm or less
		Neg.			

- a. For negative pressures over 3" w.g., refer to SMACNA Round and Rectangular Industrial Duct Construction Standards for joint and intermediate reinforcement requirements
- b. Unless otherwise specified or shown on the Drawings, the following pressure classifications shall be used for the types of ductwork listed below:
  - 1) 4" Class: All ductwork from discharge of air units to inlets of terminal volume.
  - 2) 3" Class: All fume hood, kitchen hood and smoke exhaust ductwork.
  - 3) 2" Class: All other ductwork.
- 7. Sealing requirements for Class B, Leakage Class 12, galvanized, non-welded, aluminum or non-welded stainless steel ductwork:
  - a. Transverse Joints:
    - 1) During assembly seal all flanged transverse joints with sealing tape of quality equal to Hardcast Inc. Model 1902-FR. Corners shall be sealed as described by SMACNA and when applicable per manufacturer's published procedures.
    - 2) Seal all non-flanged transverse joints with Hardcast Inc. Versa Grip Model 102 or approved equal.
  - b. Longitudinal Seams: Seal all longitudinal seams during ductwork fabrication with Hardcast Inc. Cold Seal Model 1001 or approved equal.
- 8. Support:
  - a. Space hangers as required by SMACNA (8 ft. max.) for horizontal duct on 8 ft. centers, unless concentrated loadings require closer spacing.
  - b. Support vertical duct on each floor or slab it penetrates.
  - c. Supports for ductwork and equipment shall be galvanized unless specified otherwise.
- 9. Connections:
  - a. Connect inlets and outlets of air handling units and fans to ductwork with flexible connections unless fan has vibration isolator mounts inside unit with flexible connections and no external vibration isolators. Exception: Do not use flex on life safety smoke exhaust fans.
  - Indoors, flexible connections shall be neoprene-coated fibrous glass fire retardant fabric, by Ventifabrics, or Durodyne. Outdoors, flexible connections shall be DuPont hyplon-coated fibrous glass fire, weather and UV-resistant by Ventifabrics or Durodyne.
  - c. Secure flexible connections tightly to air handlers with metal bands. Bands shall be same material as duct construction.

- d. Connections from trunk to branch duct shall be as detailed on Drawings.
- 10. Construction:
  - a. No sharp metal edges shall extend into air streams.
  - b. Install drive slips on air-leaving side of duct with sheetmetal screws on 6" centers.
  - c. Spin in collars shall NOT be used for branch connections in 3" or higher pressure class ductwork.
- 11. Joints:
  - a. Longitudinal lock seams shall be double-locked and flattened to make tight joints.
  - b. Make transverse joints, field connections, collar attachments and flexible connections to ducts and equipment with sheetmetal screws or bolts and nuts. Do not use rivets or staples.
- 12. Prefabricated Transverse Duct Joints:
  - a. Transverse joints in galvanized sheetmetal ductwork may be made with galvanized gasketed frame and angle duct systems by Ductmate, TDF, TDC or approved equal. Angles shall be at least 20 gauge. Prefabricated transverse duct joints shall not be used for duct 16 ga. and heavier, nor for duct 23 ga. and lighter.
  - b. Secure angles to duct with screws (using clutched arbor) or spot-welds spaced as recommended by manufacturer for duct pressure class.
- 13. Elbows and Bends:
  - a. Elbows and bends for rectangular ducts shall have centerline radius of 1-1/2 times duct width wherever possible.
  - b. Where centerline radius is less than 1-1/2 times duct width (on supply, return and exhaust ductwork), elbows shall be radius throat with radius heel. For elbows whose width is greater than 48 inches and/or where shown on plans, provide splitter vanes. Install vanes in accordance with SMACNA. Where multiple elbows are separated by less than ten duct diameters use splitter (full length) vanes.
  - c. For round ductwork provide stamped elbows, with centerline radii equal to 1-1/2 times duct diameter, or gored elbows as follows:

Elbow Angle	No. of Gores
0° - 36°	2
37° - 72°	3
73° - 90°	5

- 14. Access Panels/Doors:
  - a. Provide proper pressure and leakage rated, gasketed, duct mounted access panels/doors for the following items with minimum sizes, as indicated. Access doors shall be of double wall construction. Access doors in insulated ducts shall be insulated. Gauges of door materials, number of hinges, number and type of door locks shall be as required by the SMACNA Duct Construction Standards.

Hinged doors are not acceptable, screwed or bolted access panels are not acceptable. Doors shall be chained to frame with a minimum length of 6" to prevent loss of door. For seal Class A, access doors shall be leakage rated, neoprene gasketed UL 94 HF1 listed, DUCTMATE "sandwich" or approved equal. Door metal shall be the same gauge as the attached duct material. The minimum sizes shall be:

- 1) Fire dampers -12" x 12", or larger.
- 2) Combination Fire/Smoke dampers 12" x 12", or larger.
- 3) Smoke dampers -6" x 6" minimum.
- 4) Automatic control dampers -6" x 6" minimum.
- 5) Manual volume dampers 2 sq. ft. and larger -6" x 6" minimum.
- 6) Inlet side to all coils -12" x 12", or larger.
- 7) Suction and discharge sides of inline fans -24" x 24" minimum
- At additional locations indicated on Drawings, or specified elsewhere 12" x 12" minimum.
- 9) Access doors are not shown on the Drawings, but shall be provided in accordance with the above.
- 15. Extractors shall have adjusting rod and locknut on outside of duct.
- 16. Plenums and Connections to Louvers:
  - a. Shall be 18 ga. minimum cross-broken and properly reinforced with galvanized angle irons to SMACNA requirements.
  - b. Shall have bottom and corner seams soldered watertight at least 12" up from bottom.
  - c. Shall have neoprene gaskets or other non-corrodible material to make connections to louvers watertight.
  - d. Shall pitch connection back towards the louver. Provide half-coupling drain connection at bottom of plenum unless noted otherwise. Pipe drain to nearest floor drain.
  - e. Shall have unused portions of louvers blocked-off with sheetmetal; sealed air and watertight; insulated with 2" thick 6 lb. Density rigid or board insulation.
- 17. Duct Pressure Tests:
  - a. Pressure test ducts after takeoffs and wall penetrations are in place and before applying exterior insulation. Correct any leaks.
  - b. Pressure and leak test 25% of medium and low-pressure ductwork at 100% of operating system pressure. Duct shall be constructed so there is no joint or structural failure at the test pressure.
- 18. Duct Leakage Tests: Leak testing shall be per latest edition of SMACNA HVAC Air Duct Leakage Test Manual. Provide orifice assembly including straightening vanes, orifice-plate mounted in straight tube with properly located pressure taps, and U-tube manometer or other device as specified by SMACNA. The orifice assembly shall be calibrated accurately and shall come with calibration curve. Leakage classes shall be as previously specified. Submit leak test report (per SMACNA format) for Architect review. Drawings of ductwork tested shall also be submitted with report, indicating presence of takeoffs, wall penetrations, joints, etc.

- 19. Materials:
  - a. Sheetmetal ducts shall be constructed of hot-dipped galvanized sheetmetal with G90 Commercial coating according to ASTM 527 unless specified otherwise.
  - b. Flexible Ductwork:
    - Flexible ductwork, connecting to un-insulated or unlined duct, shall be polyester core with corrosion-resistant helical wire reinforcing. The polyester core shall be minimum two-ply and shall have a minimum thickness of 0.0017". Flex duct shall be UL rated for 6" WC positive pressure, 2" WC negative pressure with a maximum velocity of 4000 FPM. Flexduct must be listed as a Class 1 Connector according to UL 181 and shall meet the requirements of NFPA 90A. The maximum ASTM E-84 fire-hazard rating shall be 25 flame spread, 50 fuel contributed and 50 smoke developed. Uninsulated flexible duct shall be equivalent to Wiremold, Type WB, or Flexmaster Types 2 and 4 (not type 9).
    - Flexible duct connected to insulated or lined duct shall also be insulated and shall be equivalent to Wiremold Type WK or Flexmaster Types 2 or 4 (not type 9), with 1-1/2" 3/4 lb. density fiberglass insulation and an aluminized reinforced vapor barrier.
    - 3) Submittals shall include data or number of polyester plies and minimum thickness of polyester core, in addition to other data listed above required to ensure that submitted product meets the requirements of these Specifications.
    - 4) If flex duct other than the model numbers of the vendors listed above is submitted, a sample of the flex duct shall be submitted to the Architect. The Architect and Engineer shall have sole discretion in determining whether the submitted flex duct is equivalent to that of the named vendors above.
    - 5) Unless otherwise indicated, flexible duct shall not exceed 5'-0" long.
- C. 2" and Lower Pressure Class Ductwork Rectangular:
  - 1. Ducts wider than 19" with more than 10 square feet of un-braced panel shall be beaded or cross-broken.
  - 2. Internal stiffening struts shall only be used upon prior written approval of the Architect.
  - 3. Make changes in duct size with tapered connections as required by SMACNA. Changes shall NOT exceed 30° from line of airflow. Take-off to the diffusers shall be 45° leading edge type or bellmouth type.
  - 4. Transverse joints shall be TDF/TDC or slip joints; use flat or standing seam according to SMACNA. Where the duct size requires a standing seam but space restrictions dictate flat seam, notify Architect prior to fabrication.

- D. 2" and Lower Pressure Class Ductwork Round:
  - 1. Joints:
    - a. Longitudinal joints shall be spiral seam, butt welded, lap and seam welded, or ACME lock-grooved seam. Snap lock seams shall be used on 1/2" w.g. pressure class duct only.
    - b. Transverse joints shall be beaded sleeve joint or other approved joints listed in SMACNA. Use three (3) or more sheetmetal screws at 15" uniform intervals along circumference of joints.
  - 2. Branch fittings shall be conical tee (Buckley or equal) or combination tee as shown in SMACNA.
- E. Flexible Duct:
  - Flexible ductwork shall be Flexmaster Triple-Lock Buck Duct Flexible Air Duct (insulated or non-insulated) as manufactured by Buckley Associates, ATCO, or equal. Flexible duct, non-insulated, shall be Underwriters Laboratory Listed UL 181 Class 0 air duct and constructed in accordance with NFPA Standards 90A and 90B. It shall have a smoke/flame spread rating of 50/25.
  - 2. The duct shall be made from a tape of dead soft aluminum sheet, spiral wound into a tube and spiral corrugated to provide strength and stability. The joint shall consist of a triple lock mechanically performed without the use of adhesives to make a durable airtight seam. A double lock is not acceptable.
  - 3. Flexible duct connected to insulated or lined duct shall also be insulated. Flexmaster insulated flex shall have a gray Fire Retardant Polyethylene outer jacket with a 3/4 lb. density, 1-1/2" thick fiberglass insulation blanket, factory wrapped, providing a thermal performance of R-6 overall. Flexible Duct, insulated, shall be Underwriters Laboratory Listed and constructed in accordance with NFPA Standards 90A and 90B. It shall have a smoke/flame spread rating of 50/25.
  - 4. The flexible duct shall be supported as required.
  - 5. Flexible ductwork shall be rated at 12" positive pressure. Flexible ductwork from 3" to 16" in diameter shall have a negative pressure rating of 12". Flexible ductwork 18" to 20" in diameter shall have a negative pressure rating of 8".
  - 6. All flexible ductwork shall be individually boxed and labeled for delivery to the jobsite for maximum protection.
  - 7. Submittals shall include data on minimum thickness of aluminum core, in addition to other data listed above, required to ensure that submitted product meets the requirements of these Specifications.

- 8. Provide sealing compound for installation. See further paragraphs in this Specification and details for other installation requirements.
- F. Fire Dampers:
  - 1. Provide fire dampers throughout the air distribution system(s) as required by applicable codes, standards and Authorities. Provide an access door for each fire damper of sufficient size to repair the internal fusible link (see access panel/door section). Fire dampers indicated on the Drawings may not fully represent the exact number required for this project. It is the Contractor's responsibility, at no additional cost to the Owner, to provide all required dampers.
  - 2. Fire dampers shall be the fusible link spring loaded type. All fire dampers shall be the dynamic type, similar to Greenheck Model DFD series.
  - 3. Fire damper frames shall be fitted with angle iron stop and stainless steel spring latch, and shall be securely fastened to building construction.
  - 4. Seal spaces between damper frames and walls and between damper frames and floor with approved fire-retardant material.
  - 5. The use of fire dampers shall NOT reduce net free area of duct below that shown on Drawings. Fire dampers shall be Type B with the blades of the fire dampers out of the air stream.
  - 6. Samples of fire dampers shall be submitted to and approved by Local Authorities Having Jurisdiction upon request at no additional cost to Owner.
  - 7. Dampers shall bear 1-1/2 hour UL-rating fire damper label and shall be constructed and installed as required by UL-555.
  - 8. Fire dampers shall be Buckley, Greenheck, Ruskin, Nailor Industries, Pottorff or Prefco for use in the proper duct pressure classification.
  - 9. Dampers shall be installed per SMACNA with breakaway connections and nose pieces on duct liner (see SMACNA HVAC Duct Construction Standards).
- G. Volume Dampers:
  - 1. Provide manually adjustable rectangular parallel blade dampers for duct heights less than 12" with factory-installed locking hand quadrants extended 2" for all dampers installed in externally insulated duct:
    - a. On each supply, return and general exhaust duct take-off.
    - b. At each take-off to register, grille or diffuser (not all are shown on Drawings for clarity).

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  - 2. Volume dampers shall be manufactured approximately 5/16" smaller in width and 1/8" smaller in height than size of duct in which they are installed; e.g., nominal damper size is 24" x 10"; actual size is approximately 23-11/16" x 9-7/8".
  - 3. Volume damper frames shall be constructed of #6063 extruded aluminum reinforced channel with minimum thickness of 0.050". Opposed damper blades shall be #6063 extruded aluminum with minimum thickness of 0.050" and shall include reinforcing ribs. Each blade shall be supported in the damper frame by individual Teflon axle bearings, and shall be driven by stainless steel connecting slide linkage controlled by 3/8" square steel control shaft.
  - 4. All required volume dampers may not be indicated on Drawings, but volume dampers shall be provided as necessary for systems balancing.
  - 5. Dampers 12" and larger in height shall be opposed multi-blade type.
  - 6. Where volume dampers are inaccessible, use locking type ceiling regulators and miter gear or worm gear for all horizontal dampers. Bearing coupling for bottom duct control may be used for shaft on vertical blade dampers. The 3/8" rod between ceiling regulator and damper shall be provided by Contractor.
  - 7. Damper blades shall be two gauges heavier than adjoining ductwork, and shall be riveted to supporting rods. Hem over edges parallel to rods.
  - 8. Brackets shall be galvanized metal, secured to ductwork with sheetmetal screw with locking quadrant arms (see Seal Class Section for additional requirements). Provide 2" handle extension for all dampers on externally insulated ductwork.
  - 9. Note: All required volume dampers may not be indicated on Drawings but dampers shall be provided as necessary for system balancing.
  - H. Remote Control Operated Balancing Dampers:
    - 1. Round remote control operated balancing dampers applicable for use in HVAC systems with velocities to 2,600 fpm by United Enertech model i-3, Young Regulators or equal as approved by engineer.
    - 2. Submit manufacturer's product data including performance data.
      - a. Include differential pressure ratings and maximum system velocity.
      - b. Indicate materials, dimensions, construction, and installation details.
      - c. Include damper pressure drop data based on procedures performed in accordance with AMCA 500-D.
    - 3. Ratings:
      - a. Temperature Rating 35°F to 120°F (2°C to 49°C)
      - b. Maximum Velocity: 2600 fpm (13.2 m/s)

- c. Maximum Differential Pressure Rating: 3" w.g.
- 4. Construction:
  - a. Frame: Min. 24 ga galvanized steel, 8" deep
  - b. Blade: Round, minimum 24 ga galvanized steel, mechanically fastened to blade
  - c. Axels: Zinc Plated Steel Pins
  - d. Bearings: Nylon 6/6 Molded synthetic
  - e. Mounting: Vertical and/or Horizontal
  - f. Actuator: DC voltage, Direct Drive, Electronic pulse
  - g. Remote: Portable hand held power pack with RJ-11 cable
  - h. Finish: Mill Galvanized
- 5. Accessories and Options (Engineer to select and edit as required)
  - a. Custom RJ-11 cable length as required.
- 6. Installation
  - a. Install dampers at locations indicated n the drawings and in accordance with manufacturer's instructions.
  - b. Install dampers round and free from racking. Do not stretch or compress damper frame or sleeve into the opening or duct.
  - c. Handle dampers using the sleeve or frame. Do not move or lift the damper by the blades, cable, or actuator
  - d. Install remote options (if applicable) of Model J50, J100, or J150 Terminal points.
  - e. Connect RJ-11 cable from the damper to the female outlet, making sure cable is secured and cannot be pulled out of the terminal.
  - f. Coordinate power requirements with electrician.
- I. Automatic Dampers: Install automatic dampers furnished under Automatic Temperature Control Paragraph of this Section, as shown on Drawings, and as specified.
- J. Diffusers, Registers and Grilles:
  - 1. Provide diffusers, registers and grilles for supply, return and exhaust outlets, of size, type and design shown on Drawings. Acceptable manufacturers shall be Titus, Anemostat, Krueger, Metal\*Aire, Price, or approved equal.
  - 2. Equipment shall be tested and rated per ASHRAE 91-70.
  - 3. Equipment shall handle air quantities at operating velocities:
    - a. With maximum diffusion within space supplied or exhausted.
    - b. Without objectionable air movement as determined by Architect.
    - c. With sound pressure level not to exceed NC 30.
  - 4. Supply, return and exhaust outlets shall have opposed blade volume dampers operable from front.

- 5. Supply registers shall have two (2) sets of directional control blades.
- 6. Diffusers within same room or area shall be of same type and style to provide Architectural uniformity.
- 7. Diffusers, registers and grilles shall be furnished with gaskets and installed with faces set level and plumb, tightly against mounting surface.
- 8. Finish shall be as directed by the Architect.
- 9. Coordinate diffusers, registers and grilles with ceiling and wall construction. Refer to Architectural Drawings for exact lengths and for framing and mitering arrangements that may differ from those shown on HVAC Drawings.
- K. Branch Duct Take-off Fittings:
  - 1. Contractor shall provide bellmouth take-offs at all branch duct locations.
  - 2. Bellmouth fitting shall be provided with damper.
  - 3. Bellmouths shall be constructed of heavy-duty galvanized steel. Bellmouths shall include an airtight neoprene gasket to ensure a tight fitting with minimal leakage. Pre-drilled holes shall be provided for quick mounting.
  - 4. Standard damper hardware to be constructed of 26-gauge galvanized material with a quadrant damper and tight-fitting gasket to ensure minimal leakage at damper pivot points.
  - 5. Optional heavy-duty hardware shall be provided at locations of higher static pressure where shown on the Drawings.
  - 6. Ninety-degree (90°) take-offs are not permitted on this project.
  - 7. Ductwork located in unconditioned attic outside of building insulated envelope shall be considered exposed.

### 2.2 DUCT INSULATION

- A. General:
  - 1. Insulation shall be Certain-Teed, Knauf, Manville or Owens Corning. Install insulation, mastics, adhesives, coatings, covers, weather-protection and other work exactly as required by manufacturer's recommendations. Materials shall meet requirements of Adhesive and Sealant Council Standards and SMACNA.
  - 2. Apply insulation after systems have been tested, proved tight and approved by Architect or Engineer. Remove dirt, scale, oil, rust and other foreign matter prior to

installation of insulation.

- 3. Leaks in vapor barrier or voids in insulation will not be accepted.
- 4. ASTM E-84 minimum fire hazard ratings shall be 25 flame-spread, 50 fuel contributed and 50 smoke developed.
- 5. Where ducts are insulated, flexible connections to ducts shall be insulated.
- 6. Insulate standing seams with same material and thickness as duct.
- 7. Acoustically lined ductwork shall not be insulated externally, except as noted otherwise.
- 8. Return ductwork in ceiling plenums shall not be insulated.
- 9. Insulation shall be continuous through wall and ceiling openings and in sleeves.
- 10. Transmission rates of vapor barriers shall not exceed 0.02 perms.
- B. Concealed Rectangular and Round Ductwork:
  - 1. Insulate supply and outside air ductwork and plena in concealed spaces and return ductwork not in ceiling plenum with 1-1/2" thick glass duct wrap; with foil-Kraft flame-resistant vapor barrier. Increase thickness as required to meet minimum "R" values.
  - 2. Insulation shall provide a minimum R-6 value when located in unconditioned spaces and a minimum R-8 value when located outside the building.
  - 3. If insulation does not have pre-cut lap, make lapped butt joints by cutting 2" strip of insulation away from vapor barrier. Apply 6" strips of approved adhesive on 16" centers and wrap duct with insulation. Staple lapped joint with outward-clinching staples. Seal stapled joints airtight with approved matching pressure-sensitive tape.
  - 4. For rectangular duct 24" or larger in any dimension, augment application method specified in item 3 with approved mechanical fasteners, such as weld pins with speed washers, on 18" centers on bottom of duct.
  - 5. Cover breaks in vapor material with patches of same material, secured with adhesive and staples. Seal staples with approved pressure sensitive tape.
  - 6. Fill voids in insulation at jacket penetrations and seal with pressure sensitive tape.
  - 7. Seal and flash terminations and punctures with fibrous glass cloth between two (2) coats of pressure sensitive tape.
- 8. Terminate vapor barrier and extend insulation at standoff brackets.
- C. Exposed Rectangular Ductwork:
  - 1. Insulate exposed supply, return and outside air ducts and exposed plena with 1" thick, semi-rigid fibrous glass boards with factory-applied fire retardant foil-reinforced Kraft vapor barrier facing.
  - 2. Insulation density shall be a 3 lb./cf with maximum K-factor of 0.23 at 75° F mean temperature for a minimum R-value as specified.
  - 3. Impale insulation on mechanical fasteners applied to duct surface on 12" centers. Use at least two (2) rows of fasteners on each side of duct. Provide fastener rows with 3" of seams and edges. Secure insulation with suitable speed washers or clips firmly embedded in insulation. Provide additional fasteners as necessary on cross-broken ducts.
  - 4. Extend insulation to standing seams, reinforcing and other vertical projections 1" and less; do not carry over. Vapor barrier jacket shall be continuous across seams, reinforcing and projections. Insulation and jacket shall be carried over projects that exceed insulation thickness.
  - 5. Transverse joints shall be butted tightly. Longitudinal joints shall be butted, shiplapped or 45° mitered. Seal joints with 4" wide strips of approved vapor barrier patch material and adhesive, or with approved pressure sensitive tape.
  - 6. Cover breaks, rubs and standing seam penetrations with patch of jacket material no less than 2" beyond break; secure with adhesive and staple. Seal staples and joints with pressure sensitive tape.
  - 7. Fill voids in insulation at jacket penetrations and seal with pressure sensitive tape.
  - 8. Seal and flash-terminations and punctures with fibrous glass cloth between two (2) coats of pressure sensitive tape.
  - 9. Terminate vapor barrier and extend insulation at standoff brackets.
- D. Exposed Round Ductwork:
  - 1. Exposed supply and fresh air ducts and exposed plena, which are located in mechanical and electrical rooms, storage rooms, unoccupied areas, unconditioned areas and/or as indicated on plans, shall be insulated with at least 1-1/2" fibrous glass duct wrap with foil-Kraft flame-resistant pressure sensitive tape.

- 2. Insulation density shall be 3/4 lb/cf and maximum K-factor shall be 0.30 at 75° F mean temperature for a minimum R-value as specified. If insulation does not have pre-cut lap make lapped butt joints by cutting 2" strip of insulation away from vapor barrier. Apply 6" strips of adhesive on 16" centers and wrap duct with insulation. Staple lapped joint with outward-clinching staples. Seal stapled joints airtight with approved pressure-sensitive tape.
- 3. Cover breaks in vapor material with patches of same material, secured with adhesive and staples. Seal staples with approved pressure sensitive tape.
- 4. Fill voids in insulation at jacket penetrations and seal with pressure sensitive tape.
- 5. Seal and flash terminations and punctures with fibrous glass cloth between two coatings of pressure sensitive tape.
- 6. Terminate vapor barrier and extended insulation at standoff brackets.
- 2.3 PIPING AND FITTINGS
  - A. General: Pipe materials and fitting materials shall be as indicated in Schedule of Pipe and Fitting Materials.

						Fitting
						Rating
	Systems	Pipe	Pipe		Fitting	PSI/Class/
Service	Description	Size	Material	Joints	Material	Weight
Condensate	CD	All	PVC.	Solvent	PVC,	Class 150
Drain			Schedule 40	Welded	Schedule 40	
			Note 2			
Refrigerant	R	All	Copper,	Silver	Wrought	200 PSI
			ACR	Brazed	Copper	

B. Schedule of Pipe and Pipe Fitting Materials:

- 1. Note 1: Use copper for drain lines in plenums and through fire-rated walls. Copper tubing must be insulated for 12" from equipment.
- C. Connections:
  - 1. Provide dielectric fittings at connections of dissimilar materials.
  - 2. Provide eccentric reducing couplings to bring pipes flush on top for water service and flush on bottom for steam service.
  - 3. Nipples shall be same material, make and thickness as pipe with which they are used. Close nipples shall not be used.

- 4. Make piping connections 2" diameter and smaller to valves and equipment with steel body, 300 psi brass seat unions on steel piping and with heavy semi-finished brass unions on copper tubing.
- 5. Make screw joints tight with Teflon (polytetrafluoroethylene) tape or lithargeglycerin mixture applied to male threads. Use tapered threads.

### 2.4 PIPE INSULATION

- A. Insulation shall be fibrous glass insulation with factory-applied fire retardant vapor barrier jacket by Owens Corning, Certain-Teed, Manville or Knauf, installed as required by manufacturer. ASTM E-84 fire hazard ratings shall be 25 flame spread, 50 smoke developed and 50 fuel contributed.
- B. Apply insulation after systems have been tested, proved tight and approved by the Architect. Remove dirt, scale, oil, rust and foreign matter prior to installation of insulation.
- C. Provide fibrous dual temperature insulation with factory applied vapor barrier jacket on condensate drain piping, unless noted otherwise.
- D. Drain piping shall have 1/2" thick insulation.
- E. Provide longitudinal lap and 6" wide vapor barrier joint seal strips secured with approved adhesive.
- F. Seal ends of pipe insulation and seal insulation to pipe with approved fire retardant vapor barrier, at flanges, valves and fittings and at intervals of no more than 21 feet on continuous runs of piping.
- G. Secure covers on concealed pipe with metal bands at least 3/4" wide and no more than 18" apart, spaced to hold ends and center of each section.
- H. Insulation on Fittings, Valves and Flanges:
  - 1. Fittings, valves and flanges shall be insulated with pre-cut, factory-supplied fibrous glass, by Certain-Teed, Knauf, Owens Corning or Manville.
  - 2. Fittings, valves and flanges shall be insulated with same material and to same thickness as adjoining pipe insulation.
  - 3. Pipe fittings shall be pre-tested, clean and dry before insulation.
  - 4. Installation of insulation on fittings shall be as follows, in order:
    - a. Wrap insulation around fitting and tuck ends into fitting throat.
    - b. Edges of adjacent insulation shall be tufted and tucked in, to fully insulate fitting

to thickness of adjacent pipe insulation. Use two or more thicknesses if necessary.

- c. If two layers of insulation are used on fittings, wrap and secure first layer with twine before applying second layer.
- d. Top layer of insulation shall be covered with one (1) piece PVC, Zeston molded fitting cover. Secure cover with stainless steel tack fasteners inserted into jacket thread overlap seam.
- e. Tape joints with pressure-sensitive vapor barrier tape; tape shall extend 2" on either side of joint.
- I. Refrigeration Line Insulation:
  - 1. Suction lines, hot bypass lines and outdoor liquid lines shall be insulated with 3/4" thick rigid closed cell foam insulation. Armstrong Rigid Armaflex, Manville, Owens Corning or Halstead/Nomaco (Insultube), except in computer room plena.
  - 2. Installation shall meet manufacturer's recommendations. Seal butt joints with insulation manufacturers approved adhesive.
  - 3. Outside above ground insulation shall be protected with two (2) coats of approved vinyl lacquer coating over woven glass mesh adhered to insulation with Insulcolor or approved equal lagging adhesive, as recommended by manufacturer.
  - 4. Refrigerant piping in hung ceiling and under floor supply and return plena shall be insulated with 1" thick fibrous glass insulation that meets applicable requirements of this paragraph.
  - 5. VRF systems require all refrigerant lines to be insulated from the outdoor unit to the indoor terminal units.

### 2.5 PIPE HANGERS AND SUPPORTS

- A. Provide pipe stands, supports, hangers and other supporting devices in accordance with ANSI B31.9 and MSS-69, as necessary to support work required by Contract Documents.
- B. Secure vertical piping to building construction to prevent sagging or swinging.
- C. Space hangers for horizontal piping as follows:

Pipe Size	Rod Diameter	Maximum Spacing
Up to 1-1/4"	3/8"	8 ft0"
1-1/2" and 2"	3/8"	10 ft0"

D. Horizontal copper tubing shall have maximum hanger spacing of 5 ft. for tubing 1-1/4" diameter and smaller and 10' for tubing 1-1/2" and larger. Maximum spacing for PVC pipe hanger shall be 4".

- E. Reduce spacing to a maximum of 10'-0" apart, regardless of pipe size, as necessary for fittings, valves and other concentrated loads.
- F. Support piping 3" diameter and under from structure with Carpenter and Patterson Fig. 100 clevis hangers or approved equal.
- G. Hangers shall be as manufactured by Carpenter and Patterson, F&S or Grinnell Co. Figure numbers of Carpenter and Patterson are specified to establish standards of quality for performance and materials.
- H. Provide spring hangers with travel stops as specified in Vibration Isolation Paragraph, where necessary and where shown on Drawings.
- Pipe supports for 4" and larger pipe and insulated high-temperature piping shall have welded inserts of equal thickness to insulation to prevent compression of insulation. Other insulated pipe shall have 12", 14 ga. shields at hangers, composed of 180° coverage of galvanized sheetmetal and high density, preformed rigid insulation. Where rollers are required, shield shall be steel pipe.
- J. Hangers for horizontal lines shall be vertically adjustable to obtain pitch requirements of Piping Paragraph.
- 2.6 SLEEVES AND PENETRATIONS
  - A. Pipe Sleeves:
    - 1. Sleeves through floors and through exterior, structural and fire-rated construction shall be hot-dipped galvanized Schedule 40 steel pipe.
    - 2. Sleeves through partitions and non-rated construction shall be 26-gauge galvanized steel with lock longitudinal seams, or approved plastic pipe.
    - 3. Provide waterproofing membrane locking devices at floors. Provide 150 lb. slip-on welding flanges at exterior wall penetrations.
  - B. Duct Sleeves and Openings:
    - 1. Sleeves through floors, through exterior structure, through fire-rated construction and through smoke partitions that require smoke dampers shall be Schedule 40 galvanized steel pipe for round duct and shall meet the SMACNA Fire Damper and Heat Stop Guide for rectangular ducts. Fireproof packing shall be applied to seal any openings between sleeve and wall. Materials shall maintain the fire rating of the wall, and shall be installed in accordance with the SMACNA Fire Damper and Heat Stop Guide.
    - 2. Openings in walls, partitions and other fire-rated construction that do not require smoke dampers shall meet NFPA 90A, Section 3-3.8.

- 3. Materials for prepared openings in partitions shall match construction penetrated.
- C. Pipe Sleeve Packing:
  - 1. Packing between the pipe and the sleeve (or wall or slab opening) in fire-rated walls or slabs shall be a combination of fireproof insulation and fireproof caulk. The combination of materials shall have the same fire rating, in hours, as the wall or slab, as tested in accordance with the latest edition of ASTME-814 (UL 1479). The combination of materials shall be classified by UL, (fill, void or cavity materials) for the fire rating required and shall be listed as a numbered system in the UL Fire Resistance Director. Fiberglass shall not be used as the insulation material.
  - 2. Acceptable fireproof insulation materials shall be: Kaolin (Kaowool by Babcock and Wilcox); ceramic fiber blanket (Fiberfrax by Standard Oil) or fire-rated material wool (Thermafiber by USG). Acceptable fireproof caulks shall be: Silicone (Firestop by Dow Corning, Hilti CS240); ceramic fiber (Fyreputty by Standard Oil) or intumescent synthetic elastomer (Fire Barrier Caulk by 3M, Hilti CS2420).
  - 3. Packing for sleeves that do not require maintenance of fire rating shall be oakum, silicate foam, ceramic fiber or mineral fiber with approved sealant. Pack or foam to within 1" of both wall surfaces. Seal penetration packing with approved caulking and paintable waterproof mastic surface finish or silicone caulking.
  - 4. All materials must be installed in accordance with manufacturer's instructions; all gaps must be sealed. Finish caulk flush with wall or slab surface if piping runs exposed.
- D. Other Waterproof Pipe Penetrations:
  - 1. Modular mechanical penetration seals shall be interlocking synthetic rubber links shaped to fill annular space continuously, with galvanized carbon steel bolts, nuts and pressure plates to expand rubber seal between pipe and sleeve. Sleeve seal shall be watertight.
  - 2. Prefabricated modular sleeves shall be Mason Industries (SWS) or approved equal stiffened galvanized steel sleeves with preformed closed-cell elastomeric seal (non-fire-rated) or preformed mineral fiber or silicone seal (fire-rated).
  - 3. Provide waterproof 1" single ring set in silicone and bolted to floor or wall at chipped and drilled penetrations of existing slabs-on-grade and existing walls-below-grade.

# 2.7 ESCUTCHEONS AND DUCT COLLARS

A. Provide adjustable escutcheons on exposed piping that passes through finished floors, walls and ceilings. Escutcheons shall be chromium-plated cast brass, sized to cover sleeve opening and to accommodate pipe and insulation.

- B. Provide 4" wide, 20 gauge galvanized sheetmetal collars at sleeves and prepare openings, sized to cover entire duct penetration including sleeve and seal, and to accommodate duct and insulation as necessary. Edges shall have milled lips ground smooth. Paint to match finish of duct or as directed by the Architect.
- C. Provide #316 stainless steel/No. 4 finish collar for emergency generator exhaust piping which passes through exterior wall.

#### 2.8 MOTORS, STARTERS AND WIRING

- A. Provide motors and controls, and furnish starters for HVAC equipment, except units served by MCC provided under Section 260000 ELECTRICAL. Provide control and other related wiring including interlocks. Power wiring (to panelboards, disconnect switches, starters and motors) will be provided under Section 260000 ELECTRICAL. Starters that are not integral to equipment will be furnished, installed and wired under Section 260000 ELECTRICAL.
- B. Unless otherwise specified, motors shall be NEMA Design B, constant speed, selfventilated squirrel cage induction. Motors shall have 1.15-service factor unless totally enclosed. Motors shall have Class B insulation.
  - 1. Motors 1/2HP and over shall be as required in schedules.
- C. All motors shall be high or premium efficiency type. They shall conform to NEMA Standard MG-1-12.53a and shall have their efficiencies determined in accordance with IEEE Standard 112 Method B. The NEMA nominal efficiency shall be listed on the motor nameplate. Minimum nominal efficiencies shall be as follows:

Size (HP)	Nominal Efficiency
	(Minimum)
1 – 3	84%
5 – 7-1/2	88.5%
10 - 25	90%
30-100	93%
100+	95%

- D. Starters that require interlocks or remote control shall be magnetic with HAND-OFF-AUTOMATIC switch in cover. Provide magnetic starters as necessary, with auxiliary contacts, buttons and switches in required configurations. Refer to paragraph AUTOMATIC TEMPERATURE CONTROLS and to Drawings for interlock requirements. Starters shall be as manufactured by one of the following manufacturers: Cutler-Hammer, Clark, Arrow Hart, or Square D.
  - 1. Each 3-phase, 60 Hz motor shall be provided with magnetic starter with either ON-OFF push button or hand-off-automatic switch.
  - 2. Other motors shall be provided with a manual starter with ON-OFF switch.

- 3. Control relay for each starter shall be for operation on 120 V, single-phase, and transformer of sufficient capacity within starter case shall be furnished for this purpose.
- 4. Provide inverse time limit overload and under voltage protection in each leg and with pilot lights. Provide "red" and "green" On-Off pilot lights.
- 5. Provide nameplates with engraved "white" lettering to designate area and equipment served.
- 6. Starters for refrigeration machines shall be furnished by Unit Manufacturer.
- 7. Provide starters for two-speed motors with deceleration relay.
- 8. Furnish for all single speed motors, 25 HP and above, 95% power factor correction capacitors. Capacitors shall be in NEMA enclosure of the same rating as the motor's starter.

## 2.9 GAS FIRED UNIT HEATERS

- A. Provide gas fired unit heaters by Reznor, Modine, Trane, or approved equal.
  - 1. Provide 83% high-efficiency, separated-combustion, power vented, gas-fired unit heaters. The unit shall be designed for use in a building with negative pressures up to 0.15" w.c. and for use in building where a non-explosive atmosphere exist that is dust laden and/or contains mildly corrosive fumes.
- B. Each shall be equipped for use with propane gas. Gas connection shall be external to the cabinet.
- C. The heater shall be equipped with a multi-cell, 4 pass serpentine style steel heat exchanger. Heat exchanger tubes shall be press fabricated of corrosion resistant aluminized steel. All heat exchangers shall be fabricated with no welding or brazing, only tool pressed mechanical joints. All heat exchanger cells shall be designed with an aerodynamic cross section to provide maximum airflow.
- D. The units shall incorporate a single, one piece burner assembly with a single orifice. The burner shall have a continuous wound close pressed stainless steel ribbon separating the flame from the burner interior. All units shall have a single venturi tube and orifice supplying fuel to a one-piece burner housing. Each heat exchanger cell shall use balanced draft induction to maintain optimum flame control.
- E. Controls shall include a two-stage gas valve; direct spark multi-try ignition with electronic flame supervision with timed lockout integrally controlled via a printed circuit control board. The control board shall also incorporate diagnostic lights, DIP switches for fan overrun settings, and a relay for fan only operation. All units shall be equipped with a safety limit switch.

- 1. All controls shall be enclosed in the sealed control compartment to protect them from accidental damage, dust, and atmospheric corrosion.
- F. The unit shall have a factory-installed power venter device to draw combustion air from outside of the building. The outside air shall enter the unit through a factory-installed round inlet air terminal on the rear of the heater. The control compartment shall be sealed and the access door shall be gasketed to prevent dirt, lint, dust, or other contaminants present in the heated space from entering the unit. The control compartment door shall be equipped with a safety interlock switch to prevent operation when the door is open.
  - 1. The combustion air supply pipe and flue exhaust pipe shall be run in parallel from the heater to a factory sup- plied concentric adapter assembly, which allows for a single wall or roof penetration, to the horizontal or vertical air inlet and vent terminal.
  - 2. The combustion air/venting system shall include a vibration isolated power venter motor and wheel assembly and a combustion air pressure switch.
- G. Operation shall be controlled by an integrated circuit board that includes LED diagnostic indicator lights. Supply voltage connections shall be made in a sealed junction box. 24-volt control-connections shall be made on an externally mounted terminal strip with connections (W1, W2, R, and G). All internal wiring, both line and control voltages, shall be terminated by insulated terminal connectors to minimize shock hazard during service.
  - 1. Each unit shall be equipped for use with power supply as specified.
  - 2. All units will be equipped with a built-in disconnect switch.
- H. The cabinet shall be low profile with a pre-coat or powder-coat RAL 1001 white paint finish. Finish shall be a minimum 80 gloss on G30 galvanized steel. The cabinet shall be constructed so that screws are not visible from the bottom, front, or sides, except for service panel and accessories. Unit construction shall incorporate a beveled front corner on control side for additional cabinet rigidity. All units shall be manufactured with a tooled drawn supply air orifice on the rear panel to reduce fan inlet noise.
  - 1. The unit shall be designed for ceiling suspension featuring 3/8"-16 female threads (hanger kits for 1" pipe) at both 2-point and 4-point locations with no additional adapter kits.
  - 2. The cabinet shall be equipped with RAL 3005 burgundy painted, roll-formed horizontal louvers. Louvers shall be spring held and adjustable for directing airflow.
  - 3. The cabinet shall be equipped with a full safety fan guard with no more than 1/2 inch grill spacing or no more than 1 inch. The open drip proof motor and fan assembly shall be resiliently mounted to the cabinet to reduce vibration and noise.

- I. The unit shall be designed with a full opening service access panel complete with screw closure attachment and lifting handle for removal. Service panel shall be fully gasketed and equipped with a safety interlock switch. All components in the gas train, all standard electrical controls, and the power venter shall be within the sealed service compartment.
- J. Minimum top clearance from combustibles shall be 4". Minimum bottom clearance from combustibles shall be 1" for all sizes. Minimum clearance from combustibles on non-service side shall be 2".
- K. Unit(s) shall be design certified by the Canadian Standards Association to ANSI Z83.8b and CSA 2.6b for commercial/industrial installation.
  - 1. Manufacturer must have a minimum of 50 years' experience in the manufacture of gas fired unit heaters.

### 2.10 ELECTRIC UNIT HEATERS

- A. Provide electric unit heaters of horizontal discharge type, by Q Mark, Markel, Brasch, or approved equal, as shown on Drawings and on Schedules.
- B. Casings shall be heavy gauge steel with mounting bracket.
- C. Horizontal heaters shall have adjustable steel discharge louvers.
- D. Electric motor shall have integral overload protection and shall be equipped with combination fan guard/motor support resiliently mounted to absorb motor vibration.
- E. Fan blades shall be aluminum directly connected to fan motor and shall be dynamically balanced.
- F. Fan switching shall be available to operate fan independently for summer circulation.
- G. Automatic reset thermal overheat protection shall be wired for instantaneous pilot operation of built-n control contractor holding coil.

### 2.11 ELECTRIC WALL HEATERS

- A. The heating equipment shall include an electric automatic fan forced air heater suitable for small area heating, as manufactured by QMark®, Markel, Brasch, or approved equal. The heater shall be designed for wall mounting, recess or surface. Heaters shall be cETLus listed.
- B. The back box shall be designed as a recessed rough-in box in either masonry or frame installations and is also used when surface mounting frames are used in surface mounting installations. The back box shall be heavy gauge galvanized steel and shall contain knockouts through which power leads enter.

- C. The heater assembly, which fits into the back box, shall consist of a heavy gauge steel fan panel to which all of the operational parts of the heater are mounted. The inner frame assembly shall be completely pre- wired.
- D. The heating element shall be of the non-glowing design consisting of an 80/20 nickelchromium resistance wire enclosed in a steel sheath to which plate fins are copper brazed. The element shall cover the entire air discharge area to ensure uniform heating of all discharged air. It shall be warrantied for 5 years.
- E. A double-pole, single throw on/off switch shall be mounted on the back box for positive disconnect of power supply. It will be completely concealed behind the front cover.
- F. The fan motor shall be impedance protected, permanently lubricated. Fan control shall be of the bi-metallic, snap-action type and shall activate fan after heating element reaches operating temperature, and continue to operate the fan after the thermostat is satisfied and until all heated air has been discharged. The thermostat shall be single-pole type on all models. Thermal cutout shall be self- hold (manual-reset) type designed to shut off heat in the event of overheating. The fan shall be four-bladed aluminum. A back- up (End of Life) thermal fuse shall be provided for additional safety.
- G. The surface mounting frame shall be of heavy gauge steel designed to mount around the back box for a finished surface installation. Slot knock outs shall be provided for power supply conduit.
- H. The louvered front cover shall be of heavy gauge steel with a powder paint finish. A plug button will be provided to replace the thermostat knob and render the unit tamper-resistant. All sheet metal parts, except the galvanized steel back box, shall be phosphatized, then completely painted by a powder paint process.

### 2.12 LOUVERS

- A. General: Louvers to be furnished and installed by General Trades Contractor for use by Mechanical Contractor.
- 2.13 ENERGY RECOVERY VENTILATOR WITH ENTHALPY WHEEL
  - A. General: Energy Recovery Ventilator shall be as manufactured by Greenheck, Mitsubishi, Renewaire or approved equal, provided all specifications are met. Units shall be listed per ANSI/UL 1812, Heating and Cooling Equipment. Energy transfer ratings of the energy recovery wheel shall be ARI Certified. Performance to be as scheduled on plans.
  - B. Casing and Access: Unit shall be constructed of G90 galvanized steel. All components shall be easily accessible through removable access panels. Energy recovery wheel shall be mounted in a slide-out track for ease of inspection, removal and cleaning. Housing shall be insulated with 1/2-inch insulation. Outdoor air and exhaust air discharges shall have integral backdraft dampers. Duct adapters shall be factory installed on all four intake/discharge ports.

- C. Intake Location: Both the outdoor air and exhaust air intakes shall be designed for optional relocation in the field. Alternate intake location on adjacent side of the unit enables duct installation flexibility.
- D. Energy Recovery Wheel:
  - Wheel shall be of the enthalpy type for both sensible and latent heat recovery and be designed to insure laminar flow. Energy transfer ratings must be ARI Certified to Standard 1060 and bear the ARI certification symbol for ARI Air-to-Air Energy Recovery Ventilation Equipment Certification Program based on ARI 1060. Ratings "in accordance with 1060" without certification are not acceptable. Desiccant shall be silica gel for maximum latent energy transfer. Wheel shall be constructed of lightweight polymer media to minimize shaft and bearing loads. Polymer media shall be mounted in a stainless steel rotor for corrosion resistance.
  - 2. Silica gel desiccant shall be permanently bonded to wheel media to retain latent heat recovery after cleaning. Wheels with sprayed on desiccant coatings are not acceptable. Wheels with desiccant applied after wheel formation is not acceptable. Energy recovery device shall transfer moisture entirely in the vapor phase.
  - 3. Energy recovery drive belt material shall be high strength urethane and shall be factory installed in a pre-stretched state, eliminating the need for field belt tension adjustment. Link style belts are not acceptable.
- E. Fans and Motors: Fans shall be double width, double inlet centrifugal, forward curved type. Fans shall be statically and dynamically balanced. Fan motors shall be [[115], [208], [230]] volts, single phase, thermally protected and are compatible for use with speed controller.
- F. Filters: The outdoor air shall be filtered with a 1-inch deep, 30% efficient, disposable filter. Filter rack shall be internal to the unit and factory installed.
- G. Electrical: All internal electrical components shall be factory wired for single point power connection. All electrical components shall be UL listed, approved, or classified where applicable and wired in accordance with the National Electrical Code.
- H. Warranty: The energy recovery ventilator shall be warranted to be free from defects in material and workmanship for a period of one year from the purchase date. The energy recovery wheel shall be warranted to be free from defects in material and workmanship for a period of five years from the purchase date. Motors shall be warranted by the motor manufacturer for a period of one year from the purchase date.

## 2.14 ENERGY RECOVERY VENTILATOR WITH STATIC CORE

- A. Manufacturers:
  - 1. Available Manufacturers: Subject to compliance with specifications contained within

this document, manufacturers offering products that may be incorporated into the work include, but are not limited to: Greenheck, Mitsubishi, Renewaire, or approved equal.

B. Manufactured Units: Unit shall be fully assembled at the factory and consist of an insulated metal cabinet, energy core, motorized intake damper, motorized exhaust damper, frost control, filter assembly for intake and exhaust air, supply air blower assembly, exhaust air blower assembly and an electrical control center. All specified components and internal accessories factory installed and tested and prepared for single-point high voltage connection.

### C. Cabinet:

- 1. Materials: Formed double wall insulated metal cabinet, fabricated to permit access to internal components for maintenance.
  - a. Outside casing: 18 gauge, galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish.
  - b. Internal assemblies: 18 gauge, galvanized (G90) steel except for motor supports which shall be minimum 14 gauge galvanized (G90) steel.
- 2. Shall have factory-installed duct flanges on all duct openings.
- 3. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.
  - a. Materials: Fiberglass insulation. If insulation other than fiberglass is used, it must also meet the Fire Hazard Classification shown below.
    - 1) Thickness: 1 inch (25 mm)
    - 2) Fire Hazard Classification: Maximum flame spread of 25 and smoke developed of 50, when tested in accordance with ASTM C 411.
    - 3) Location and application: Full coverage of entire cabinet exterior to include walls, roof and floor of unit. Insulation shall be of semi-rigid type and installed between inner and outer shells of all cabinet exterior components.
- 4. Energy Core: Energy core shall be of total enthalpy and shall be removable from the cabinet. The core shall consist of a galvanized steel framework (designed to produce laminar air flow through the core) and an energy core as specified. The core media shall be a corrugated hydroscopic resin in a galvanized steel framework and can be removable for servicing. The energy core is to have a five year warranty. Performance criteria are to be as specified in AHRI Standard 1060.
- 5. Supply Air and Exhaust Air blower assemblies: Blower assemblies consist of an electric motor and a belt driven blower. Assembly shall be mounted on heavy gauge galvanized rails and further mounted on 1.125 inch thick neoprene vibration isolators.
- 6. Control panel / connections: Energy Core Ventilator shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections.

- 7. Frost control: timed exhaust.
- 8. Economizer Control: None.
- 9. Motorized dampers / Exhaust Air, Intake Air, Motorized dampers of low leakage type shall be factory installed.
- D. Blower Section:
  - 1. Blower section construction, Supply Air and Exhaust Air: Belt drive motor and blower shall be assembled onto a 14 gauge galvanized steel platform and must have neoprene vibration isolation devices.
  - 2. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.
  - 3. Centrifugal blower housing: Formed and reinforced steel panels to make curved scroll housing with shaped cutoff.
  - 4. Forward curved blower (fan) wheels: Galvanized or aluminum construction with inlet flange and shallow blades curved forward in direction of airflow. Mechanically attached to shaft with set screws.
  - 5. Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, "Laboratory Methods of Testing Fans for Rating".
- E. Motors:
  - General: Blower motors greater than 3/4 horsepower shall be "NEMA Premium" unless otherwise indicated. Minimum compliance with EPAct minimum energyefficiency standards for single speed ODP and TE enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase and enclosure. Drives shall be sized for a minimum of 150% of driven horsepower and pulleys shall be fully machined casttype, keyed and fully secured to the fan wheel and motor shafts. Electric motors of ten horsepower or less shall be supplied with an adjustable drive pulley. Comply with requirements in Division 23 05 13, matched with fan load.
  - 2. Motors shall be 60 cycle, 3 phase 208 volts.
- F. Unit Controls:
  - 1. The unit shall be constructed so that it can be controlled by factory-supplied controllers, thermostats and sensors or it can be monitored and controlled by a

Building Management System (BMS).

- 2. This unit shall be controlled by a factory-installed microprocessor programmable controller (DDC) that is connected to various optional sensors.
- 3. Sensors: Dirty filter sensor.
- G. Filters: Unit shall have permanent metal filters located in the outdoor air intake and shall be accessible from the exterior of the unit. MERV 8 disposable pleated filters shall be provided in the intake

#### 2.15 CENTRIFUGAL FANS

- A. Provide centrifugal fans by Cook, Twin City, Greenheck, or approved equal, with welded steel housing and wheel, balanced dynamically and statically. Fans shall be AMCA-certified and sealed.
- B. Duct mounted supply, exhaust or return fans shall be of the centrifugal, direct-driven, inline type. The fan housing shall be of a square design constructed of heavy-gauge galvanized steel or aluminum and shall include square duct mounting collars.
- C. Fan construction shall include two removable access panels located perpendicular to the motor mounting panel. The access panels must be of sufficient size to permit easy access to all interior components.
  - 1. The fan wheel shall be centrifugal, backward-inclined, constructed of aluminum, and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.
- D. A NEMA-1 disconnect switch shall be provided as standard. Factory wiring shall be provided from motor to the handy box.
- E. All fans shall bear the AMCA Certified Ratings Seal for Sound and Air Performance.
- F. Fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.
- G. Motor to be an electronic commutation (EC) motor specifically designed for fan applications. AC induction type motors are not acceptable. Examples of unacceptable motors are: Shaded Pole, Permanent Split Capacitor (PSC), Split Phase, Capacitor Start and 3 phase induction type motors. Motors shall be permanently lubricated with heavy-duty ball bearings to match the fan load and prewired to the specific voltage and phase. Internal motor circuitry shall convert AC power supplied to the fan to DC power to operate the motor. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by either a potentiometer dial mounted on the motor or by a 0-10 VDC signal. Motor shall be a minimum of 85% efficient at all speeds.

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H. Remote dial shall be a Vari-Green control specifically designed to provide 0-10 VDC signal to Greenheck's Vari-Green Motor.

HVAC

#### 2.16 VARIABLE REFRIGERANT FLOW SYSTEMS

- A. Outdoor Unit Heat Pump Unit with Heat Recovery:
  - 1. General: The outdoor unit shall be used specifically with appropriate indoor and control components. The outdoor units shall be equipped with multiple circuit boards that interface to the manufacturer's controls system and shall perform all functions necessary for operation. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.
    - a. All units requiring a factory supplied twinning kits shall be piped together in the field, without the need for equalizing line(s). If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor.
    - b. Outdoor unit shall have a sound rating no higher than 61 dB(A) individually or 64 dB(A) twinned. Units shall have a sound rating no higher than 51 dB(A) individually or 54 dB(A) twinned while in night mode operation. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.
    - c. Both refrigerant lines from the outdoor unit to the BC (Branch Circuit) Controller (Single or Main) shall be insulated in accordance with the installation manual.
    - d. The outdoor unit shall have the capability of installing the main refrigerant piping through the bottom of the unit.
    - e. There shall be no more than 3 branch circuit controllers connected to any one outdoor unit.
    - f. Outdoor unit shall be able to connect to up to 50 indoor units depending upon model.
    - g. The outdoor unit shall have an accumulator with refrigerant level sensors and controls.
    - h. The outdoor unit shall have a high-pressure safety switch, over-current protection, crankcase heater and DC bus protection.
    - i. The outdoor unit shall have the ability to operate with a maximum height difference of 164 feet and have total refrigerant tubing length of 1804-3100 feet. The greatest length is not to exceed 541 feet between outdoor unit and the indoor units without the need for line size changes or traps.
    - j. The outdoor unit shall be capable of operating in heating mode down to  $-4 \Box F$  ambient temperatures or cooling mode down to  $23 \Box F$  ambient temperatures, without additional low ambient controls. If an alternate manufacturer is selected, any additional material, cost, and labor to meet low ambient operating condition and performance shall be incurred by the contractor.
    - k. The outdoor unit shall be capable of operating in cooling mode down to  $-10\Box F$  with optional manufacturer supplied low ambient kit.
    - 1. Manufacturer supplied low ambient kit shall be provided with predesigned control box rated for outdoor installation and capable of controlling kit operation

automatically in all outdoor unit operation modes.

- m. Manufacturer supplied low ambient kit shall be listed by Electrical Laboratories (ETL) and bear the ETL label.
- n. Manufacturer supplied low ambient kit shall be factory tested in low ambient temperature chamber to ensure operation. Factory performance testing data shall be available when requested.
- o. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.
- p. Unit must defrost all circuits simultaneously in order to resume full heating more quickly. Partial defrost which may extend "no or reduced heating" periods shall not be allowed.
- 2. Unit Cabinet: The casing(s) shall be fabricated of galvanized steel, bonderized and finished. Unit cabinets shall be able to withstand 960 hours per ASTM B117 criteria for seacoast protected models.
- 3. Fan:
  - a. Each outdoor unit module shall be furnished with one direct drive, variable speed propeller type fan. The fan shall be factory set for operation under 0 in. WG external static pressure, but capable of normal operation under a maximum of 0.24 in. WG external static pressure via dipswitch.
  - b. All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.
  - c. All fan motors shall be mounted for quiet operation.
  - d. All fans shall be provided with a raised guard to prevent contact with moving parts.
  - e. The outdoor unit shall have vertical discharge airflow.
- 4. Refrigerant:
  - a. R410A refrigerant shall be required for all outdoor unit systems.
  - b. Polyolester (POE) oil shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.
- 5. Coil:
  - a. The outdoor Hexicoil<sup>TM</sup> heat exchanger shall be of zinc coated aluminum construction with turbulating flat tube construction.
  - b. The coil fins shall have a factory applied corrosion resistant blue-fin finish.
  - c. A stainless steel pipe connects the aluminum coil to copper piping.
  - d. The coil shall be protected with an integral metal guard.
  - e. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.
  - f. The outdoor coil shall include 4 circuits with two position valves for each circuit, except for the last stage.

- 6. Compressor:
  - a. Each outdoor unit module shall be equipped with one inverter driven scroll hermetic compressor. Non-inverter-driven compressors, which cause inrush current (demand charges) and require larger wire sizing, shall not be allowed.
  - b. A crankcase heater(s) shall be factory mounted on the compressor(s).
  - c. The outdoor unit compressor shall have an inverter to modulate capacity. The capacity shall be completely variable with a turndown of 15%-5% of rated capacity, depending upon unit size.
  - d. The compressor will be equipped with an internal thermal overload.
  - e. The compressor shall be mounted to avoid the transmission of vibration.
  - f. Field-installed oil equalization lines between modules are not allowed. Prior to bidding, manufacturers requiring equalization must submit oil line sizing calculations specific to each system and module placement for this project.
- 7. Controls: The outdoor unit shall have the capability of up to 8 levels of demand control for each refrigerant system.
- 8. Electrical:
  - a. The outdoor unit electrical power shall be 208/230 volts, 3-phase, 60 hertz.
  - b. The outdoor unit shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz), 207-253V (230V/60Hz).
  - c. The outdoor unit shall be controlled by integral microprocessors.
  - d. The control circuit between the indoor units, BC Controller and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.
- B. Branch CIRCUIT (BC) Controllers:
  - 1. General
    - a. The BC (Branch Circuit) Controllers shall include multiple branches to allow simultaneous heating and cooling by allowing either hot gas refrigerant to flow to indoor unit(s) for heating or subcooled liquid refrigerant to flow to indoor unit(s) for cooling. Refrigerant used for cooling must always be subcooled for optimal indoor unit LEV performance; alternate branch devices with no sub-cooling risk bubbles in liquid supplied to LEV and are not allowed.
    - b. The BC (Branch Circuit) Controllers shall be specifically used with R410A systems. These units shall be equipped with a circuit board that interfaces to the M-NET controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish. The BC Controller shall be completely factory assembled, piped and wired. Each unit shall be run tested at the factory. This unit shall be mounted indoors, with access and service clearance provided for each controller. The sum of connected capacity of all indoor air handlers shall range from 50% to 150% of rated capacity. The BC Controller shall be suitable for use in plenums in accordance with UL1995 edition 4.

- 2. BC Unit Cabinet:
  - a. The casing shall be fabricated of galvanized steel.
  - b. Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves.
  - c. The unit shall house two tube-in-tube heat exchangers.
- 3. Refrigerant: R410A refrigerant shall be required.
- 4. Refrigerant Branches: All BC Controller refrigerant pipe connections shall be brazed or flared.
- 5. Refrigerant Valves:
  - a. The unit shall be furnished with multiple branch circuits which can individually accommodate up to 54,000 BTUH and up to three indoor units. Branches may be twinned to allow more than 54,000 BTUH.
  - b. Each branch shall have multiple two-position valves to control refrigerant flow.
  - c. Service shut-off valves shall be field-provided/installed for each branch to allow service to any indoor unit without field interruption to overall system operation.
  - d. Linear electronic expansion valves shall be used to control the variable refrigerant flow.
- 6. Integral Drain Pan: An Integral resin drain pan and drain shall be provided.
- 7. Electrical:
  - a. The unit electrical power shall be 208/230 volts, 1 phase, 60 Hertz.
  - b. The unit shall be capable of satisfactory operation within voltage limits of 187-228 (208V/60Hz) or 207-253 (230/60Hz).
  - c. The BC Controller shall be controlled by integral microprocessors
  - d. The control circuit between the indoor units and outdoor units shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.
- C. 4-Way Ceiling-Recessed Cassette Indoor Unit:
  - 1. General: The unit shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.
  - 2. Unit Cabinet:
    - a. The cabinet shall be a compact 22-7/16" wide x 22-7/16" deep so it will fit within a standard 24" square suspended ceiling grid.

- b. The cabinet panel shall have provisions for a field installed filtered outside air intake.
- c. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.
- 3. Fan:
  - a. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
  - b. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
  - c. The indoor fan shall consist of three (3) speeds, Low, Mid, and High.
  - d. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
  - e. The auto air swing vanes shall be capable of automatically swinging up and down for uniform air distribution.
- 4. Filter: Return air shall be filtered by means of a long-life washable filter.
- 5. Coil:
  - a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
  - b. The tubing shall have inner grooves for high efficiency heat exchange.
  - c. All tube joints shall be brazed with phos-copper or silver alloy.
  - d. The coils shall be pressure tested at the factory.
  - e. A condensate pan and drain shall be provided under the coil.
  - f. The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 19-3/4" inches above the condensate pan.
  - g. Both refrigerant lines to the PLFY indoor units shall be insulated in accordance with the installation manual.
- 6. Electrical:
  - a. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
  - b. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).
- 7. Controls:
  - a. This unit shall use controls provided by VRF system manufacturer to perform functions necessary to operate the system.
  - b. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
  - c. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F 9.0°F adjustable dead-band from set point.
  - d. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

- e. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.
- D. 1-Way Ceiling-Recessed Cassette Indoor Unit:
  - 1. General: The unit shall be a one-way cassette indoor unit that recesses into the ceiling with a ceiling grille and shall have a modulating linear expansion device. The unit shall be used with the appropriate outdoor unit and manufacturer's controller. The unit shall support individual control using DDC controllers.
  - 2. Indoor Unit: The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.
  - 3. Unit Cabinet:
    - a. The cabinet shall be space-saving ceiling recessed.
    - b. The cabinet panel shall have provisions for a field installed filtered outside air intake.
    - c. Branch ducting shall be allowed from cabinet.
    - d. The one-way grille shall be fixed to bottom of cabinet allowing for one-way airflow.
  - 4. Fan:
    - a. The indoor fan shall be an assembly with one line-flow fan direct driven by a single motor.
    - b. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
    - c. The indoor fan shall consist of four (4) speeds, Low, Mid1, Mid2, and High.
  - 5. Filter: Return air shall be filtered by means of a long-life washable permanent filter.
  - 6. Coil:
    - a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
    - b. The tubing shall have inner grooves for high efficiency heat exchange.
    - c. All tube joints shall be brazed with phos-copper or silver alloy.
    - d. The coils shall be pressure tested at the factory.
    - e. A condensate pan and drain shall be provided under the coil.
    - f. The unit shall be provided with an integral condensate lift mechanism able to raise drain water 23 inches above the condensate pan.
    - g. Both refrigerant lines to the PMFY indoor units shall be insulated in accordance with the installation manual.

- 7. Electrical:
  - a. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
  - b. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).
- 8. Controls:
  - a. This unit shall use controls provided by VRF system manufacturer to perform functions necessary to operate the system. Please refer to Part 5 of this guide specification for details on controllers and other control options.
  - b. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
  - c. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with  $1.8^{\circ}F 9.0^{\circ}F$  adjustable dead-band from set point.
  - d. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.
  - e. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.
- E. Ceiling-Concealed Ducted Indoor Unit:
  - 1. General: The unit shall be a ceiling-concealed ducted indoor fan coil design that mounts above the ceiling with a 2-position, field adjustable return and a fixed horizontal discharge supply and shall have a modulating linear expansion device. The unit shall be used with the appropriate outdoor unit and manufacturer controller. The unit shall support individual control using DDC controllers. The unit shall be suitable for use in plenums in accordance with UL1995 ed 4.
  - 2. Indoor Unit: The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.
  - 3. Unit Cabinet:
    - a. The unit shall be, ceiling-concealed, ducted.
    - b. The cabinet panel shall have provisions for a field installed filtered outside air intake.
  - 4. Fan:
    - a. The unit shall feature external static pressure settings from 0.14 to 0.60 in. WG.
    - b. The indoor unit fan shall be an assembly with one or two fan(s) direct driven by a

single motor.

- c. The indoor fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.
- d. The indoor fan shall consist of three (3) speeds, High, Mid, and Low plus the Auto-Fan function
- e. The indoor unit shall have a ducted air outlet system and ducted return air system.
- 5. Filter:
  - a. Return air shall be filtered by means of a standard factory installed return air filter.
  - b. Optional return filter box (rear or bottom placement) with high-efficiency filter shall be available for all indoor units.
- 6. Coil:
  - a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
  - b. The tubing shall have inner grooves for high efficiency heat exchange.
  - c. All tube joints shall be brazed with phos-copper or silver alloy.
  - d. The coils shall be pressure tested at the factory.
  - e. A condensate pan and drain shall be provided under the coil.
  - f. The condensate shall be gravity drained from the fan coil.
  - g. Both refrigerant lines to the indoor units shall be insulated in accordance with the installation manual.
- 7. Electrical:
  - a. The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
  - b. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).
- 8. Controls:
  - a. This unit shall use controls provided by VRF system manufacturer to perform functions necessary to operate the system.
  - b. Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
  - c. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with  $1.8^{\circ}F 9.0^{\circ}F$  adjustable dead-band from set point.
  - d. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.
  - e. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

- F. Controls:
  - 1. Overview:
    - a. General: The Controls Network shall be capable of supporting remote controllers.
  - 2. Electrical Characteristics
    - a. General: The Controls Network shall operate at 30VDC. Controller power and communications shall be via a common non-polar communications bus.
    - b. Wiring:
      - 1) Control wiring shall be installed in a daisy chain configuration from indoor unit to indoor unit, to the branch controller (main and subs, if applicable) and to the outdoor unit. Control wiring to remote controllers shall be run from the indoor unit terminal block to the controller associated with that unit.
      - 2) Control wiring for the remote controller shall be from the remote controller to the first associated indoor unit (TB-5) M-NET connection. The remote controller shall be assigned an M-NET address.
      - 3) Control wiring for the remote controllers shall be from the remote controller (receiver) to the first associated indoor unit (TB-15) then to the remaining associated indoor units (TB-15) in a daisy chain configuration.
    - c. Wiring Type:
      - 1) Wiring shall be 2-conductor (16 AWG), twisted, stranded, shielded wire as defined by the Diamond System Builder output.
      - 2) Network wiring shall be CAT-5 with RJ-45 connection.
  - 3. Controls Network:
    - a. The Controls Network consists of stand-alone remote controllers. The Controls Network shall support operation monitoring, scheduling, occupancy, error email distribution, personal web browsers, tenant billing, online maintenance support, and integration with Building Management Systems (BMS) using either LonWorks® or BACnet® interfaces. The below figure illustrates a sample Controls Network System Configuration.
    - b. Controls Network System Configuration:
      - 1) Remote Controllers: Backlit Simple Remote Controller:
        - a) The Backlit Simple Remote Controller shall be capable of controlling up to 16 indoor units (defined as 1 group). The Backlit Simple Remote Controller shall be compact in size, approximately 3" x 5" and have limited user functionality. The Backlit Simple supports temperature display selection of Fahrenheit or Celsius. The Backlit Simple Remote Controller shall allow the user to change on/off, mode (cool, heat, auto, dry, setback and fan), temperature setting, and fan speed setting and airflow direction. The Backlit Simple Remote Controller shall be able to limit the set temperature range from the Backlit Simple Remote Controller. The Backlit Simple Remote controller shall be controller of night setback control with upper and lower set temperature settings. The room temperature shall be sensed at either the Backlit Simple Remote Controller or the Indoor Unit dependent on the indoor unit dipswitch setting. The Backlit Simple Remote Controller shall be sensed at either the Backlit Simple Remote controller setting. The Backlit Simple Remote Controller shall be sensed at either the Backlit Simple Remote controller setting. The Backlit Simple Remote Controller shall be sensed at either the Backlit Simple Remote Controller setting. The Backlit Simple Remote Controller shall be sensed at either the Backlit Simple Remote controller setting. The Backlit Simple Remote Controller shall be sensed at either the Backlit Simple Remote controller setting. The Backlit Simple Remote Controller shall be sensed at either the Backlit Simple Remote controller setting. The Backlit Simple Remote Controller shall be sensed at either the Backlit Simple Remote Controller setting. The Backlit Simple Remote Controller shall display a four-digit error code in

the event of system abnormality/error.

- b) The Backlit Simple Remote Controller shall only be used in same group with Wireless Remote Controllers or with other Backlit Simple Remote Controllers, with up to two remote controllers per group.
- c) The Backlit Simple Remote Controller shall require no addressing. The Backlit Simple Remote Controller shall connect using two-wire, stranded, non-polar control wire to TB15 connection terminal on the indoor unit. The Simple Remote Controller shall require cross-over wiring for grouping across indoor units.

Backlit Simple Remote Controller					
Item	Description	Operatio n	Display		
ON/OFF	Run and stop operation for a single group	Each Group	Each Group		
Operation Mode	Switches between Cool/Drying/Auto/Fan/Heat/Setback. Operation modes vary depending on the air conditioner unit. Auto and Setback mode are available.	Each Group	Each Group		
Temperature Setting	Sets the temperature from 40°F – 95°F depending on operation mode and indoor unit. Separate COOL and HEAT mode set points available depending on central controller and connected mechanical equipment.	Each Group	Each Group		
Fan Speed Setting	Available fan speed settings depending on indoor unit.	Each Group	Each Group		
Air Flow Direction Setting	Air flow direction settings vary depending on the indoor unit model.	Each Group	Each Group		
Permit / Prohibit Local Operation	Individually prohibit operation of each local remote control function (Start/Stop, Change operation mode, Set temperature, Reset filter). *1: Centrally Controlled is displayed on the remote controller for prohibited functions.	N/A	Each Group *1		
Display Indoor Unit Intake Temp	Measures and displays the intake temperature of the indoor unit when the indoor unit is operating.	N/A	Each Group		
Display Backlight	Pressing the button lights up a backlight. The light automatically turns off after a certain period of time. (The brightness settings can be selected from Bright, Dark, and Light off.)		Each Unit		
Error When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed		N/A	Each Unit		

Backlit Simple Remote Controller					
Item	Description	Operatio n	Display		
Test Run	Operates air conditioner units in test run mode. *2 The display for test run mode will be the same as for normal start/stop (does not display "test run").	Each Group	Each Group *2		
Ventilation Equipment	Up to 16 indoor units can be connected to an interlocked system that has one ventilation unit.	Each Group	N/A		
Set Temperature Range Limit	Set temperature range limit for cooling, heating, or auto mode.	Each Group	Each Group		

- 4. Input/Output (I/O) Boards:
  - a. Advanced HVAC Controller (AHC): The AHC shall be capable of providing programmable binary and analog inputs and outputs to control general equipment in conjunction with indoor unit functions and states. Input and output states and values shall be monitored through the Central Controller or the Remote controller. The remote controller shall be able to adjust temperature and humidity set points for equipment controlled by the AHC. In addition to analog and binary inputs the AHC can monitor M-NET equipment states and sensor values. Available inputs include room temperature, room humidity, occupancy, brightness, outdoor temperature, inlet/outlet water temperature (PWFY), on/off state, mode, ventilation on/off, error status. In addition to programmable analog and binary outputs, the AHC can control indoor unit on/off, mode, temperature set point, fan speed, ERV on/off and ERV fan speed.
  - b. Digital Input Digital Output (DIDO) Board:
    - The DIDO board shall be capable of providing On/Off control for equipment from another manufacturer via the Centralized Controller's licensed web browser functions, the touch screen of the Centralized Controller, the interlock function of the Centralized Controller and the software. Each DIDO board shall have two digital inputs and two digital outputs. Each digital output shall be capable of supporting an independent schedule via the Centralized Controller's web browser functions and the software. Status indication of the On/Off state of the non-Mitsubishi Electric equipment shall be either via the On/Off status of the digital output or by receipt of a digital input to the DIDO board.
    - 2) The DIDO board shall be capable of receiving a digital input for interlock settings with the indoor units or digital outputs on the DIDO board. Based on the digital input status the DIDO board shall be capable of setting the following parameter on the indoor unit On/Off, Mode, and Set Temperature to predefined settings. The DIDO board shall also be capable of interlocking the On/Off state of a digital output on the DIDO board based on an onboard channel digital input status or a free contact input status from system indoor units.
  - c. Analog Input (AI) Board:
    - 1) The AI board shall be capable of monitoring temperature or humidity via the

Centralized Controller's web browser functions and the. Each AI board shall have two analog inputs. Each input shall be capable of receiving a 4/20mA, 0/10 VDC, or 1/5 VDC signal for monitoring temperature or humidity. The AI board shall be capable of monitoring the temperature or humidity input and shall be capable of displaying graphical trending of the temperature or humidity values via the Centralized Controller's web browser functions and the software. Notification of user adjustable high and low-level alarms shall be capable of being emailed to distribution list or outputted via a digital output.

- 2) The AI board shall be capable of setting the following parameters on the indoor unit On/Off, Mode, and Set Temperature to predefined settings based on the input value of the temperature or humidity. The AI board shall also be capable of interlocking the On/Off state of a digital output on the input value of the temperature or humidity.
- G. The complete VRF system shall be as manufactured by Mitsubishi (basis of design), LG, Toshiba, or approved equal.

## 2.17 VIBRATION ISOLATION AND SEISMIC RESTRAINTS FOR HVAC SYSTEMS

### A. General:

- 1. Intent:
  - a. All mechanical equipment, piping and ductwork as noted on the equipment schedule or in the specification shall be mounted on vibration isolators to prevent the transmission of vibration and mechanically transmitted sound to the building structure. Vibration isolators shall be selected in accordance with the weight distribution so as to produce reasonably uniform deflections.
  - b. All isolators and isolation materials shall be of the same manufacturer and shall be certified by the manufacturer.
  - c. It is the intent of the seismic portion of this specification to keep all mechanical and electrical building system components in place during a seismic event.
  - d. All such systems must be installed in strict accordance with seismic codes, component manufacturer's recommendations and building construction standards. Whenever a conflict occurs between the manufacturer's recommendations or construction standards, the most stringent shall apply.
  - e. This specification is considered to be minimum requirements for seismic consideration and is not intended as a substitute for legislated, more stringent, national, state or local construction requirements (i.e. California Title 24, California OSHPD, Canadian Building Codes, or other requirements).
  - f. Any variance or non-compliance with these specification requirements shall be corrected by the contractor in an approved manner.
- 2. The work of this section includes but is not limited to the following:
  - a. Vibration isolation elements.
  - b. Equipment isolation bases.

- c. Piping flexible connections.
- d. Seismic restraints for isolated and non-isolated mechanical and electrical items.
- e. Certification of seismic restraint designs and installation supervision.
- f. Certification of seismic attachment of housekeeping pads.
- g. All Mechanical and Electrical systems. Equipment buried underground is excluded but entry of services through the foundation wall is included.
- 3. Qualifications:
  - a. Only firms having five years' experience designing and manufacturing seismic devices shall be capable of work in this specification.
- 4. Definitions:
  - a. Life Safety Systems:
    - 1) All systems involved with fire protection including sprinkler piping, fire pumps, jockey pumps, fire pump control panels, service water supply piping, water tanks, fire dampers and smoke exhaust systems.
    - 2) All systems involved with and/or connected to emergency power supply including all generators, transfer switches, transformers and all flow paths to fire protection and/or emergency lighting systems.
    - 3) All medical and life support systems.
    - 4) Fresh air relief systems on emergency control sequence including air handlers, conduit, duct, dampers, etc.
  - b. Positive Attachment:
    - A positive attachment is defined as a cast-in anchor, a drill-in wedge anchor, a double sided beam clamp loaded perpendicular to a beam, or a welded or bolted connection to structure. Single sided "C" type beam clamps for support rods of overhead piping, ductwork, fire protection, electrical conduit, bus duct, or cable trays, or any other equipment are not acceptable on this project as seismic anchor points.
  - c. Transverse Bracing:
    - 1) Restraint(s) applied to limit motion perpendicular to the centerline of the pipe, duct or conduit.
  - d. Longitudinal Bracing:
    - 1) Restraint(s) applied to limit motion parallel to the centerline of the pipe, duct or conduit.
  - e. Failure:
    - For the purposes of this project, failure is defined as the discontinuance of any attachment point between equipment or structure, vertical permanent deformation greater than 1/8" (3mm) and/or horizontal permanent deformation greater than 1/4" (6mm).
- 5. Submittals:
  - a. Submittal material shall include copies of descriptive data for all products and materials including but not limited to the following:
    - 1) Descriptive Data:
      - a) Catalog cuts or data sheets on vibration isolators and specific restraints

detailing compliance with the specification.

- b) An itemized list showing the items to be isolated and/or seismically restrained, product type or model number to be used and loading and deflection data.
- 2) Shop Drawings:
  - a) Submit fabrication details for equipment bases including dimensions, structural member sizes and support point locations.
  - b) Provide Drawings showing methods of suspension and support guides for conduit, piping, ductwork and ceiling hung equipment.
  - c) Where walls, floors, slabs or supplementary steel work are used for seismic restraint locations, details of acceptable attachment methods for ducts, conduit and pipe must be included and approved before the condition is accepted for installation. Restraint manufacturers' submittals must include spacing, static loads and seismic loads at all attachment and support points.
  - d) Provide specific details of seismic restraints and anchors; include number, size and locations for each piece of equipment.
  - e) Drawings showing methods for isolation of conduits, pipes and ductwork penetrating walls and floor slabs.
  - f) Specific details of restraints including anchor bolts for mounting and maximum loading at each location, for each piece of equipment and/or pipe and duct locations.
- 3) Seismic Certification and Analysis:
  - a) Seismic restraint calculations must be provided for all connections of equipment to the structure. Calculations must be stamped by a registered professional engineer with at least five years of seismic design experience, licensed in the state of the job location.
  - b) All restraining devices shall have a preapproval number from California OSHPD or some other recognized government agency showing maximum restraint ratings. Preapprovals based on independent testing are preferred to preapprovals based on calculations. Where preapproved devices are not available, submittals based on independent testing are preferred. Calculations (including the combining of tensile and shear loadings) to support seismic restraint designs must be stamped by a registered professional engineer with at least five years of seismic design experience and licensed in the state of the job location. Testing and calculations must include both shear and tensile loads as well as one test or analysis at 45 degrees to the weakest mode.
  - c) Analysis must indicate calculated dead loads, static seismic loads and capacity of materials utilized for connections to equipment and structure. Analysis must detail anchoring methods, bolt diameter, embedment and/or welded length. All seismic restraint devices shall be designed to accept, without failure, the forces detailed in section 1.06 acting through the equipment center of gravity. Overturning moments may exceed forces at ground level.

- 6. Contractor's Responsibilities:
  - a. Contractor to have the following responsibilities:
    - 1) Determine vibration isolation and seismic restraint sizes and locations per specifications.
    - 2) Provide and install isolation systems and seismic restraints as scheduled or specified.
    - 3) Guarantee specified isolation system deflection.
    - 4) Provide installation instructions, drawings and field supervision to assure proper installation and performance.
    - 5) Provide installation instructions, drawings and trained field supervision to insure proper installation and performance.
    - 6) Substitution of "Internally Isolated" mechanical equipment in lieu of the specified isolation of this section is acceptable.
- 7. Seismic Force Levels:
  - a. Installations shall be designed to safely accept external forces determined in accordance with the International Building Code –2009, Section 16 in any direction for all rigidly supported equipment without failure and permanent displacement of the equipment. Seismic restraints shall not short circuit vibration isolation systems or transmit objectionable vibration or noise.
- 8. Project Record Documents:
  - a. Submit under provision of Division 1.
  - b. Record actual locations and installation of vibration isolators and seismic restraints including attachment points.
- B. Products:
  - 1. Manufacturers:
    - a. Mason Industries Inc. (basis for model numbers listed below).
    - b. Vibration Eliminator Co.
    - c. Amber/Booth Co.
  - 2. Product Descriptions:
    - a. Vibration Isolators and Seismic Restraint Specifications:
      - 1) Specification 1 Neoprene Pad:
        - a) Two layers of 3/4" (19mm) thick neoprene pad consisting of 2" (50mm) square waffle modules separated horizontally by a 16 (1.5mm) gauge galvanized shim. Load distribution plates shall be used as required.
        - b) Pads shall be Type Super "W" as manufactured by Mason Industries, Inc.
      - 2) Specification 2 Bridge-Bearing Neoprene Mountings:
        - a) Bridge-bearing neoprene mountings shall have a minimum static deflection of 0.2" (5mm) and all directional seismic capability. The mount shall consist of a ductile iron casting containing two separated and opposing molded neoprene elements. The elements shall prevent the central threaded sleeve and attachment bolt from contacting the casting

during normal operation. The shock absorbing neoprene materials shall be compounded to bridge-bearing specifications. Mountings shall have an Anchorage Preapproval "R" Number from OSHPD in the State of California verifying the maximum certified horizontal and vertical load ratings.

- b) Mountings shall be Type BR as manufactured by Mason Industries, Inc.
- 3) Specification 3 Bushing Assemblies:
  - a) Sheet metal panels shall be bolted to the walls or supporting structure by assemblies consisting of a neoprene bushing cushioned between 2 steel sleeves. The outer sleeve prevents the sheet metal from cutting into the neoprene. Enlarge panel holes as required. Neoprene elements pass over the bushing to cushion the back panel horizontally. A steel disc covers the inside neoprene element and the inner steel sleeve is elongated to act as a stop so tightening the anchor bolts does not interfere with panel isolation in 3 planes. Bushing assemblies can be applied to the ends of steel cross members where applicable. All neoprene shall be bridge bearing quality.
  - b) Bushing assemblies shall be type PB as manufactured by Mason Industries, Inc.
- 4) Specification 4 Neoprene Bushing:
  - a) A one piece molded bridge bearing neoprene washer/bushing. The bushing shall surround the anchor bolt and have a flat washer face to avoid metal to metal contact.
  - b) Neoprene bushings shall be type HG as manufactured by Mason Industries, Inc.
- 5) Specification 5 Spring Isolators:
  - a) Spring isolators shall be free standing and laterally stable without any housing and complete with a molded neoprene cup or 1/4" (6mm) neoprene acoustical friction pad between the baseplate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be no less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection. Submittals shall include spring diameters, deflection, compressed spring height and solid spring height.
  - b) Mountings shall be Type SLF as manufactured by Mason Industries, Inc.
- 6) Specification 6 Restrained Spring Mountings:
  - a) Restrained spring mountings shall have an SLF mounting as described in Specification 5, within a rigid housing that includes vertical limit stops to prevent spring extension when weight is removed. The housing shall serve as blocking during erection. A steel spacer shall be removed after adjustment. Installed and operating heights are equal. A minimum clearance of 1/2" (12mm) shall be maintained around restraining bolts and between the housing and the spring so as not to interfere with the spring action. Limit stops shall be out of contact during normal operation. Since housings will be bolted or welded in position there must be an internal isolation pad. Housing shall be designed to resist all seismic forces.

Mountings shall have Anchorage Preapproval "R" Number from OSHPD in the state of California certifying the maximum certified horizontal and vertical load ratings.

- b) Mountings shall be SLR as manufactured by Mason Industries, Inc.
- 7) Specification 7 Spring Mountings:
  - a) Spring mountings as in specification 5 built into a ductile iron or steel housing to provide all directional seismic snubbing. The snubber shall be adjustable vertically and allow a maximum of 1/4" (6mm) travel in all directions before contacting the resilient snubbing collars. Mountings shall have an Anchorage Preapproval "R" number from OSHPD in the State of California verifying the maximum certified horizontal and vertical load ratings.
  - b) Mountings shall be SSLFH as manufactured by Mason Industries, Inc.
- 8) Specification 8 Air Springs:
  - a) Air Springs shall be manufactured with upper and lower steel sections connected by a replaceable flexible nylon reinforced neoprene element. Air spring configuration shall be multiple bellows to achieve a maximum natural frequency of 3 Hz. Air Springs shall be designed for a burst pressure that is a minimum of three times the published maximum operating pressure. All air spring systems shall be connected to either the building control air or a supplementary air supply and equipped with three leveling valves to maintain leveling within plus or minus 1/8" (3mm). Submittals shall include natural frequency, load and damping tests performed by an independent lab or acoustician.
  - b) Air Springs shall be Type MT and leveling valves Type LV as manufactured by Mason Industries, Inc.
- 9) Specification 9 Restrained Air Springs:
  - a) Restrained air spring mountings shall have an MT air spring as described in Specification 8, within a rigid housing that includes vertical limit stops to prevent air spring extension when weight is removed. The housing shall serve as blocking during erection. A steel spacer shall be removed after adjustment. Installed and operating heights are equal. A minimum clearance of 1/2" (12mm) shall be maintained around restraining bolts and between the housing and the air spring so as not to interfere with the air spring action. Limit stops shall be out of contact during normal operation. Housing shall be designed to resist all seismic forces.

b) Mountings shall be SLR-MT as manufactured by Mason Industries, Inc.

- 10) Specification 10 Hangers:
  - a) Hangers shall consist of rigid steel frames containing minimum 1 1/4"
    (32mm) thick neoprene elements at the top and a steel spring with general characteristics as in specification 5 seated in a steel washer reinforced neoprene cup on the bottom. The neoprene element and the cup shall have neoprene bushings projecting through the steel box. To maintain stability the boxes shall not be articulated as clevis hangers nor the neoprene element stacked on top of the spring. Spring diameters and hanger box lower hole sizes shall be large enough to permit the hanger rod to swing

through a 30o arc from side to side before contacting the rod bushing and short circuiting the spring. Submittals shall include a hanger drawing showing the 30o capability.

- b) Hangers shall be type 30N as manufactured by Mason Industries, Inc.
- 11) Specification 11 Hangers:
  - a) Hangers shall be as described in 10, but they shall be pre-compressed and locked at the rated deflection by means of a resilient seismic upstop to keep the piping or equipment at a fixed elevation during installation. The hangers shall be designed with a release mechanism to free the spring after the installation is complete and the hanger is subjected to its full load. Deflection shall be clearly indicated by means of a scale. Submittals shall include a drawing of the hanger showing the 30o capability.
  - b) Hangers shall be type PC30N as manufactured by Mason Industries, Inc.
- 12) Specification 12 Seismic Cable Restraints:
  - a) Seismic Cable Restraints shall consist of galvanized steel aircraft cables sized to resist seismic loads with a minimum safety factor of two and arranged to provide all-directional restraint. Cables must be prestretched to achieve a certified minimum modulus of elasticity. Cable end connections shall be steel assemblies that swivel to final installation angle and utilize two clamping bolts to provide proper cable engagement. Cables must not be allowed to bend across sharp edges. Cable assemblies shall have an Anchorage Preapproval "R" Number from OSHPD in the State of California verifying the maximum certified load ratings.
  - b) Cable assemblies shall be Type SCB at the ceiling and at the clevis bolt, SCBH between the hanger rod nut and the clevis or SCBV if clamped to a beam all as manufactured by Mason Industries, Inc.
- 13) Specification 13 Seismic Solid Braces:
  - a) Seismic solid braces shall consist of steel angles or channels to resist seismic loads with a minimum safety factor of 2 and arranged to provide all directional restraint. Seismic solid brace end connectors shall be steel assemblies that swivel to the final installation angle and utilize two through bolts to provide proper attachment. Seismic solid brace assembly shall have anchorage preapproval "R" number from OSHPD in the state of California verifying the maximum certified load ratings.
  - b) Solid seismic brace assemblies shall be type SSB as manufactured by Mason Industries, Inc.
- 14) Specification 14 Rod Clamp Assemblies:
  - a) Steel angles, sized to prevent buckling, shall be clamped to pipe or equipment rods utilizing a minimum of three ductile iron clamps at each restraint location when required. Welding of support rods is not acceptable. Rod clamp assemblies shall have an Anchorage Preapproval "R" Number from OSHPD in the State of California.
  - b) Rod clamp assemblies shall be Type SRC as manufactured by Mason Industries, Inc.
- 15) Specification 15 Clevis Hanger Cross Brace:
  - a) Pipe clevis cross bolt braces are required in all restraint locations. They

shall be special purpose preformed channels deep enough to be held in place by bolts passing over the cross bolt. Clevis cross braces shall have an Anchorage Preapproval "R" Number from OSHPD in the State of California.

- b) Clevis cross brace shall be type CCB as manufactured by Mason Industries, Inc.
- 16) Specification 16 All-Directional Seismic Snubbers:
  - a) All-directional seismic snubbers shall consist of interlocking steel members restrained by a one-piece molded neoprene bushing of bridge bearing neoprene. Bushing shall be replaceable and a minimum of 1/4" (6mm) thick. Rated loadings shall not exceed 1000 psi (.7kg/mm2). A minimum air gap of 1/8" (3mm) shall be incorporated in the snubber design in all directions before contact is made between the rigid and resilient surfaces. Snubber end caps shall be removable to allow inspection of internal clearances. Neoprene bushings shall be rotated to insure no short circuits exist before systems are activated. Snubbers shall have an Anchorage Preapproval "R" Number from OSHPD in the State of California verifying the maximum certified horizontal and vertical load ratings.
  - b) Snubber shall be Type Z-1225 as manufactured by Mason Industries, Inc.
- 17) Specification 17 All-Directional Seismic Snubbers:
  - a) All directional seismic snubbers shall consist of interlocking steel members restrained by shock absorbent rubber materials compounded to bridge bearing specifications. Elastomeric materials shall be replaceable and a minimum of 3/4" (19mm) thick. Rated loadings shall not exceed 1000 psi (.7kg/mm2). Snubbers shall be manufactured with an air gap between hard and resilient material of not less than 1/8" (3mm) nor more than 1/4" (6mm). Snubbers shall be installed with factory set clearances. The capacity of the seismic snubber at 3/8" (9mm) deflection shall be equal or greater than the load assigned to the mounting grouping controlled by the snubber multiplied by the applicable "G" force. Submittals shall include the load deflection curves up to 1/2" (12mm) deflection in the x, y and z planes. Snubbers shall have an anchorage preapproval "R" number from OSHPD in the state of California verifying the maximum certified horizontal and vertical load ratings.
  - b) Snubbers shall be series Z-1011 as manufactured by Mason Industries, Inc.
- 18) Specification 18 Stud Wedges:
  - a) Stud wedge anchors shall be manufactured from full diameter wire, not from undersized wire that is "rolled up" to create the thread. The stud anchor shall also have a safety shoulder which fully supports the wedge ring under load. The stud anchors shall have an evaluation report number from the I.C.B.O Evaluation Service, Inc. verifying its allowable loads.
  - b) Drill-in stud wedge anchors shall be type SAS as manufactured by Mason Industries, Inc.

- 19) Specification 19 Female Wedge Anchors:
  - a) Female wedge anchors are preferred in floor locations so isolators or equipment can be slid into place after the anchors are installed. Anchors shall be manufactured from full diameter wire, and shall have a safety shoulder to fully support the wedge ring under load. Female wedge anchors shall have an evaluation report number from the I.C.B.O Evaluation Service, Inc. verifying to its allowable loads.
  - b) Drill-in female wedge anchors shall be type SAB as manufactured by Mason Industries, Inc.
- 20) Specification 20 Equipment Bases:
  - a) Vibration isolation manufacturer shall furnish integral structural steel bases. Rectangular bases are preferred for all equipment. Centrifugal refrigeration machines and pump bases may be T or L shaped where space is a problem.

Pump bases for split case pump shall include supports for suction and discharge elbows. All perimeter members shall be steel beams with a minimum depth equal to 1/10 of the longest dimension of the base. Base depth need not exceed 14" (350mm) provided that the deflection and misalignment is kept within acceptable limits as determined by the manufacturer. Height saving brackets shall be employed in all mounting locations to provide a base clearance of 1" (25mm).

- b) Bases shall be type WF as manufactured by Mason Industries, Inc.
- 21) Specification 21 Inertia Foundations:
  - a) Vibration isolation manufacturer shall furnish rectangular steel concrete pouring forms for floating and inertia foundations. Bases for split case pumps shall be large enough to provide for suction and discharge elbows. Bases shall be a minimum of 1/12 of the longest dimension of the base but not less than 6" (150mm). The base depth need not exceed 12" (300mm) unless specifically recommended by the base manufacturer for mass or rigidity. Forms shall include minimum concrete reinforcing consisting of 1/2" (12mm) bars welded in place on 6" (150mm) centers running both ways in a layer 1 1/2" (38mm) above the bottom. Forms shall be furnished with steel templates to hold the anchor bolts sleeves and anchors while concrete is being poured. Height saving brackets shall be employed in all mounting locations to maintain a 1" (25mm) clearance below the base. Wooden formed bases leaving a concrete rather than a steel finish are not acceptable.

b) Base shall be type BMK or K as manufactured by Mason Industries, Inc. 22) Specification 22 – Curbs:

a) Curb mounted rooftop equipment shall be mounted on spring isolation curbs. The lower member shall consist of a sheet metal Z section containing adjustable and removable steel springs that support the upper floating section. The upper frame must provide continuous support for the equipment and must be captive so as to resiliently resist wind and seismic forces. All directional neoprene snubber bushings shall be a minimum of 1/4" (6mm) thick. Steel springs shall be laterally stable and rest on 1/4" (6mm) thick neoprene acoustical pads. Hardware must be plated and the springs provided with a rust resistant finish. The curbs waterproofing shall consist of a continuous galvanized flexible counter flashing nailed over the lower curbs waterproofing and joined at the corners by EPDM bellows. All spring locations shall have access ports with removable waterproof covers. Lower curbs shall have provision for 2" (50mm) of insulation. The roof curbs shall be built to seismically contain the rooftop unit. The unit must be solidly fastened to the top floating rail, and the lower Z section anchored to the roof structure. Curb shall have anchorage preapproval "R" from OSHPD in the state of California attesting to the maximum certified horizontal and vertical load ratings.

b) Curb shall be type RSC as manufactured by Mason Industries, Inc.

- 23) Specification 23 Expansion Joints:
  - a) Flexible spherical expansion joints shall employ peroxide cured EPDM in the covers, liners and Kevlar7 tire cord frictioning. Any substitutions must have equal or superior physical and chemical characteristics. Solid steel rings shall be used within the raised face rubber flanged ends to prevent pullout. Flexible cable bead wire is not acceptable. Sizes 2" (50mm) and larger shall have two spheres reinforced with a ductile iron external ring between spheres. Flanges shall be split ductile iron or steel with hooked or similar interlocks. Sizes 16" (400mm) to 24" (600mm) may be single sphere. Sizes 3/4" (19mm) to 1 2" (38mm) may have threaded two piece bolted flange assemblies, one sphere and cable retention. Connectors shall be rated at 250 psi (1.72MPa) up to 1700 F (77oC) with a uniform drop in allowable pressure to 215 psi (1.48MPa)at 2500 F (121oC) in sizes through 14"(350mm). 16" (400mm) through 24" (600mm) single sphere minimum ratings are 180 psi (1.24MPa) at 1700 F (77oC) and 150 psi (1.03 MPa) at 250o F (121oC). Higher rated connectors may be used to accommodate service conditions. All expansion joints must be factory tested to 150% of rated pressure for 12 minutes before shipment. Safety factors to burst and flange pullout shall be a minimum of 3/1. Concentric reducers to the above ratings may be substituted for equal ended expansion joints.
  - b) Expansion joints shall be installed in piping gaps equal to the length of the expansion joints under pressure. Control rods need only be used in unanchored piping locations where the manufacturer determines the installation exceeds the pressure requirement without control rods. If control rods are used, they must have 2" (12mm) thick Neoprene washer bushings large enough in diameter to take the thrust at 1000 psi (.7 kg/mm2) maximum on the washer area.
  - c) Submittals shall include two test reports by independent consultants showing minimum reductions of 20 DB in vibration accelerations and 10 DB in sound pressure levels at typical blade passage frequencies on this or a similar product by the same manufacturer. All expansion joints shall be installed on the equipment side of the shut off valves.
  - d) Expansion joints shall be SAFEFLEX SFDEJ, SFEJ, SFDCR or SFU and
Control Rods CR as manufactured by Mason Industries, Inc.

- 24) Specification 24 Flexible Stainless Steel Hoses
  - a) Flexible stainless steel hose shall have stainless steel braid and carbon steel fittings. Sizes 3" (75mm) and larger shall be flanged. Smaller sizes shall have male nipples. Minimum lengths shall be as tabulated:

Flar	nged	Male Nipples				
3 x 14	10 x 26	1/2 x 9	1 1/2 x 13			
4 x 15	12 x 28	3/4 x 10	2 x 14			
5 x 19	14 x 30	1 x 11	2 1/2 x 18			
6 x 20	16 x 32	1 1/4 x 12				
8 x 22						

b) Hoses shall be installed on the equipment side of the shut-off valves horizontally and parallel to the equipment shafts wherever possible.

c) Hoses shall be type BSS as manufactured by Mason Industries, Inc.

25) Specification 25 - All-Directional Acoustical Pipe Anchor:

- a) All-directional acoustical pipe anchor, consisting of two sizes of steel tubing separated by a minimum 1/2" (12mm) thick 60 durometer neoprene. Vertical restraint shall be provided by similar material arranged to prevent vertical travel in either direction. Allowable loads on the isolation material should not exceed 500 psi (.35 kg/mm2) and the design shall be balanced for equal resistance in any direction.
- b) All-directional anchors shall be type ADA as manufactured by Mason Industries, Inc.

26) Specification 26 – Pipe Guides:

a) Pipe guides shall consist of a telescopic arrangement of two sizes of steel tubing separated by a minimum 1/2" (12mm) thickness of 60 durometer neoprene. The height of the guides shall be preset with a shear pin to allow vertical motion due to pipe expansion or contraction. Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of +15/8" (41mm) motion, or to meet location requirements.

b) Pipe guides shall be type VSG as manufactured by Mason Industries, Inc. 27) Specification 27 - Split Wall Seals:

a) Split Wall Seals consist of two bolted pipe halves with minimum 3/4" (19mm) thick neoprene sponge bonded to the inner faces. The seal shall be tightened around the pipe to eliminate clearance between the inner sponge face and the piping. Concrete may be packed around the seal to make it integral with the floor, wall or ceiling if the seal is not already in place around the pipe prior to the construction of the building member. Seals shall project a minimum of l" (25mm) past either face of the wall. Where temperatures exceed 2400 F (115oC), 10# (4.5kg) density fiberglass may be used in lieu of the sponge.

- b) Seals shall be Type SWS as manufactured by Mason Industries, Inc.
- 28) Specification 28 Horizontal Thrust Restraint:
  - a) The horizontal thrust restraint shall consist of a spring element in series with a neoprene molded cup as described in specification 5 with the same deflection as specified for the mountings or hangers. The spring element shall be designed so it can be preset for thrust at the factory and adjusted in the field to allow for a maximum of 1/4" (6mm) movement at start and stop. The assembly shall be furnished with 1 rod and angle brackets for attachment to both the equipment and the duct work or the equipment and the structure. Horizontal restraints shall be attached at the centerline of thrust and symmetrical on either side of the unit.
  - b) Horizontal thrust restraints shall be type WBI/WBD as manufactured by Mason Industries, Inc.

# C. Execution:

- 1. General:
  - a. Vibration isolators and seismic restraint systems shall control excessive noise and vibration in the buildings due to the operation of machinery or equipment, and/or due to interconnected piping, ductwork, or conduit. [The installation of all vibration isolators and seismic restraint units, and associated hangers and bases, shall be under the direct supervision of the vibration isolation manufacturer's representative.]
  - b. All vibration isolators and seismic restraint systems must be installed in strict accordance with the manufacturers written instructions and all certified submittal data.
  - c. Installation of vibration isolators and seismic restraints must not cause any change of position of equipment, piping or ductwork resulting in stresses or misalignment.
  - d. No rigid connections between equipment and the building structure shall be made that degrades the noise and vibration control system herein specified.
  - e. The contractor shall not install any equipment, piping, duct or conduit that makes rigid connections with the building unless isolation is not specified. "Building" includes, but is not limited to, slabs, beams, columns, studs and walls.
  - f. Coordinate work with other trades to avoid rigid contact with the building.
  - g. Any conflicts with other trades that will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions should be brought to the architects/engineers attention prior to installation. Corrective work necessitated by conflicts after installation shall be at the responsible contractor's expense.
  - h. Bring to the architects/engineers attention any discrepancies between the specifications and the field conditions or changes required due to specific equipment selection, prior to installation. Corrective work necessitated by discrepancies after installation shall be at the responsible contractor's expense.
  - i. Correct, at no additional cost, all installations that are deemed defective in workmanship and materials at the contractor's expense.

- j. Overstressing of the building structure must not occur because of overhead support of equipment. Contractor must submit loads to the structural engineer of record for approval. Generally bracing may occur from:
  - 1) Flanges of structural beams.
  - 2) Upper truss cords in bar joist construction.
  - 3) Cast in place inserts or wedge type drill-in concrete anchors.
- k. Specification 12 cable restraints shall be installed slightly slack to avoid short circuiting the isolated suspended equipment, piping or conduit.
- 1. Specification 12 cable assemblies are installed taut on non-isolated systems. Specification 13 seismic solid braces may be used in place of cables on rigidly attached systems only.
- m. At locations where specification 12 or 13 restraints are located, the support rods must be braced when necessary to accept compressive loads with specification 14 braces.
- n. At all locations where specification 12 or 13 restraints are attached to pipe clevis's, the clevis cross bolt must be reinforced with specification type 15 braces.
- o. Drill-in concrete anchors for ceiling and wall installation shall be specification type 18, and specification type 19 female wedge type for floor mounted equipment.
- p. Vibration isolation manufacturer shall furnish integral structural steel bases as required. Independent steel rails are not permitted on this project. Each fan and motor assembly shall be supported on a single structural steel frame.
- q. Hand built elastomeric expansion joints may be used when pipe sizes exceed 24" or specified movements exceed specification 23 capabilities.
- r. Where piping passes through walls, floors or ceilings the vibration isolation manufacturer shall provide specification 27 wall seals.
- s. Air handling equipment and centrifugal fans shall be protected against excessive displacement which results from high air thrust in relation to the equipment weight. Horizontal thrust restraint shall be specification type 28 (see selection guide).
- t. Locate isolation hangers as near to the overhead support structure as possible.
- u. [Provide resiliently mounted equipment, piping, and ductwork with seismic snubbers. Each inertia base shall have minimum of four seismic snubbers located close to isolators. Snub equipment designated for post disaster use to 0.05 inch (1.5 mm) maximum clearance. Other snubbers shall have clearance between 0.15 inch (4 mm) and 0.25 inch (7 mm).]
- 2. Vibration Isolation and Seismic Restraint Installation:
  - a. Horizontal pipe isolation: The first three pipe hangers in the main lines near the mechanical equipment shall be as described in specification 11. Specification 11 hangers must also be used in all transverse braced isolated locations. Brace hanger rods with SRC clamps specification 14. Horizontal runs in all other locations throughout the building shall be isolated by hangers as described in specification 10. Floor supported piping shall rest on isolators as described in specification 6. Heat exchanger's and expansion tanks are considered part of the piping run. The first three isolators from the isolated equipment will have the same static deflection as specified for the mountings under the connected

equipment. If piping is connected to equipment located in basements and hangs from ceilings under occupied spaces the first three hangers shall have 0.75" (19mm) deflection for pipe sizes up to and including 3" (75mm), 1 1/2" (38mm) deflection for pipe sizes up to and including 6" (150mm), and 2 1/2" (64mm) deflection thereafter. Hangers shall be located as close to the overhead structure as practical. Where piping connects to mechanical equipment install specification 23 expansion joints or specification 24 stainless hoses if 23 is not suitable for the service.

- b. Riser isolation: Risers shall be suspended from specification 10 hangers or supported by specification 5 mountings, anchored with specification 25 anchors, and guided with specification 26 sliding guides. Steel springs shall be a minimum of 0.75" (19mm) except in those expansion locations where additional deflection is required to limit load changes to + 25% of the initial load. Submittals must include riser diagrams and calculations showing anticipated expansion and contraction at each support point, initial and final loads on the building structure, spring deflection changes and seismic loads. Submittal data shall include certification that the riser system has been examined for excessive stresses and that none will exist in the proposed design.
- c. [Building expansion joints: Install swing joints at piping crossing expansion joints and brace piping either side of the expansion joint.]
- d. Seismic Restraint of Piping:
  - 1) Seismically restrain all piping listed as a, b or c below. Use specification 12 cables if isolated. Specification 12 or 13 restraints may be used on unisolated piping.
    - a) Fuel oil piping, gas piping, medical gas piping, and compressed air piping that is 1" (25mm) I.D. or larger.
    - b) Piping located in boiler rooms, mechanical equipment rooms, and refrigeration equipment rooms that is 1 1/4" (32mm) I.D. and larger.
    - c) All other piping 2 1/2" (64mm) diameter and larger.
  - 2) Transverse piping restraints shall be at 40' (12m) maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.
  - 3) Longitudinal restraints shall be at 80' (24m) maximum spacing for all pipe sizes, except where lesser spacing is required to limit anchorage loads.
  - 4) Where thermal expansion is a consideration, guides and anchors may be used as transverse and longitudinal restraints provided they have a capacity equal to or greater than the restraint loads in addition to the loads induced by expansion or contraction.
  - 5) For fuel oil and all gas piping transverse restraints must be at 20' (6m) maximum and longitudinal restraints at 40' (12m) maximum spacing.
  - 6) Transverse restraint for one pipe section may also act as a longitudinal restraint for a pipe section of the same size connected perpendicular to it if the restraint is installed within 24" (600m) of the elbow or TEE or combined stresses are within allowable limits at longer distances.
  - 7) Hold down clamps must be used to attach pipe to all trapeze members before applying restraints in a manner similar to clevis supports.
  - 8) Branch lines may not be used to restrain main lines.

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- 9) Cast iron pipe of all types, glass pipe and any other pipes joined with a four band shield and clamp assembly in Zones 2B, 3 and 4 shall be braced as in sections 3.2.D.2 and 3. For Zones 0, 1 and 2A, 2 band clamps may be used with reduced spacings of 1/2 of those listed in sections 3.2.D.2 and 3.
- e. Vibration Isolation of Ductwork:
  - All discharge runs for a distance of 50' (15m) from the connected equipment shall be isolated from the building structure by means of specification 10 hangers or specification 5 floor isolators. Spring deflection shall be a minimum of 0.75" (19mm).
  - 2) All duct runs having air velocity of 1000 fpm (5 m/s) or more shall be isolated from the building structure by specification 11 hangers or specification 5 floor supports. Spring deflection shall be a minimum of 0.75" (19mm).
  - 3) Flexible duct connections shall be provided at inlet and discharge ducts. Refer to Section 15910.
- f. Seismic Restraint of Ductwork:
  - 1) Seismically restrain all duct work with specification 12 or 13 restraints as listed below:
    - a) Restrain rectangular ducts with cross sectional area of 6 sq.ft. (.5 m2) or larger.
    - b) Restrain round ducts with diameters of 28" (700mm) or larger.
    - c) Restrain flat oval ducts the same as rectangular ducts of the same nominal size.
  - 2) Transverse restraints shall occur at 30' (9mm) intervals or at both ends of the duct run if less than the specified interval. Transverse restraints shall be installed at each duct turn and at each end of a duct run.
  - 3) Longitudinal restraints shall occur at 60' (18m) intervals with at least one restraint per duct run. Transverse restraints for one duct section may also act as a longitudinal restraint for a duct section connected perpendicular to it if the restraints are installed within 4' (1.2m) of the intersection of the ducts and if the restraints are sized for the larger duct. Duct joints shall conform to SMACNA duct construction standards.
  - 4) The ductwork must be reinforced at the restraint locations. Reinforcement shall consist of an additional angle on top of the ductwork that is attached to the support hanger rods. Ductwork is to be attached to both upper angle and lower trapeze.
  - 5) A group of ducts may be combined in a larger frame so that the combined weights and dimensions of the ducts are less than or equal to the maximum weight and dimensions of the duct for which bracing details are selected.
  - 6) Walls, including gypsum board non-bearing partitions, which have ducts running through them may replace a typical transverse brace. Provide channel framing around ducts and solid blocking between the duct and frame.
  - Chimneys and stacks passing through floors are to be bolted at each floor level or secured above and below each floor with riser clamps and specification type 13 for seismic solid brace restraints.
  - 8) Chimneys and stacks running horizontally to be braced every 30' with specification type 12 seismic cable restraints or specification type 13 for

seismic solid brace restraints.

- g. Seismic Restraint of Electrical Services:
  - 1) All electrical conduit 2 1/2" (64mm) in diameter and larger shall be restrained with specification type 12 seismic cable restraints or specification type 13 for seismic solid brace restraints.
  - 2) All electrical bus ducts, cable trays and ladder trays shall be restrained with specification type 12, seismic cable restraints or specification 13 seismic solid brace restraints.
  - 3) Transverse restraints shall occur at 30' (9m) intervals or both ends if the electrical run is less than the specified interval. Transverse restraints shall be installed at each electrical services turn and at each end of the electric run.
  - 4) Longitudinal restraints shall occur at 60' (9m) intervals with at least one restraint per electric run. Transverse restraints for one electric section may also act as a longitudinal restraint for a duct for an electric section connected perpendicular to it if the restraints are installed within 4' (1.2m) of the intersection of the electric run and if the restraints are sized for the larger electric run.
  - 5) All rigid floor mounted equipment must have a resilient media between the equipment mounting hole and the anchor bolt. Anchor bolts shall be designed in accordance with section 1.9 seismic forces. Neoprene bushings shall be specification type 4 and anchor bolts shall be specification type 18 or 19.
  - 6) Wall mounted panels shall be mounted with specification type 3 bushings. Floor mounted panels shall be mounted on specification type 4 bushings. Anchor bolts shall be specification type 18 or 19.
- h. All fire protection piping shall be braced in accordance with NFPA 13 and 14.
- i. Vibration Isolation and Seismic Restraint of Mechanical Equipment
  - 1) All mechanical equipment shall be vibration isolated and seismically restrained as per the schedules in part 3.5 of this specification.
  - 2) Equipment mounted on housekeeping pads: Pads shall be properly doweled or expansion shielded to deck to meet acceleration criteria.
  - 3) Requirements for installation on concrete inertia bases shall be as follows:
    - a) Minimum operating clearance between concrete inertia and base and housekeeping pad or floor shall be 2".
    - b) The equipment structural steel or concrete inertia base shall be placed in position and supported temporarily by blocks or shims, as appropriate, prior to the installation of the machine or isolators.
    - c) The isolators shall be installed without raising the machine and frame assembly.
    - d) After the entire installation is complete and under full operational load, the isolators shall be adjusted so that the load is transferred from the blocks to the isolators. When all isolators are properly adjusted, the blocks or shims shall be barely free and shall be removed.
    - e) Install equipment with flexibility in wiring connection.
    - f) Verify that all installed isolator and mounting systems permit equipment motion in all directions. Adjust or provide additional resilient restraints to flexibly limit start-up equipment lateral motion to 1/4".

- g) Prior to start-up, clean out all foreign matter between bases and equipment. Verify that there are no isolation short circuits in the base, isolators, or seismic restraints.
- 3. Seismic Restraint Exclusions:
  - a. General: All mechanical and electrical components and systems that are considered exempt from the requirement for seismic restraint, in accordance with The International Building Code – 2003, Section 1621, shall not require seismic restraint.
  - b. Piping:
    - 1) Piping in boiler and mechanical rooms less than 1 1/4" (32mm) inside diameter.
    - 2) All other piping less than 2 1/2" (64mm) inside diameter.
    - 3) All piping suspended by individual hangers 12" (300mm) or less as measured from the top of the pipe to the bottom of the support where the hanger is attached. However, if the 12" (300mm) limit is exceeded by any hanger in the run, seismic bracing is required for the run.
    - 4) The 12" (300mm) exemption applies for trapeze supported systems if the top of each item supported by the trapeze qualifies.
  - c. Ductwork:
    - 1) Rectangular and square and ducts that are less than 6 square feet in cross sectional area.
    - 2) Oval ducts that are less than 6 square feet (.5m2) in cross sectional area based on nominal size.
    - 3) Round duct less than 28" (.5m2) in diameter.
    - 4) All duct suspended by hangers 12" (300mm) or less in length as measured from the top of the duct to the point of attachment to the structure. Hangers must be attached within 2" (50mm) of the top of the duct with a minimum of two #10 sheet metal screws. If the 12" (300mm) limit is exceeded by any hanger in the run, seismic bracing is required for the run.
  - d. Electrical:
    - 1) All conduit less than 2 1/2" (64mm) diameter suspended by individual hanger rods.
    - 2) All conduits suspended by individual hangers 12" (300mm) or less as measured from the top of the conduit to the bottom of the support where the hanger is attached. However, if the 12" (300mm) limit is exceeded by any hanger in the run, seismic bracing is required for the run.
    - 3) The 12" (300mm) exemption applies for trapeze supported systems if the top of each item supported by the trapeze qualifies.
- 4. Inspection:
  - a. Examine systems under provisions of Division 1.
  - b. On completion of installation of all vibration isolation devices herein specified, the local representative shall inspect the completed system and report in writing any installation error, improperly elected isolation devices, or other faults in the system that could affect the performance of the system. Contractor shall submit a

report to the Owner, including the manufacturers representatives' final report, indicating all isolation reported as properly installed or requiring correction, and include a report by the Contractor on steps taken to properly complete the isolation work.

5. Schedules:

	ISOLATION, DEFLECTION AND SEISMIC RESTRAINT CRITERIA FOR SOLID CONCRETE FLOORS 4" AND THICKER (NOTE 7)							OR		
	Grou Suppo Slab Basem	nd rted or nent	20' Floor Possible Defl. – (	r Span Floor 0.67"	30' Floor Possible Defl. –	r Span Floor 1.0"	40' Floor Possible Defl. –	r Span Floor 1.33"	50' Floor Possible Defl. – 1	Span Floor 1.67"
SPECIFICATION SELECTION GUIDE	Isol. & Seismic Spec.	Isol. Defl.	Isol. & Seismic Spec.	Isol. Defl.	Isol. & Seismic Spec.	Isol. Defl.	Isol. & Seismic Spec.	Isol. Defl.	Isol. & Seismic Spec.	Isol. Defl.
REFRIG. MACHINES										
Absorption Machines	2-23	0.35	6-23	0.75	6-23	0.75	6-23	1.5	6-23	1.5
Centrifugal Chillers or Heat Pumps										
Cooler Condenser Mounted Hermetic Compressors	2-20-23	0.35	6-20-23	0.75	6-20-23	1.5	6-23	1.5	6-20-23	2.5
Cooler Condenser Alongside Hermetic Compressor	2-23	0.35	6-23	0.75	6-23	1.5	6-23	1.5	6-23	2.5
Open Type Compressor (note 3)	2-23	0.35	6-23	0.75	6-23	1.5	6-20-23	1.5	6-20-23	2.5
Refrig. Reciprocating Compressors										
500 rpm to 750 rpm	6-23	0.75	6-23	1.5	6-23	1.5	6-20-23	2.5	6-20-23	3.5

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	ISOLATION, DEFLECTION AND SEISMIC RESTRAINT CRITERIA FOR SOLID CONCRETE FLOORS 4" AND THICKER (NOTE 7)									
	Grou Suppo Slab Basem	nd rted or ient	20' Floor Possible Defl. –	r Span Floor 0.67"	30' Floor Possible Defl. –	r Span Floor 1.0"	40' Floor Possible Defl. –	r Span Floor 1.33"	50' Floor Possible Defl. –	r Span Floor 1.67"
SPECIFICATION SELECTION GUIDE	Isol. & Seismic Spec.	Isol. Defl.	Isol. & Seismic Spec.	Isol. Defl.	Isol. & Seismic Spec.	Isol. Defl.	Isol. & Seismic Spec.	Isol. Defl.	Isol. & Seismic Spec.	Isol. Defl.
751 rpm and Over	6-23	0.75	6-23	0.25	6-23	1.5	6-20-23	2.5	6-20-23	3.5
Reciprocating Chillers or Heat Pumps										
500 rpm to 750 rpm	6-23	0.75	6-23	1.5	6-23	1.5	6-20-23	2.5	6-20-23	3.5
751 rpm and Over	6-23	0.75	6-23	0.75	6-20-23	1.5	6-20-23	2.5	6-20-23	3.5
PACKAGED STEAM GENERATIONS (Boilers)	2-24	0.35	6-24	0.75	6-24	0.75	6-24	1.5	5,23,24	2.5
PUMPS										
<b>Closed Coupled</b>										
Thru 5 hp	2-21-23	0.35	5-16- 21-23	0.75	5-16- 21-23	0.75	5-16- 21-23	1.5	5-16- 21-23	1.5
7 ½ hp and Larger	5-16- 21-23	0.75	5-16- 21-23	0.75	5-16- 21-23	1.5	5-16- 21-23	1.5	5-16- 21-23	2.5
Base Mounted (note 2)										
Thru 60 hp	5-16- 21-23	0.75	5-16- 21-23	0.75	5-16- 21-23	1.5	5-16- 21-23	1.5	5-16- 21-23	2.5
75 hp and Larger	5-16- 21-23	0.75	5-16- 21-23	1.5	5-16- 21-23	2.5	5-16- 21-23	2.5	5-16- 21-23	3.5
FACTORY ASSEMBLED H & V UNITS										

# CARVER POLICE CARVER, MA HVAC 23 00 00-76

	ISOL	ISOLATION, DEFLECTION AND SEISMIC RESTRAINT CRITERIA FOR SOLID CONCRETE FLOORS 4" AND THICKER (NOTE 7)								
	Grou Suppo Slab Basem	nd rted or nent	20' Floor Possible Defl. –	r Span Floor 0.67"	30' Floor Possible Defl. –	r Span Floor 1.0"	40' Floor Possible Defl. –	r Span Floor 1.33"	50' Floor Possible Defl. – 1	Span Floor 1.67"
SPECIFICATION SELECTION GUIDE	Isol. & Seismic Spec.	Isol. Defl.	Isol. & Seismic Spec.	Isol. Defl.	Isol. & Seismic Spec.	Isol. Defl.	Isol. & Seismic Spec.	Isol. Defl.	Isol. & Seismic Spec.	Isol. Defl.
Curb Mounted Roof Top Units			22	1.0	22	2.5	22	2.5	22	2.5
Suspended Units (for Fan Heads see Blowers Guide)										
Thru 5 hp	10-12	1.0	10-12	1.0	10-12	1.0	10-12	1.0	10-12	1.0
7 ½ hp and Larger – 275 rpm to 400 rpm	10-12	1.5	10-12	1.5	10-12	1.5	10-12	1.5	10-12	1.5
7 ½ hp and Larger – 401 rpm and Over	10-12	1.0	10-12	1.0	10-12	1.0	10-12	1.5	10-12	2.5
Floor Mounted Units (for Fan Heads see Blowers Guide)										
Thru 5 hp	2	0.35	7	0.75	7	0.75	7	0.25	7	0.75
7 ½ hp and Larger – 275 rpm to 400 rpm	2	0.35	7	1.5	7	1.5	7	1.5	7	1.5
7 ½ hp to 40 hp – 401 rpm and Over	2	0.35	7	0.75	7	0.75	7	1.5	5-16-20	2.5
50 hp and Larger – 401 rpm and Over	2	0.35	7	0.75	7	1.5	5-16-20	2.5	5-16-20	3.5
AIR COMPRESSOR										

# **CARVER POLICE** CARVER, MA HVAC 23 00 00-77

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	ISOL	ISOLATION, DEFLECTION AND SEISMIC RESTRAINT CRITERIA FOR SOLID CONCRETE FLOORS 4" AND THICKER (NOTE 7)								OR
	Grou Suppo Slab Basem	nd rted or nent	20' Floor Possible Defl. – (	r Span Floor 0.67"	30' Floor Possible Defl. –	r Span Floor 1.0"	40' Floor Possible Defl. –	r Span Floor 1.33"	50' Floor Possible Defl. –	r Span Floor 1.67"
SPECIFICATION SELECTION GUIDE	Isol. & Seismic Spec.	Isol. Defl.	Isol. & Seismic Spec.	Isol. Defl.	Isol. & Seismic Spec.	Isol. Defl.	Isol. & Seismic Spec.	Isol. Defl.	Isol. & Seismic Spec.	Isol. Defl.
Tank Mounted Type	5-16- 21-24	0.75	5-16- 21-24	0.75	5-16- 21-24	1.5	5-16- 21-24	2.5	5-16- 21-24	3.5
V – W Type	5-16- 21-24	0.75	5-16- 21-24	0.75	5-16- 21-24	1.5	5-16- 21-24	2.5	5-16- 21-24	3.5
Horz, Vert, 1 or 2 Cylinders										
275 rpm to 499 rpm	5-16- 21-24	2.5	5-16- 21-24	2.5	5-16- 21-24	2.5	5-16- 21-24	3.5	5-16- 21-24	3.5
500 rpm to 800 rpm	5-16- 21-24	1.5	5-16- 21-24	1.5	5-16- 21-24	2.5	5-16- 21-24	3.5	5-16- 21-24	3.5

		DEFLECTION AND MOUNTING CRITERIA FOR SOLID CONCRETE FLOORS 4" OR THICKER (NOTE 7)						
	Gr Sup Sla Bas	ound ported ab or ement	20' Floor Span Possible Floor Defl. – 0.67''	30' Floor Span Possible Floor Defl. – 1.0"	40' Floor Span Possible Floor Defl. – 1.33"	50' Floor Span Possible Floor Defl. – 1.67''		
SPECIFICATION SELECTION GUIDE	Min Static Defl (in) Engr (note Spec 1)		Engineer Sp	Specifications and Minimum Static Deflection as tabulated below (note 1)				
Blowers								
Utilities Set								
Floor Mounted (note 5)	2 0.35 Spec 7 for 0.75" and 1/5" deflection and Spec 5-20 over 1.5" deflection with deflection from Blower 1 Deflection Guide, but not to exceed 2.5"					5-20-16 for wer Minimum		

	DEFLECTION AND MOUNTING CRITERIA FOR SOLID CONCRETE FLOORS 4" OR THICKER (NOTE 7)							
	Gr Supj Sla Bas	ound ported ab or ement	20' Floor Span Possible Floor Defl. – 0.67"	30' Floor Span Possible Floor Defl. – 1.0"	40' Floor Span Possible Floor Defl. – 1.33"	50' Floor Span Possible Floor Defl. – 1.67''		
SPECIFICATION SELECTION GUIDE	Engr Spec	Min Static Defl (in) (note 1)	Engineer Sp	ecifications and as tabulated b	Minimum Stati below (note 1)	c Deflection		
Roof Mounted			Spec 5-21-16 with deflection from Blower Minimum Deflection Guide. If roof will not handle concrete base load use Spec 6 for 0.75 and 1.5" deflection and Spec 6-20 for over 1.5" deflection					
Suspended Unit (note 5)			Spec 10-12 with deflection from Blower Minimum Deflection Guide, not to exceed 2.5" deflection					
Centrifugal Blowers (note 6)	2-21	0.35	Spec 5-21-16 with deflection from Blower Minimum Deflection Guide					
Fan Heads								
Floor Mounted	2-28	0.35	Spec 7-28 if 0. deflection ove Deflection Gu	75" or 1.5" defl r 1.5" to 4.5" fro ide.	lection or Spec 3 om Blower Min	5-20-16-28 for imum		
Suspended Units			Spec 10-12-28 Deflection Gu	with deflection	from Blower M	ſinimum		
Tubular Centrifugal and Axial Fans								
Suspended Units			Spec 10-12 wi Deflection Gu Spec 10-12-28	th deflection fro ide, for over 4" stat	om Blower Mini ic pressure	mum		
Floor Mounted with Motor on/in Fan Casing	2	0.35	Spec 7 for 0.7: over 1/5" defle Deflection Gu static pressure	5" to 1.5" deflect ection with deflect ide, Spec 5-21-1	etion and Spec 5 ection from Blov 16 or 5-16-28 fo	-20-16 for wer Minimum r over 4"		
Floor Mounted Arrangement 1 or any Separately Mounted Motor	2-21	0.35	Spec 5-21-16 Deflection Gu	with deflection	from Blower Mi	nimum		

		DEFLECTION AND MOUNTING CRITERIA FOR SOLID CONCRETE FLOORS 4" OR THICKER (NOTE 7)							
	Gr Sup	ound ported	20' Floor Span Possible	30' Floor Span Possible	40' Floor Span Possible	50' Floor Span Possible			
	Slab or Basement		Floor Defl. – 0.67"	Floor Defl. – 1.0"	Floor Defl. – 1.33"	Floor Defl. – 1.67"			
		Min Static Defl (in)							
SPECIFICATION SELECTION GUIDE	Engr Spec	(note 1)	Engineer Sp	ecifications and as tabulated b	Minimum Stati below (note 1)	c Deflection			
Cooling Towers & Condensing Units	2	0.35	Spec 6 with de Guide	eflection from B	lower Minimun	Deflection			

Blower Minimum Deflection Guide								
Fan Speed RPM	Required Deflection for Ground Supported Slab or Basement	Required Deflection for 20' Floor Span	Required Deflection for 30' Floor Span	Required Deflection for 40' Floor Span	Required Deflection for 50' Floor Span			
500 and up	0.35"	0.75"	1.5"	2.5"	3.5"			
375-499	0.35"	1.5"	2.5"	3.5"	3.5"			
300-374	0.35"	2.5"	2.5"	3.5"	3.5"			
225-299	0.35"	3.5"	3.5"	3.5"	3.5"			
175-225	0.35"	3.5"	4.5"	4.5"	4.5"			

When blowers are 60 HP or larger, select deflection requirements for next larger span. A minimum of 2.5" should be used unless larger deflections are called for on the chart or these fans are located in the lowest sub-basement or on a slab on grade.

# 6. Notes:

- a. Minimum deflection called for in this specification are not 'nominal' but certifiable minimums. The 0.75", 1.5", 2.5", 3.5", and 4.5" minimums should be selected from manufacturer's nominal 1", 2", 3", 4" and 5" series respectively. Air spring isolation specifications 8 & 9 may be substituted for steel springs above in highly sensitive noise free locations.
- b. Vacuum, Condensate or Boiler Feed Pumps shall be mounted with their tanks on a common spec. 21 base with deflections as specified for base mounted pumps.
- c. The base described in specification 20 is used under the drive side. Individual

mountings as described in specification 6 are used under the Cooler and Condenser.

- d. This type of compressor is highly unbalanced and sometimes requires inertia bases weighing 5 to 7 times equipment weight to reduce running motion.
- e. Limit deflection f or utility sets 18" wheel diameter and smaller to  $1 \frac{1}{2"}$ .
- f. FLOATING CONCRETE INERTIA BASES. Floating concrete inertia bases do not reduce vibration transmitted to the structure through the mountings. These bases will reduce vibratory motion, provide a very rigid machine base and minimize spring reactions to fan thrust. Engineers preferring steel bases rather than the concrete mentioned above in specification 5-21 should change the designation to 5-20. Concrete is preferred for all fans operating at static pressure above 4" and on roof tops.
- g. LIGHT FLOOR CONSTRUCTION. When floors or roofs are lighter than 4" solid concrete a localized mass shall be introduce under the vibration mountings in the form of a sub-base. This sub-base should be 12" thick and 12" longer and wider than the mechanical equipment above it. When this mass is provided the 30' minimum static deflection requirements will suffice even in longer bays. The mass is also useful for unusually large bays over 50'. When floors are lighter than the 4" concrete or the location is in a particularly sensitive area and the mass described above cannot be introduced, select deflection requirements for the next larger span.
- h. For equipment where increased resiliency and decreased accelerations are required change specification 16 snubbers to specification 17 snubbers.

# 2.18 SEQUENCE OF OPERATIONS

- A. Variable Refrigerant Flow System: System shall operate per the manufacturer's sequence of operation to maintain space setpoint temperature in each space associated with the system. The system shall be capable of provide simultaneous heating and cooling as required by each associated space.
- B. Enthalpy Recovery Units:
  - 1. ERV-1: Enthalpy recovery unit shall be energized during occupied hours and deenergized during non-occupied hours. Occupied hours shall be defined by the VRF system Centralized Controller, and coordinated with building occupants.
  - 2. ERV-2: Enthalpy recovery unit shall operate continuously.
  - 3. ERV-3: Enthalpy recovery unit shall be interlocked with AH-7 fan operation.
  - 4. The associated electric duct coil (EDH-\*) shall be normally off. The coil shall be energized when the outdoor air temperature is sensed to be below 55°F and shall be energized and shall modulate via SCR control to maintain a minimum discharge air temperature of 65°F. The coil shall be de-energized when the discharge air temperature is above 65°F.

- C. Electric Unit Heaters: The integral thermostat shall cycle the fan and energize the heating coil according to the manufacturer's sequence of operation to maintain the space temperature setpoint.
- D. Gas Fired Unit Heaters: The integral thermostat shall cycle the fan and energize the burner according to the manufacturer's sequence of operation to maintain the space temperature setpoint.
- E. Exhaust Fans:
  - 1. Signal shall be generated at the VRF system Centralized Controller if any fan has failed.
  - 2. EF-1 (Narcotic Storage): Fan shall be energized continuously.
  - 3. EF-2 (Sallyport): Fan shall be energized continuously.
  - 4. EF-3 (Sallyport): Fan shall be energized when any of the wall mounted CO detectors sense a CO level above 900 PPM or an NO level above 1 PPM. An audible and visual alarm shall be generated when the wall mounted CO level above 1200 PPM or an NO level above 3 PPM.
  - 5. EF-4 (Armory): Fan shall be controlled by a wall mounted switch.
  - 6. EF-5 (Outbuilding): Fan shall be energized continuously.
  - EF-6 (Emergency Supply): Fan shall be normally off during all hours of operation. Fan shall be energized upon activation of building's fire alarm system. <u>Exception</u>: If fire alarm devices located within Detention area (area served by AH-16) are activated, the fan shall not be energized.

# PART 3 EXECUTION

# 3.1 COMMISSIONING OF EQUIPMENT AND SYSTEMS

- A. The Architect will check the completed installation either sequentially as different parts are completed, or when the entire installation is complete, at the sole option of the Architect.
- B. Prior to the Architect's checking a part of the installation or the entire installation, this Contractor shall submit a letter signed by an Officer of this Contracting Company or an Officer of the General Contractor stating that:
  - 1. He is an Officer of the Company.

- 2. He has personally inspected the installation to be checked.
- 3. The date of his inspection.
- 4. The installation is complete and tested and ready to be inspected by the Architect, and that all required test reports have been submitted.
- C. This Contractor shall arrange that an Officer of this Contracting Company or of the General Contractor, as well as the Clerk of the Works, in addition to other test witnesses that may be specified, shall witness the below listed tests. At the conclusion of each such test this Contractor shall submit a letter signed by the Officer stating that:
  - 1. He is an Officer of the Company.
  - 2. He has personally witnessed the tests (giving the name of the tests).
  - 3. The date of testing.
  - 4. The results of testing, as compared to specified performance.
  - 5. List the name, title and company affiliated to all those witnessing the tests.

Tests Requiring Letters:

HVAC: Smoke Control VRF Operation and Controls Fan Operation and Controls Air Handler Operation and Controls ERV Operation and Controls

# 3.2 SPECIAL RESPONSIBILITIES

- A. Coordination: Cooperate and coordinate with work of other Sections in executing work of this Section.
  - 1. Perform work such that progress of entire project including work of other Sections shall not be interfered with or delayed.
  - 2. Provide information as requested on items furnished under this Section which shall be installed under other Sections.
  - 3. Obtain detailed installation information from manufacturers of equipment provided under this Section.
  - 4. Obtain final roughing dimensions or other information as needed for complete installation of items furnished under other Sections or by Owner.
  - 5. Keep fully informed as to shape, size and position of openings required for material or equipment to be provided under this and other Sections. Give full information so that openings required by work of this Section may be coordinated with other work and other openings and may be provided for in advance. In case of failure to provide

sufficient information in proper time, provide cutting and patching or have same done, at own expense and to full satisfaction of Architect.

- 6. Provide information as requested as to sizes, number and locations of concrete housekeeping pads necessary for floor-mounted vibrating and rotating equipment provided under this Section.
- B. Installation Only Items:
  - 1. Where this Contractor is required to install items which it does not purchase, it shall coordinate their delivery and be responsible for this unloading from delivery vehicles and for their safe handling and field storage up to the time of installation. This trade shall be responsible for:
    - a. Any necessary field assembly and internal connections, as well as mounting in place of the items, including the purchase and installation of all dunnage supporting members and fastenings necessary to adapt them to architectural and structural conditions.
    - b. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building system.
  - 2. This Contractor shall carefully examine such items upon delivery. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of work of this Contractor will be considered only if presented in writing within one (1) week of their date of delivery. Unless such claims have been submitted this Contractor shall be fully responsible for the complete reconditioning or replacement of the damaged items.
- C. Maintenance of equipment and Systems: Maintain HVAC equipment and systems until Final Acceptance. Ensure adequate protection of equipment and material during delivery, storage, installation and shutdown delays pending final test of systems and equipment because of seasonal conditions. Do not use boilers before providing water treatment where required; this includes use of boilers for temporary heat or for testing.
- D. Use of Premises: Use of premises shall be restricted as directed by Architect and as required below:
  - 1. Remove and dispose of dirt and debris, and keep premises reasonably clean. Upon completion of work, remove equipment and unused material. Put building and premises in neat and clean condition and do cleaning and washing required to provide acceptable appearance and operation of equipment, to satisfaction of Architect and as specified under CLEANING paragraph.
  - 2. It shall be this trade's responsibility to store his material in a manner that will maintain an orderly clean appearance. If stored on-site in open or unprotected areas, all equipment and material shall be kept off the ground by means of pallets or racks, and covered with tarpaulins.

- 3. Do not interfere with functions of existing sewers and gas mains. Extreme care shall be observed to prevent debris from entering ductwork. Confer with Architect as to disruption of heating services or other utilities due to testing or connection of new work to existing. Interruption of heating services shall be performed at time of day or night deemed by Architect to provide minimum interference with normal operation. Obtain Architect's approval of the method proposed for minimizing service interruption.
- E. Surveys and Measurements:
  - 1. Base measurements, both horizontal and vertical, on reference points established by Contractor and be responsible for correct laying out of work.
  - 2. In event of discrepancy between actual measurements and those indicated, notify Architect in writing and do not proceed with work until written instructions have been issued by Architect.
- F. Fireproofing:
  - 1. Clips, hangers, clamps, supports and other attachments to surfaces to be fireproofed shall be installed, insofar as possible prior to start of spray fiber work.
  - 2. Ducts, piping and other items, which would interfere with proper application of fireproofing, shall be installed after completion of spray fiber work.
  - 3. Patching and repairing of spray fireproofing due to cutting or damaging to fireproofing during course of work specified under this Section shall be performed by installer of fireproofing and paid for by trade responsible for damage and shall not constitute grounds for an extra to Owner.
- G. Gypsum Drywall Enclosures:
  - 1. Coordinate and supervise construction of drywall and related work affecting work of this Section.
  - 2. Work shall include but not be limited to the following:
    - a. Supply and return air duct enclosures on rooftop air handling units.
    - b. Supply air plenums located above labs and computer rooms.
    - c. Return air shafts.
  - 3. Ensure tightness of plenums and chases used as part of air distribution system. System will not be accepted until proved tight, without leakage. Notify Architect in writing after system test for leakage, if construction and finish of plenums and ducts are not satisfactory.

### 3.3 MATERIALS AND WORKMANSHIP

- A. Work shall be neat and rectilinear. Ductwork and piping shall run concealed except in mechanical rooms and areas where no hung ceiling exists. Install material and equipment as required by manufacturers. Installation shall operate safely and without leakage, undue wear, noise, vibration, corrosion or water hammer. Work shall be properly and effectively protected, and pipe and duct openings shall be temporarily closed to prevent obstruction and damage before completion.
  - 1. Except as specified otherwise, material and equipment shall be new. Provide supplies, appliances and connections necessary for complete and operational installation. Provide components required or recommended by OSHA and applicable NFPA documents.
  - 2. References to manufacturers and to catalog designation are intended to establish standards of quality for materials and performance but imply no further limitation of competitive bidding.
  - 3. Finish of materials, components and equipment shall be as approved by Architect and shall be resistant to corrosion and weather as necessary.
  - 4. Owner will not be responsible for material and equipment before testing and acceptance.

### 3.4 TAGS

- A. Upon completion of work, attach engraved laminated tags to all valves (listed in the valve directory called for in the "Bulletins, Manuals and Instructions" paragraph of these Specifications) and all pieces of HVAC equipment (including but not limited to pumps, fans, air handlers, coils and all other equipment listed in the HVAC Schedules). Valve tags shall have black characters on white face, consecutively numbered and prefixed by letter "V". Equipment tags shall have black characters on white face with labels corresponding to drawing schedule numbers.
- B. Embossed or engraved aluminum or brass tags may be substituted if desired. Tags shall be at least 1/8" thick.
- C. Valve tags shall be at least 1" in diameter with numerals at least 3/8" high and attached by "S" hooks or chains. Equipment tags shall be at least 2" diameter securely attached to apparatus.
- D. Provide manufacturers equipment nameplates, catalog numbers and rating identification securely attached to electrical and mechanical equipment with screws or rivets. Adhesives or cements will not be permitted.
- 3.5 PIPE AND DUCT IDENTIFICATION

- A. Ductwork shall be stenciled at each junction or branch takeoff, at least once in each room, and at intervals not longer than 20 feet. Stencil shall clearly identify duct service ("S" for supply; "R" for return' "X" for exhaust), area served by branch, and arrow indicating direction of flow.
- B. Provide color-coded pipe identification markers on piping installed under this Section. Pipe markers shall be snap-on laminated plastic protected by clear acrylic coating. Pipe markers shall be applied after architectural painting where such is required.
- C. Provide arrow marker with each pipe content marker to indicate direction of flow. If flow can be in either direction, use double-headed arrow marker.
- D. Mains shall be labeled at points of entrance and exit from mechanical room, adjacent to each valve, on each riser, at each tee fitting, at points of entrance and exit from building, at least once in each room and at intervals no longer than 20 feet.
- E. Size of legend letters on markers and length of color field shall be per the latest edition of ANSI A13.1.
- F. Markers shall be "Setmark" by Seton Name Plate Corp., or approved equal.
- G. Following color-coding shall be used with names in black letters on background and while letters on green background:

Service	Legend	Background Color
Condensate	CW	Yellow
Refrigerant	REF	Green

H. Color banding shall meet latest edition of ANSI A13.1 and OSHA.

# 3.6 ACCESS AND ACCESS PANELS

- A. Provide proper access to materials and equipment that require inspection, replacement, repair or service and coordinate their delivery with the installing Trade. If proper access cannot be provided, confer with Architect as to best method of approach for minimizing effect of reduced access which may result.
- B. Coordinate and prepare a location, size and function schedule of access panels required to fully service equipment and deliver to a representative of the installing Trade. Furnish and install distinctively colored buttons (color as selected by Architect) in finished ceiling to identify all access panels.
- C. Furnish access panels for installation under other Sections where fire dampers, volume dampers, controls, shut-off valves, control valves, check valves or other items installed under this Section require access and are concealed in floor, wall, furred space or above ceiling. Access panels shall be by Milcor, Knapp, Nystrom or Inland Steel; coordinate selection with other Sections supplying similar access panels.

- D. Ceilings consisting of lay-in or removable splined tiles do not require access panels and dampers, splitters or test hole openings above ceiling shall have location marked with thumb tack on finished ceiling panel. Location shall be noted on record Drawings.
- E. Access panels shall have same fire-rating classification as surface penetrated.
- F. Panels shall be at least 12" x 12"; access panels at equipment (air handlers and others) shall be 18" x 18".
- 3.7 PENETRATIONS AND SLEEVES

### A. General:

- 1. Provide pipe and duct sleeves and packing materials as specified and as shown on Drawings at penetrations of foundations, walls, slabs (except on-grade), partitions and floors. Sleeves shall meet NFPA-101 requirements and materials requirements of PART 2 or this Section.
- 2. Coordinate work carefully with architectural and structural work. Set sleeves in forms before concrete is poured. Provide core drilling as necessary if walls are poured, or otherwise constructed, without sleeves and a wall penetration is required. Provide core drilling as required for penetrations of existing construction. Do not penetrate structural members without Architect's approval.
- 3. Sleeves for insulated pipe and duct in non-fire rated construction shall accommodate continuous insulation without compression. Sleeves and/or penetrations in fire-rated construction shall be packed with fire-rated material which shall maintain the fire rating of the wall. Seal ends of penetrations to provide continuous vapor barrier where insulation is interrupted. See "PART 2" of these Specifications for requirements for packing materials.
- 4. Sleeves through floor shall be water-tight and shall extend 2" above floor surface.
- B. Pipe Sleeves:
  - 1. Annular space between pipe and sleeve shall be at least 1/4".
  - 2. Sleeves are not required for slabs-on-grade unless specified otherwise.
  - 3. Sleeves and packing materials, through rated fire walls and smoke partitions shall maintain fire rating of construction penetrated.
  - 4. Do not support piping risers on sleeves.
- C. Duct Sleeves and Prepared Openings:
  - 1. Provide duct sleeves for round ducts 15" and smaller; provide prepared, framed

openings for round ducts larger than 15" and for square, rectangular and flat oval ducts, except as specified otherwise. Sleeves shall met SMACNA requirements.

- 2. Provide sleeves for ducts through 1, 2, or 3-hour fire-rated construction and smoke partitions, regardless of size and shape of ducts. Sleeves shall maintain fire rating of construction penetrated. Sleeve and seal materials, construction and clearances shall meet requirements of SMACNA Fire Damper and Heat Stop Guide for Air Handling Systems.
- 3. Prepared openings shall be framed to provide 1" clearance between framing and duct or duct insulation.
- D. Installation Testing, Listings and Approvals:
  - 1. Installation shall meet material manufacturer's recommendations exactly, particularly as regarding safety, ventilation, removal of foreign materials and other details of installation. Dam openings as recommended. Remove flammable materials used for damming and forming seals in fire-rated construction.
  - 2. Sleeve penetration methods shall be water and gas-tight and shall meet requirements of ASTM E-119 Standard Methods of Fire Tests of Building Construction and Materials.
  - 3. Fire-stop penetration seal methods and materials shall be FM-approved and UL-listed as applicable.
  - 4. Inspect foamed sealants to ensure manufacturer's optimum cell structure and color ranges.

### 3.8 ANCHORS AND INSERTS

- A. Inserts shall be iron or steel of type to receive machine bolt head or nut after installation. Inserts shall permit adjustment of bolt in one (1) horizontal direction and shall develop strength of bolt when installed in properly cured concrete.
- B. Provide anchors as necessary for attachment of equipment supports and hangers.

# 3.9 INSTALLATION OF EQUIPMENT

- A. Avoid interference with structure and with work of other trades, preserving adequate headroom and clearing doors and passageways to satisfaction of Architect and in accordance with code requirements. Installation shall permit clearance for access to equipment for repair, servicing and replacement.
- B. Install equipment so as to properly distribute equipment loads on building structural members provided for equipment support under other Sections. Roof-mounted equipment shall be installed and supported on structural steel provided under other

Sections.

- C. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs as necessary for floor, wall or ceiling mounting of equipment provided under this Section (e.g. heating and ventilating units, fans, ducts and piping) as indicated on Drawings and in Specifications.
- D. Provide steel supports and hardware for proper installation of hangers, anchors, guides, etc.
- E. Provide cuts, weight and other pertinent data required for proper coordination of equipment support provisions and installation.
- F. Structural steel and hardware shall conform to Standard Specifications of ASTM; use of steel and hardware shall conform to requirements of Section 5 of Code of Practice of American Institute of Steel Construction.
- G. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly which will void warrantee. Report in writing to Architect, prior to purchase or shipment of equipment involved, on conditions which may prevent proper installation.
- 3.10 CLEANING
  - A. Ductwork:
    - 1. New ductwork shall be shipped from the shop to the job site with the ends of the ducts sealed tight with heavy duty plastic to prevent dirt, water or other elements from entering the ducts while in transport to the job site.
    - 2. At the end of each working day all open ends of ducts that have been hung in place shall be re-covered with the plastic material to prevent the entry of foreign objects, dirt or debris into the ducts.
    - 3. All ducts shall be cleaned of dirt and any other foreign matter if it should accumulate on or in the ducts prior to start-up and testing of the new HVAC systems. If the ducts do need to be blown clean, cheesecloth shall be placed over the outlet air openings, and the rooftop unit(s) serving the ducts shall be provided with temporary filters.

# 3.11 STARTUP, TESTING, ADJUSTING AND BALANCING FOR HVAC

- A. General:
  - 1. References:
    - a. AABC National Standards for Total System Balance.
    - b. ADC Test Code for Grilles, Registers, and Diffusers.
    - c. ASHRAE 111 Practices for Measurement, Testing, Adjusting, and Balancing of

Building Heating, Ventilating, Air Conditioning and Refrigeration Systems.

- d. NEBB Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
- e. SMACNA HVAC Systems Testing, Adjusting, and Balancing.
- 2. Qualifications:
  - a. Agency: Company specializing in the testing, adjusting, and balancing of systems specified in this section with minimum three years documented experience certified by AABC. Any of the following agencies shall be considered acceptable to perform the work of this section:
    - 1) Design Flow Associates, LLC
    - 2) J.F. Coffey and Associates, Inc.
    - 3) Kevin S. Cox Associates, Inc.
    - 4) American Test and Balance, Inc.
    - 5) Milarmer Associates, Inc.
  - b. Perform work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor.
- B. Examination:
  - 1. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
    - a. Systems are started and operating in a safe and normal condition.
    - b. Control systems are installed complete and operable.
    - c. Proper thermal overload protection is in place for electrical equipment.
    - d. Ductwork systems:
      - 1) Final filters are clean and in place. If required, install temporary media in addition to final filters.
      - 2) Duct systems are clean of debris.
      - 3) Fans are rotating correctly.
      - 4) Dampers are in place and open.
      - 5) Air coil fins are cleaned and combed.
      - 6) Access doors are closed and duct end caps are in place.
      - 7) Air inlets and outlets are installed and connected.
      - 8) Duct system leakage is minimized.
  - 2. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.
  - 3. Beginning of work means acceptance of existing conditions.
- C. Preparation:
  - 1. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Owner to facilitate spot checks during testing.

- 2. Provide additional balancing devices as required.
- D. Installation Tolerances:
  - 1. HVAC Systems: Adjust to within plus or minus 10 percent of design for supply and return systems and plus or minus 10 percent of design for exhaust systems.
  - 2. Air Outlets and Inlets: Adjust outlets and inlets in space to within plus or minus 10 percent of design.
  - 3. Hydronic Systems: Adjust to within plus or minus 10 percent of design.
- E. Adjusting:
  - 1. Ensure recorded data represents actual measured or observed conditions.
  - 2. Permanently mark settings of balancing devices allowing settings to be restored. Set and lock memory stops.
  - 3. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
  - 4. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- F. Sequencing:
  - 1. All systems providing both heating and cooling shall be balanced in both modes of operation.
  - 2. For all systems provide initial balancing to tolerances indicated in this section. After initial balancing readjust systems as directed by engineer and owner as necessary to achieve uniform space temperatures free from objectionable drafts and noises.
- G. Air System Procedure:
  - 1. Adjust equipment and distribution systems to provide required or design air quantities.
  - 2. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
  - 3. Measure and record air quantities at air inlets and outlets.
  - 4. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Adjust air volume by adjusting duct internal devices such as dampers and splatters. Do not utilized

opposed blade dampers at air inlets and outlets.

- 5. Vary total system air quantities by adjusting sheave position or replacing fixed sheaves with larger or smaller diameter sheaves at each fan. Provide replacement fixed ratio sheaves and belts after final balancing selected to achieve design airflows. Vary branch air quantities by damper regulation.
- 6. Measure and record static air pressure conditions at air supply and exhaust units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
- 7. Adjust settings and minimum setpoints for motorized and backdraft dampers to design conditions.
- 8. Measure and record temperature conditions across dampers to check leakage.
- 9. Where modulating dampers are provided, take measurements and balance at extreme conditions.
- Measure and record building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches (12.5 Pa) positive static pressure near the building entries.
- 11. Measure and record inlet and outlet temperatures at each air supply unit at full cooling and heating capacity.
- 12. Prepare system pressure profiles: On schematic fan system diagrams, show STATIC pressure readings taken at following points.
  - a. Fan discharge
  - b. Fan discharge plenum or main duct in fan room
  - c. Fan inlet plenum
  - d. Inlet and outlet plenum space on each side of each heating coil, cooling coil and filter
  - e. Return air/outside air mixing plenum
  - f. Duct or plenum immediately behind outside air louver
  - g. Return/exhaust fan inlet
  - h. Return/exhaust fan outlet
  - i. Each main branch duct takeoff at each floor
  - j. Within 3 feet of last supply air outlet connection in most remote duct.
- H. Schedules:
  - 1. Equipment requiring Testing, Adjusting, and Balancing including but not limited to:
    - a. Indoor Air Handling Units
    - b. Energy Recovery Ventilators
    - c. Exhaust Fans

- d. Air Cooled Refrigerant Condensers
- I. Report Forms:
  - 1. Forms shall include the following:
    - a. Title Page:
      - 1) Name of Testing, Adjusting, and Balancing Agency
      - 2) Address of Testing, Adjusting, and Balancing Agency
      - 3) Telephone number of Testing, Adjusting, and Balancing Agency
      - 4) Project name
      - 5) Project location
      - 6) Project Architect
      - 7) Project Engineer
      - 8) Project Contractor
      - 9) Project altitude
      - 10) Report date
    - b. All equipment shall include:
      - 1) Manufacturer
      - 2) Model/Size
      - 3) Identification/Number
      - 4) Serial Number
    - c. Summary Comments:
      - 1) Design versus final performance
      - 2) Notable characteristics of system
      - 3) Description of systems operation sequence
      - 4) Summary of outdoor and exhaust flows to indicated amount of building pressurization
      - 5) Nomenclature used throughout report
      - 6) Test conditions
    - d. Instrument List:
      - 1) Instrument
      - 2) Manufacturer
      - 3) Model number
      - 4) Serial number
      - 5) Range
      - 6) Calibration date
    - e. Electric Motors: (data for single and multispeed motors)
      - 1) Manufacturer
      - 2) Model/Frame
      - 3) HP/BHP/efficiency
      - 4) Phase, voltage, amperage; nameplate, actual, no load
      - 5) RPM
      - 6) Service factor
      - 7) Starter size, rating, heater elements
      - 8) Sheave Make/Size/Bore
    - f. Combustion Test:

- 1) Manufacturer
- 2) Model number
- 3) Firing rate
- 4) Over-fire draft
- 5) Gas meter timing dial size
- 6) Gas meter time per revolution
- 7) Gas pressure at meter outlet
- 8) Gas flow rate
- 9) Heat input
- 10) Oil flow rate
- 11) Burner manifold gas pressure
- 12) Percent carbon monoxide (CO)
- 13) Percent carbon dioxide (CO2)
- 14) Percent oxygen (O2)
- 15) Percent excess air
- 16) Flue gas temperature at outlet
- 17) Ambient temperature
- 18) Net stack temperature
- 19) Percent stack loss
- 20) Percent combustion efficiency
- 21) Heat output
- g. Air Cooled Condensing Unit:
  - 1) Location
  - 2) Serial number
  - 3) Entering DB air temperature, design and actual
  - 4) Leaving DB air temperature, design and actual
  - 5) Number of compressors
- h. Coil Data:
  - 1) Location
  - 2) Service
  - 3) Air flow, design and actual
  - 4) Entering air DB temperature, design and actual
  - 5) Entering air WB temperature, design and actual
  - 6) Leaving air DB temperature, design and actual
  - 7) Leaving air WB temperature, design and actual
  - 8) Saturated suction temperature, design and actual
  - 9) Air pressure drop, design and actual
- i. Electric Duct Heater:
  - 1) Location
  - 2) Number of stages
  - 3) Wattage, phase, voltage, amperage
  - 4) Test voltage (each phase)
  - 5) Test amperage (each phase)
  - 6) Air flow, specified and actual
  - 7) Temperature rise, specified and actual
- j. Air Handling Units:

- 1) Location
- 2) Arrangement/Class/Discharge
- 3) Air flow, specified and actual
- 4) Return air flow, specified and actual
- 5) Outside air flow, specified and actual
- 6) Total static pressure (total external), specified and actual
- 7) Inlet pressure
- 8) Discharge pressure
- 9) Sheave Make/Size/Bore
- 10) Number of Belts/Make/Size
- 11) Fan RPM
- k. Return Air/Outside Air Data:
  - 1) Identification/location
  - 2) Design air flow
  - 3) Actual air flow
  - 4) Design return air flow
  - 5) Actual return air flow
  - 6) Design outside air flow
  - 7) Actual outside air flow
  - 8) Return air temperature
  - 9) Outside air temperature
  - 10) Required mixed air temperature
  - 11) Actual mixed air temperature
  - 12) Design outside/return air ratio
  - 13) Actual outside/return air ratio
- l. Exhaust/Supply Fan Data:
  - 1) Location
  - 2) Air flow, specified and actual
  - 3) External static pressure, specified and actual
  - 4) Inlet pressure
  - 5) Discharge pressure
  - 6) Fan RPM
- m. Duct Traverse:
  - 1) System zone/branch
  - 2) Duct size
  - 3) Area
  - 4) Design velocity
  - 5) Design air flow
  - 6) Test velocity
  - 7) Test air flow
  - 8) Duct static pressure
  - 9) Air temperature
  - 10) Air correction factor
- n. Duct Leak Test:
  - 1) Description of ductwork under test
  - 2) Duct design operating pressure

- 3) Duct design test static pressure
- 4) Duct capacity, air flow
- 5) Maximum allowable leakage duct capacity times leak factor
- 6) Test apparatus
  - a) Blower
  - b) Orifice, tube size
  - c) Orifice size
  - d) Calibrated
- 7) Test static pressure
- 8) Test orifice differential pressure
- 9) Leakage
- J. Sound and Vibration Testing:
  - 1. Test and adjust mechanical systems for sound and vibration in accordance with the detailed instructions of the referenced standards.
  - 2. The following components shall be tested for sound power levels:
    - a. Air Handling Units
    - b. Energy Recovery Ventilators
    - c. Fans
  - 3. The following components shall be tested for vibration:
    - a. Air Handling Units
    - b. Energy Recovery Ventilators
    - c. Fans
  - 4. Sound level test and report:
    - a. Location
    - b. Octave bands equipment off
    - c. Octave bands equipment on
  - 5. Vibration test and report:
    - a. Location of points:
      - 1) Fan bearing, drive end
      - 2) Fan bearing, opposite end
      - 3) Motor bearing, center (if applicable)
      - 4) Motor bearing, drive end
      - 5) Motor bearing, opposite end
      - 6) Casing (bottom or top)
      - 7) Casing (side)
      - 8) Duct after flexible connection (discharge)
      - 9) Duct after flexible connection (suction)
    - b. Test readings:
      - 1) Horizontal, velocity and displacement

- 2) Vertical, velocity and displacement
- 3) Axial, velocity and displacement
- c. Normally acceptable readings, velocity and acceleration.
- d. Unusual conditions at time of test.
- e. Vibration source (if non-complying).

# 3.12 VRF SYSTEM PROJECT SUPERVISION

# A. General:

- 1. VRF Manufacturer shall provide on-site *Project Supervision* as outlined in this specification section, providing: onsite technical review of installed VRF systems, review of activities related to the installation of the VRF system, VRF system components and associated controls.
- 2. All *Project Supervision* field activities shall be completed by an employee of the VRF manufacturer whose primary job responsibilities are to provide direct technical support of their product; sales staff or in-house support staff are not permitted to complete this scope of work.
- 3. A factory certified representative may assist the VRF manufacturer's personnel in the completion of certain elements of work contained within this specification. Activities completed by a Factory Certified Representative shall be supervised onsite by the VRF manufacturer. Certified representatives shall not be used in lieu of the manufacturer's personnel.
- 4. The installing contractor shall assist the VRF manufacturer, in their completion of the system review and have available onsite a technician with appropriate diagnostic tools, materials and equipment, as required, for the duration of the inspection process. The technician assisting the VRF manufacturer shall be fully licensed and insured to complete necessary duties as directed by the VRF manufacturer.
- 5. The installing contractor shall have been certified by the manufacturer to install VRF systems, having attended and successfully completed a minimum 3- day VRF Service & Installation course at an approved training facility. A copy of this certificate shall be presented to the VRF manufacturer prior to the commencement of installation activity.
- 6. VRF manufacturer shall provide four (4) onsite visits during the course of the project's completion. Additional site visits, if requested, shall require approval by the owner's representative and will be billed accordingly.
- 7. Onsite visits shall be conducted at installation milestones noted below. The installing contractor is responsible to coordinate each visit at the appropriate milestone, giving the VRF manufacturer a minimum 2-week notice prior to each visit.
  - a. Project milestones
    - 1) Project Kick Off meeting

- 2) Site Visit at 25% project completion
- 3) Site Visit at 50% project completion
- 4) Final Inspection prior to Commissioning of the VRF System
- B. Project Kick-Off:
  - 1. A project kick off meeting will be conducted with the installing contractor and appropriate parties with the sole purpose to review the installation of VRF systems being installed.
  - 2. Kick off meeting shall consisting of a single [4] hour meeting with the installing contractor. This meeting shall be completed at the project site and be executed at the beginning stages of the installation of VRF systems.
    - a. Items to be reviewed during the Project kick-off meeting are:
      - 1) Presentation of Best Practices & Installation Requirements specific to the VRF system(s) being installed under this scope of work.
      - 2) Review of the project's mechanical design drawings related to the VRF systems being installed. Documents to be provided by the mechanical contractor.
      - 3) Review of VRF Manufacturers design selection software and system design schematic drawings for the system being installed Documents to be provided by the mechanical contractor.
      - 4) Discuss project activity related to the installation of VRF system components
      - 5) Establish clear path of communication and project support. Mechanical contractor shall designate an onsite point of contact for all field coordination activities.
  - 3. The installing contractor shall obtain from the Engineer/Designer of the VRF system a copy of the most current electronic design file used in the design and engineering process of the VRF system being installed. This electronic design file shall have been completed on the VRF Manufacturer's software and is the mechanical contractor's responsibility to provide the most current as-built version of this file during the course of the projects installation.
  - 4. The installing contractor shall provide the VRF manufacturer, for their use, a complete set of HVAC mechanical plans prior to the Kick off meeting. The mechanical contractor is responsible to updates these plans during the course of the project.
- C. Site Visit:
  - 1. Each site visit shall consist of a single visit, not exceeding an [8] hour period. All visits shall occur during regular business hours of 8:30AM-4PM, Monday thru Friday.
  - 2. Activates to be completed during each Site-Visit are as follows:

- a. Meet with designated representative from the VRF installation contractor to discuss field activities and provide technical support related to the VRF systems.
- b. Review installed VRF systems for compliance with manufacturer's installation, service and engineering specifications.
- c. Assist the contractor in updating the VRF Design software for as-built purposes and for calculating the appropriate refrigerant charge.
- d. Provide a field report identifying any installation issues requiring attention. Report shall provide detailed information containing:
  - 1) Issue reference number
  - 2) Priority Level of issue
  - 3) Equipment M# & Reference TAG#
  - 4) Status of issue
  - 5) Description of issue being identified
  - 6) Recommendation for corrective action
  - 7) Follow-up requirements, if required
- D. Project Close Out Documents:
  - 1. Documents completed during the project Supervision process shall be compiled and presented to the owner's representative at the completion of field activities.
  - 2. Close out documentation shall include
    - a. Project Supervision report outlining activities completed under this scope of work
    - b. As-built VRF design file depicting Model numbers and BTU capacity ratings of equipment installed, refrigerant pipe size & connection lengths between each system component, calculated refrigerant charge and issue report
- E. Professional Solutions Contact information:
  - 1. Contact your regions [MANUFACTURER] VRF installation and service manager for information and pricing related to services required under this projects scope of work.

# 3.13 VRF SYSTEM COMMISSIONING

- A. General:
  - 1. The VRF Manufacturer shall oversee and assist the installing contractor with the startup and commissioning of VRF equipment as outlined below. This process will be completed in two phases. Phase one shall cover the Pre-Start-Up inspection process, Phase two will cover the Physical Start-Up & Commissioning of Equipment.
  - 2. All *VRF System Commissioning* activities shall be completed by an employee of the VRF manufacturer whose primary job responsibilities are to provide start up and commissioning of their products; sales staff or in-house support staffs are not permitted to complete this scope of work.
  - 3. A factory certified representative may assist the VRF manufacturer's personnel in the

completion of certain elements of work contained within this specification. Activities completed by a Factory Certified Representative shall be supervised onsite by the VRF manufacturer. Certified representatives shall not be used in lieu of the manufacturer's personnel.

- 4. The installing contractor shall have been certified by the manufacturer to install VRF systems, having attended a minimum 3- day VRF Service & Installation course at an approved training center. A copy of this certificate shall be presented as part of the VRF equipment submittal process.
- 5. The installing contractor shall assist the VRF manufacturer in their completion of the system review and have available a technician with appropriate diagnostic tools, materials and equipment, as required, for the duration of the inspection process. The technician shall be fully licensed and insured to complete necessary duties as directed under the supervision of the VRF manufacturer.
- 6. Upon completion of the Equipment Start-Up & VRF Commissioning process, the VRF manufacturer shall provide a formal report outlining the status of the system, in electronic format only. Contained within this report shall be copies of all field inspection reports, required action items and status, Manufacturers design software As-Built, equipment model & serial numbers.
- 7. Completion of the Equipment Start-Up and VRF Commissioning process shall verify that the VRF system has been installed per the Engineer's design intent and complies with the VRF manufacturers engineering and installation specifications related to their equipment.
- 8. Compliance with federal, state and local codes as well as other authorities having jurisdictions are not part of this process and are the responsibility of the installing contractor.
- 9. Contact your regions [MANUFACTURER] VRF installation and service manager for information and pricing related to services required under this projects scope of work.
- B. Pre Start-up Inspection:
  - 1. Contractor shall employ the services of the VRF manufacturer to provide a comprehensive field review of the completed VRF system installation, prior to the physical start up and operation of equipment. Upon satisfaction that the system meets the VRF manufacturer's installation requirements and specifications, the contractor shall be allowed to proceed with the physical start up and operation of equipment.
  - 2. Prior to the pre-start-up inspection, all systems components shall be in a final state of readiness having been fully installed and awaiting inspection.
  - 3. The installing contractor shall provide the VRF manufacturer a copy of the electronic

design file used in the design and engineering process of the system being inspected. This electronic design file shall have been completed on software approved by the specified VRF manufacturer and shall have been updated to reflect as-built conditions.

- 4. The installing contractor shall have prepared the refrigeration piping systems per equipment installation and service manuals. All refrigerant piping systems, upon completion of assembly, shall have been pressurized to a minimum 600 PSI, using dry nitrogen, and held for an uninterrupted 24HR period, with acceptable change due to atmospheric conditions.
  - a. A record of the pressure check process shall be recorded and tagged at the outdoor unit. The tag shall contain the following information: date & time of pressure check start, fill pressure, outdoor temperature at start & stop, date & time of pressure check completion, and the person's full name & company information completing the pressure check.
  - b. The installing contractor shall engage the General Contractor as a witness of the pressure check process, confirming that all steps and procedures related to the pressure check where properly followed and that the system held the holding pressure of 600PSI for a period of 24hr hours, with acceptable change due to atmospheric conditions.

Witness information, including full name, company name, title, phone number and signature shall be recorded on same pressure tag used by installing contractor.

- 5. Upon completion of the 600 PSI pressure check, the system shall be evacuated to a level of 500 microns, where it will be held for a period of 1HR with no deflection. The installing contractor shall utilize the triple evacuation method per the equipment install and service manuals.
  - a. Evacuation start & stop dates, times, and persons involved shall be recorded and tagged at the outdoor equipment.
  - b. Installing contractor shall digitally capture a photo of the micron gauge reading, at the conclusion of the 1hr holding period, for each system and provide a copy to the VRF manufacturer. Each photo shall contain a tag providing the outdoor units Serial number.
- 6. Upon the completion of the 500-micron hold, the calculated additional refrigerant charge can be added. The calculated refrigerant charge shall have been calculated using the VRF manufacturers design software.
  - a. Total refrigerant charge of the system shall be recorded and displayed at the outdoor unit by permanent means.
- 7. A review of the equipment settings shall be completed, with recommendations provided to improve system performance, if applicable. Physical changes of system settings will be completed by the contractor. Electronic recording of final DIP switches shall be provided as part of the commissioning report.
- 8. A comprehensive review and visual inspection shall be completed for each piece of

equipment following a detailed check list, specific to the equipment being reviewed. A copy of the inspection report shall be provided as part of the manufacturers close out documentation. Any deficiencies found during the inspection process shall be brought to the attention of the installing contractor for corrective action. Any system components that are not accessible for proper inspection shall be noted as such.

- 9. Indoor Equipment report shall contain
  - a. Model & Serial Number
  - b. Equipment location
  - c. Equipment Tag/Identification number
  - d. Network Address & Port Assignment
  - e. Digital recording of equipment settings
  - f. Mounting/support method
  - g. Seismic restraints used
  - h. Proper service clearance provided
  - i. Wiring and connection points are correct
  - j. High voltage reading(s) within acceptable range
  - k. Low voltage reading(s) within acceptable range
  - 1. Type of Remote Controller used and its location
  - m. Occupied space temperature sensing location
  - n. Air temperature readings within acceptable range
  - o. Condensate pump interlock method
  - p. Fan E.S.P. setting
  - q. Air Filter condition
  - r. Height differential setting in heat mode
  - s. Noise level acceptable
  - t. Refrigerant pipe connected and insulated properly
  - u. Condensate pipe connected and insulated properly
  - v. Condition of connected ductwork
  - w. Fresh air connected
  - x. Humidifier connected and checked
  - y. Review of air balance report complete
  - z. Other interlocked systems, i.e. baseboard heat, booster fan etc.
- 10. Outdoor Air Cooled equipment report shall contain
  - a. Model & Serial Number
  - b. Equipment location
  - c. Equipment Tag/Identification number
  - d. Network Address & Port Assignment
  - e. Digital recording of equipment settings
  - f. Mounting/support method
  - g. Seismic restraints used
  - h. High Wind Tethering method
  - i. Proper service clearance provided
  - j. Defrost Condensate removal addressed
  - k. Wiring and connection points are correct
- 1. High voltage reading(s) within acceptable range
- m. Low voltage reading(s) within acceptable range
- n. Control Network settings
- o. Noise level setting
- p. Refrigerant pipe installed and insulated properly
- q. Low ambient operation settings
- C. Physical Start-Up & Commissioning of Equipment:
  - 1. Upon proper equipment start up by the contractor, following the manufacturers guidelines and specifications, an employee of the VRF manufacturer shall complete a review of the system performance and complete the following tasks:
    - a. Check and confirm all communication addressing of system components.
    - b. Check and confirm each indoor unit, individually, is properly piped and wired by commanding the indoor unit on, in either heat or cool mode and verifying proper response.
      - 1) This process shall be digitally recorded and included as part of the close out documentation.
    - c. Electronically record a minimum of one-hour of operational data per refrigeration system.
    - d. Electronically record selector switch positions on all indoor and outdoor equipment.
    - e. The VRF manufacturer shall retain the electronically recorded data, collected during the start-up and equipment commissioning process, at a designated location within the US for future reference.
- D. Close-Out Information:
  - 1. The VRF manufacturer shall issue a System Performance report at the completion of all fieldwork. Contained within this report shall be an overview of the system performance, recommendations, field reports, all electronic data, and as-built design file.
- E. VRF Equipment Warranty:
  - Having successfully completed the Pre-Inspection, Start-Up & Equipment Commissioning processes and fulfilling all requirements, as outlined in the VRF manufacturers Extended Warranty Process. Along with installing contractor being certified by the VRFR manufacturer to install VRF systems, having attended a minimum 3- day VRF Service & Installation course at an authorized training center.
  - 2. The equipment shall be provided with the following warranty per the VRF manufacturer's warranty policy:
    - a. Compressor: 7-year part only
    - b. Parts: 5-years part only
    - c. Labor: no labor coverage provided by VRF Manufacturer

## 3.14 VRF SYSTEM OWNER TRAINING AND TECHNICAL SUPPORT

- A. The VRF manufacturer shall provide the owner's representative a minimum 16-hour VRF Operation and Maintenance training class covering systems installed under this scope of work.
- B. Training program is to be provided at the time of Owner occupancy.
- C. Owner shall provide a suitable location, onsite, to conduct the VRF Operation and Maintenance class.
- D. Training material shall be provided to participants in electronic format.
- E. Contact your region's VRF installation and service manager for information and pricing related to services required under this projects scope of work.

END OF SECTION 23 00 00

# SECTION 26 00 00 – ELECTRICAL TABLE OF CONTENTS

PAR	Г 1 - GENERAL	1
1.1	TIME, MANNER AND REQUIREMENTS FOR FILING SUB-BIDS	
1.2	RELATED DOCUMENTS	
1.3	GENERAL REOUIREMENTS AND REFERENCES	
1.4	DEFINITIONS	
1.5	SCOPE	
1.6	RELATED WORK UNDER OTHER SECTIONS	6
1.7	REGULATORY REQUIREMENTS	7
1.8	SUBMITTALS	7
1.9	SURVEYS AND MEASUREMENTS	
1.10	COORDINATION	
1.11	MECHANICAL AND ELECTRICAL COORDINATION	
1.12	MECHANICAL AND ELECTRICAL COORDINATION DRAWINGS	
1.13	INSTALLATION REQUIREMENTS	14
1.14	TYPICAL DETAILS	
1.15	SLEEVES, INSERTS	
1.16	CORING, DRILLING	
1.17	FIRESTOPPING, SMOKEPROOFING AND WATERPROOFING	
1.18	COMMISSIONING OF SYSTEMS	
1.19	ACCESSIBILITY	
1.20	SUPPLEMENTARY SUPPORTING STEEL	
1.21	TOOLS AND EQUIPMENT	
1.22	PORTABLE AND DETACHABLE PARTS	17
1.23	RECORD DRAWINGS, PROJECT CLOSEOUT	17
1.24	GUARANTEE/WARRANTY	17
1.25	OPERATING, INSTRUCTION AND MAINTENANCE MANUALS	
1.26	SERVICE CHARACTERISTICS	19
1.27	QUALITY ASSURANCE	
1.28	DELIVERY, STORAGE AND HANDLING	
1.29	TEMPORARY POWER AND LIGHTING	
1.30	STAGING AND SCAFFOLDING	
1.31	EXTRA MATERIALS	
1.32	SEISMIC REQUIREMENTS	
PAR	Г 2 – PRODUCTS	
2.1	GENERAL	
2.2	POWER SYSTEM STUDIES	
2.3	RACEWAYS AND FITTINGS	
2.4	CABLE TRAY	
2.5	WIRING MATERIALS	

2.6	OUTLET, JUNCTION, PULL BOXES AND WIRING TROUGHS FOR ALL	
SYST	EMS	
2.7	WIRING DEVICES	
2.8	GROUNDING REQUIREMENTS	31
2.9	PHASING AND COLOR CODING	32
2.10	ENCLOSURES FOR INDIVIDUALLY MOUNTED OVERCURRENT AND	
SWIT	CHING DEVICES	33
2.11	PANELBOARDS	33
2.12	MOLDED CASE CIRCUIT BREAKERS	35
2.13	CARTRIDGE FUSES	35
2.14	MOTOR CONTROLS	
2.15	ENGINE GENERATOR SYSTEM	
2.16	AUTOMATIC TRANSFER SWITCHES	46
2.17	LIGHTING FIXTURES	57
2.18	LOW VOLTAGE LIGHTING RELAY CONTROL PANEL	60
2.19	LOW VOLTAGE LIGHTING CONTROL DEVICES	65
2.20	INTEGRATED TECHNOLOGY INFRASTRUCTURE SUPPORT SYSTEM	68
2.21	FIRE ALARM SYSTEM	69
2.22	SERVICE ENTRANCE SPD PROTECTION	
2.23	BRANCH PANEL SPD PROTECTION	80
2.24	ACCESS PANELS	83
2.25	LIGHTNING PROTECTION SYSTEM	84
2.26	EMERGENCY RESPONDER RADIO COVERAGE SYSTEM	86
2.27	TEMPORARY GENERATOR DOCKING STATION	89
2.28	THREE-PHASE UNINTERRUPTIBLE POWER SYSTEM (UPS)	
2.29	UNDERGROUND ENCLOSURES	95
2.30	EQUIPMENT RACKS	96
2.31	SURGE PROTECTED POWER STRIP	97
2.32	CABLE SUPPORTS	97
2.33	BONDING AND GROUNDING JUMPER CABLE	98
2.34	UNSHIELDED TWISTED PAIR (UTP) CABLING SYSTEMS	98
2.35	BROADBAND RF CABLING SYSTEMS	101
		100
PART	3 EXECUTION	103
3 1	BASIC REOLUREMENTS	103
3.1	TESTING REQUIREMENTS & INSTRUCTIONS	105
3.2	BRANCH CIRCUITRY	105
3.5	SHORT_CIRCUIT COORDINATION STUDIES	112
3.4	REQUERENTS COVERNING ELECTRICAL WORK IN DAMP OR WET	, 113
	ATIONS	114
36	REQUIREMENTS GOVERNING ELECTRIC WORK IN AIR HANDI ING SPA	ACES
5.0	115	ICL0
3.7	UNDERGROUND CONDUIT BANKS	116
3.8	IDENTIFICATION AND TAGGING	118
3.9	LIMITING NOISE PRODUCED BY ELECTRICAL INSTALLATION	120
-		

3.10	SUPPORTS AND FASTENINGS	. 120
3.11	SPLICING AND TERMINATING WIRES AND CABLES	121
3.12	PULLING WIRES INTO CONDUITS AND RACEWAYS	122
3.13	REQUIREMENTS FOR THE INSTALLATION OF JUNCTION BOXES, OUTLET	Γ
BOXE	ES AND PULL BOXES	. 123
3.14	LOCATING AND ROUTING OF CIRCUITRY	. 125
3.15	INSTALLING CIRCUITRY	. 126
3.16	EXCAVATION AND BACKFILLING FOR UNDERGROUND ENCLOSURES	. 127
3.17	TELECOMMUNICATIONS EQUIPMENT RACKS, CABINETS AND BRACKET	S
	127	
3.18	TELECOMMUNICATIONS CABLE TERMINATIONS	. 128
3.19	TELECOMMUNICATIONS CABLE PATHWAYS	. 128
3.20	SEALING OF PENETRATIONS AND OPENINGS	. 129
3.21	SEISMIC SUPPORTS, SUPPLEMENTARY STEEL AND CHANNELS	. 130
3.22	TELECOMMUNICATIONS CABLE SUPPORTS	. 132
3.23	TELECOMMUNICATIONS CABLE PROTECTION	. 132
3.24	TELECOMMUNICATIONS CABLE INSTALLATION	. 133
3.25	TELECOMMUNICATIONS SYSTEM GROUNDING.	. 135
3.26	UTP CABLING SYSTEMS	. 136
3.27	PATCH PANELS, PATCH CORDS AND LINE CORDS	. 138
3.28	TELECOMMUNICATIONS CABLING LABELING	. 138
3.29	SLEEVING AND BUSHINGS	. 139
3.30	TELECOMMUNICATIONS SYSTEMS TESTING	. 139
3.31	TELECOMMUNICATIONS SYSTEMS DOCUMENTATION	142
3.32	TELECOMMUNICATIONS SYSTEM PROJECT OWNER COORDINATION	. 143
3.33	CLEANING UP	. 144

### SECTION 26 00 00 – ELECTRICAL

#### PART 1 - GENERAL

#### 1.1 TIME, MANNER AND REQUIREMENTS FOR FILING SUB-BIDS

- A. Sub-Bids shall be submitted in accordance with the provisions of General Laws, Chapter 149, Section 44A, inclusive, as amended.
- B. Sub-Bids for work under this Section shall be received electronically, until 2:00
  p.m. on Tuesday, October 29, 2019, at which time and place all Trade Contractor Bids shall be duly recorded.
- C. This project is being Electronically Bid (E-Bid). All bids shall be submitted online at <u>www.Projectdog.com</u>. Hard copy bids will not be accepted by the Awarding Authority. E-Bid tutorials and instructions are available within the specifications and online at <u>www.Projectdog.com</u>. For assistance, call Projectdog, Inc at (978)499-9014, M-F 8:30AM-5PM.
  - 1. All required bid forms must be submitted in **PDF** format only. The bidder must complete all required signatures either digitally (using Adobe Acrobat) or manually (print, sign and scan as a PDF file).
  - 2. Bid Bonds issued by a surety company shall be submitted on the E-Bid page. Bid bonds in the form of cash or check shall be completed and delivered as outlined on the Bid Bond Affidavit form.
  - 3. The bidder must enter bid price on the E-Bid form as a whole dollar value only with no punctuation. Sums shall be expressed in both words and figures on the bid form. Note: The E-Bid form will automatically match the word value to the numeric figure entered by the bidder.
  - 4. Bidders may save, submit or modify an E-Bid at any time prior to bid close. Once submitted, a bid cannot be edited. To modify a bid the bidder must retract the bid, make any necessary changes, and then submit the bid again. Upon submitting or retracting the bidder will receive a convenience email for informational purposes only. Bidders are encouraged to contact Projectdog, Inc at (978) 499-9014, M-F 8:30AM-5PM, if an email is not received.
  - 5. If a bid is submitted prior to an Addendum being issued, the bidder will receive an automated email for informational purposes only. The bidder must review the addendum, retract the bid, acknowledge all addenda, and submit the bid again. If a bidder fails to acknowledge addenda their bid may be rejected by the Awarding Authority.
  - 6. Timely submission of an E-Bid shall be the full responsibility of the Bidder. The server clock is the time of record. It is the bidder's responsibility to review and confirm online that a bid has been submitted and/or retracted and that the bid is 100% true, complete and accurate. All bidders are required to review their submitted E-Bid via the "View My Bid Package" link.

- D. Sub-Bids filed with the Awarding Authority shall be accompanied by a Bid Deposit in the form of a certified check or a treasurer's or cashier's check issued by a responsible bank or trust company, payable to the "**Town of Carver**". A bid bond shall be:
  - 1. In a form satisfactory to the Awarding Authority.
  - 2. With a surety company qualified to do business in the Commonwealth and satisfactory to the Awarding Authority.
  - 3. Conditioned upon the faithful performance by the principal of the agreements contained in the Bid. The amount of such bid deposit shall be five percent (5%) of the value of the Bid.
- E. Sub-Bids for work under this Section shall be for the complete work required as specified and as shown on the drawings.
- F. Sub-Bidders are directed to the Instructions to Bidders, and to the requirements that all bidders visit the site to determine the scope of work required under this Section.
- G. Sub-Bidders must comply with all provisions of Division 1, General Requirements, in the same manner as the General Contractor.

### 1.2 RELATED DOCUMENTS

- A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.
- B. Work Included: Provide labor, materials and equipment necessary to complete the work of this section, including, but not limited to, all work on the following drawings:
  - 1. E-0.0 Electrical Legend, Fixture Schedule and Notes
  - 2. ES-1.0 Electrical Site Plan
  - 3. ES-1.1 Electrical Site Details
  - 4. ES-1.2 Electrical Site Details
  - 5. E-1.0 Electrical Floor Plan Lighting
  - 6. E-2.0 Electrical Floor Plan Power
  - 7. E-2.1 Electrical Part Plans
  - 8. E-2.2 Electrical Floor Plan Mechanical Power

ELECTRICAL

- 9. E-2.3 Main Building Attic Electrical Plan
- 10. E-2.4 Electrical (Outbuilding) Plans Power and Lighting
- 11. E-3.0 Electrical Riser Diagram and Schedules
- 12. E-3.1 Electrical Details and Schedules
- 13. E-4.0 Electrical Floor Plan Security
- 14. E-4.1 Electrical (Out Building) Plan Security, Security Legend and Details
- 15. FA-0.0 Electrical Fire Alarm Legend, Riser Diagram and Notes
- 16. FA-1.0 Electrical Floor Plan Fire Alarm
- 17. FA-1.1 Main Building Attic Fire Alarm Plan
- 18. FA-2.0 Electrical (Outbuilding) Plan Fire Alarm
- 1.3 GENERAL REQUIREMENTS AND REFERENCES
  - A. Include "General Requirements" and applicable parts of Division 1 as part of this section.
  - B. Examine all other sections of the Specifications for requirements which affect work under this Section whether or not such work is specifically mentioned in this section. Where paragraphs of this section conflict with similar paragraphs of Division 1, requirements of this section shall prevail.
  - C. Coordinate work with that of all other trades affecting, or affected by work of this section. Cooperate with such trades to assure the steady progress of all work under the Contract.
  - D. The Subcontractor shall be responsible for filing all documents, payment of all fees, and securing of all inspections and approvals necessary for the work of this section.
  - E. The Electrical Subcontractor shall carry in the Bid Price all Utility Company and Municipal back charges for all materials furnished and work performed by them in conjunction with this Contract and pay same to the respective agency upon demand. The Electrical Subcontractor shall not be entitled to additional compensation after the submittal of his bid price should he fail, for any reason, to obtain the total back charge costs to be incurred by the Local Utility Companies or Municipal Agencies.

## 1.4 DEFINITIONS

- A. As used in this section, "provide" means "furnish and install", and "POS" means "Provided Under Other Sections".
- B. As used in the Contract Drawings and Specifications for Electrical work, certain non-

technical words shall be understood to have specific meanings as follows, regardless of indications to the contrary in the General Conditions of other documents governing the Electrical work.

- 1. "Furnish" means: Purchase and deliver to the project site complete with every necessary appurtenance and support, all as part of the Electrical work. Purchasing shall include payment of all sales taxes and other surcharges as may be required to assure that purchased item(s) are free of all liens, claims, or encumbrances.
- 2. "Install" means: Unload at the delivery point at the site and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project, all as part of the Electrical work.
- 3. "Provide" means: "Furnish" and "Install".
- 4. "New" means: Manufactured within the past two (2) years and never before used.
- C. Except where modified by a specific notation to the contrary, it shall be understood that the indication and/or description of any electrical item in the Contract Drawings or Specifications for Electrical work carries with it the instruction to furnish, install and connect the item as part of the Electrical work, regardless of whether or not this instruction is explicitly stated.
- D. It shall be understood that the Specifications and Drawings for Electrical work are complimentary and are to be taken together for a complete interpretation of the Electrical work except that indications on the Contract Drawings, which refer to an individual element of work, take precedence over the Specifications where they conflict.
- 1.5 SCOPE
  - A. Perform work and provide material and equipment as shown on Drawings and as specified or indicated in this Section of the Specifications. Completely coordinate work of this Section with work of other trades and provide a complete and fully functional installation.
    - 1. Primary electric service duct bank.
    - 2. Secondary electric service including underground conduit bank and secondary service entrance feeders, from the utility company pad mounted transformer, building grounding electrode and main service disconnect.
    - 3. Interior secondary distribution systems including main distribution panel, all distribution panelboards, motor controls, magnetic starters, overcurrent and switching devices, panelboards, raceways, cables, wiring, junction and pull boxes, wireways, and all other components required for complete electrical distribution system.
    - 4. Power system study.

- 5. All lighting systems (indoor and outdoor, normal, night, emergency and exit) including all fixtures, lamps, mounting accessories, switches, controls, outlets, wiring, raceways, and all other components and fittings required for a complete lighting system.
- 6. Telephone and data empty raceway system.
- 7. Telecommunications system including Tel/Data and broadband cabling, outlets, equipment racks and patch panels.
- 8. Grounding and bonding of all electrical systems and equipment.
- 9. Fire alarm system complete with all devices and wiring including municipal connections.
- 10. Wiring devices (switches and receptacles) complete with associated wallplates.
- 11. Power wiring to HVAC, plumbing and fire protection equipment.
- 12. Security system and CCTV system empty raceway systems.
- 13. Testing of all electrical systems.
- 14. Access panels (furnish only).
- 15. Emergency distribution system including diesel generator, automatic transfer switch, panelboards, and all other components required for a complete system.
- 16. Coordination between electrical and other trades.
- 17. Connections for all kitchen equipment.
- 18. Lighting controls.
- 19. All other systems hereinafter specified or indicated on the Contract Drawings, complete, leaving ready an electrical system in perfect operating condition.
- 20. All required staging and scaffolding of any height.
- 21. Lightning protection.
- 22. UPS system.
- 23. Emergency responder radio coverage system.
- 24. Temporary generator docking station.
- B. Drawings and Specifications form complimentary requirements; provide work specified and not shown, and work shown and not specified as though explicitly required by both.

Although work is not specifically shown or specified, provide supplementary or miscellaneous items, appurtenances, devices and materials obviously necessary for a sound, secure and complete installation.

C. Give notices, file plans, obtain permits and licenses, pay fees and back charges, and obtain necessary approvals from Authorities that have jurisdiction as required to perform work in accordance with all legal requirements and with Specifications, Drawings, Addenda and Change Orders, all of which are part of Contract Documents.

## 1.6 RELATED WORK UNDER OTHER SECTIONS

- A. The following items are not included in this section and will be performed under the designated sections.
  - 1. Temporary Facilities.
  - 2. Earthwork: Excavation and backfill.
  - 3. Concrete:
    - a. Equipment foundations.
    - b. Housekeeping pads.
    - c. Concrete encasement for conduit banks.
    - d. Light pole bases.
    - e. Rebar for items "a, b, c & d" above.
  - 4. Masonry: All openings in masonry walls.
  - 5. Waterproofing, Dampproofing and Caulking.
  - 6. Roofing and Flashing.
  - 7. Painting: All painting except as specified herein.
  - 8. Finish Carpentry and Millwork.
  - 9. Steel Doors and Frames.
  - 10. Finish Hardware.
  - 11. Fire Protection.
  - 12. Plumbing.
  - 13. HVAC.
  - 14. Kitchen equipment.

## 1.7 REGULATORY REQUIREMENTS

- A. Comply with all applicable Federal and State laws, and all Local Codes, By-laws and Ordinances.
- B. Where provisions of the Contract Documents conflict with any codes, rules or regulations, the latter shall govern. Where the contract requirements are in excess of applicable codes, rules or regulations, the contract provisions shall govern unless the Architect rules otherwise.
- C. Request inspections from Authorities having jurisdiction, obtain all permits and pay for all fees and inspection certificates as applicable and/or required. All permits and certificates shall be turned over to the Owners at the completion of the work. Copies of permits shall be given to the resident engineer prior to the start of work.
- D. Unless otherwise specified or indicated, materials and workmanship and equipment performance shall conform with the latest edition of the following standards, codes, Specifications, requirements and regulations:
  - 1. State Building Code.
  - 2. State Electrical Code.
  - 3. National Fire Protection Association (NFPA).
  - 4. Local Town Regulations and By-Laws.
  - 5. Underwriter's Laboratories, Inc. (UL).
  - 6. National Electrical Manufacturer's Association (NEMA).
  - 7. American National Standards Institute (ANSI).
- E. All Electrical work shall meet or exceed any other state and local codes and/or Authorities having jurisdiction including all other standards indicated herein.

## 1.8 SUBMITTALS

- A. This paragraph shall supplement Division 1.
- B. Definitions:
  - 1. Shop Drawings: Information prepared by the Contractor to illustrate portions of the work in more detail than shown in the Contract Documents.
  - 2. Coordination Drawings: Detailed, large-scale layout Shop Drawings showing HVAC, Electrical, Plumbing and Fire Protection work superimposed to identify conflicts and ensure inter-coordination of Mechanical, Electrical, Architectural, Structural and other work.

- 3. Manufacturer's Product Data: Information prepared by the manufacturer which depicts standard equipment.
- C. Submittals, Procedures and Format:
  - 1. Review submittal packages for compliance with Contract Documents and then submit to Architect for review. Submit transparency and two (2) blue or black-line reproductions of each Shop Drawing larger than 8-1/2" x 11". Submit eight (8) sets of each smaller shop drawing. After review, transparency original of each large Shop Drawing and six (6) sets of each small shop drawing will be returned with reviewer's marks. Electronically submitted shop drawings are acceptable.
  - 2. Each Shop Drawing shall indicate in title block, and each Product Data package shall indicate on cover sheet, the following information:
    - a. Title.
    - b. Name and location of project.
    - c. Names of Architect, Engineer, Contractor and Subcontractor(s).
    - d. Names of Manufacturer, Supplier, Vendor, etc.
    - e. Date of submittal.
    - f. Whether original submittal or resubmitted.
  - 3. Shop Drawings and/or Manufacturer's Product Data shall contain detailed dimensional Drawings, accurate and complete description of materials of construction, manufacturer's published performance characteristics and capacity ratings (performance data alone is not acceptable), electrical requirements and wiring diagrams. Drawings shall clearly indicate location (terminal block or wire number), voltage and function for all field terminations, and other information necessary to demonstrate compliance with all requirements of Contract Documents.
- D. Acceptable Manufacturers:
  - The Architect's Mechanical/Electrical design for each project is based on the single manufacturer listed in the schedule or shown on the Contract Drawings. In Division 26 of these Specifications certain "Alternate Manufacturers" are listed as being acceptable. These are acceptable only if, as a minimum, they:
    - a. Meet all performance criteria listed in the schedules and outlined in the Specifications.
    - b. Have identical operating characteristics to those called for in the Specifications.
    - c. Fit within the available space it was designed for, including space for maintenance and component removal, with no modifications to either the space or the product. Clearances to walls, ceilings and other equipment will be at least equal to those shown on the Contract Documents. The fact that a manufacturer's name appears as acceptable shall not be taken to mean the Architect has determined that the manufacturer's products will fit within the available space. This determination is solely the responsibility of the Contractor.
    - d. For equipment mounted in areas where structural matters are a consideration, the products must have a weight no greater than the product listed in the schedules or Specifications.

- e. Products must adhere to all architectural considerations including, but not limited to, being the same size and of the same physical appearance as scheduled or specified products.
- E. Substitutions: Substitution of products by manufacturers other than those listed shall only be done in accordance with subparagraph "F" "Substitutions and Deviations".
- F. Substitutions and Deviations:
  - Deviations from the Contract Documents and the substitution of materials or equipment relative to the "Acceptable Manufacturers" referred to above shall be requested individually in writing whether deviations result from field conditions, standard shop practice, or other cause. Submit letter with transmittal of Shop Drawings which flags the substitution or deviation to the attention of the Architect. The letter shall describe changes in the system shown and physical characteristics (connections to adjacent materials, electrical services, service access requirements, and other characteristics), and differences in operating characteristics or cycles.
  - 2. Without letters flagging the substitution or deviation to the Architect, it is possible that the Architect may not notice such substitution or deviation or may not realize its ramifications. Therefore, if such letters are not submitted to the Architect, the Contractor shall hold the Architect and his consultants harmless for any and all adverse consequences resulting from the deviations being implemented. Adverse consequences shall include, but not be limited to, excessive noise, excessive maintenance, shortened longevity, spatial coordination problems, and inadequate performance versus scheduled design. This shall apply regardless of whether the Architect has reviewed or approved Shop Drawings containing the deviation, and will be strictly enforced.
  - 3. Do not request substitute materials or equipment unless identical material or equipment has been operated successfully for at least three (3) consecutive years. Such materials and equipment shall be a regular cataloged item shown in the current catalog of the manufacturer. When deviation or substitution is permitted, coordinate fully with related changes to Architectural, Structural, Plumbing, Fire Protection, Mechanical, and other work. Ensure that related changes necessary for coordination of substituted items are made within the Contract Price. Assume full responsibility for safety, operation and performance of the altered system. Any extra costs incurred to the project based on the use of alternate manufacturers shall be borne by the Contractor who has requested the substitution.
  - 4. Substitutions of equipment, systems, etc. requiring approval of local Authorities must comply with such regulations and be filed by the Contractor (should filing be necessary).
  - 5. Consideration will not be given to claims that the substituted item meets the performance requirements with lesser construction. Performance, as delineated in schedules and in the Specifications, shall be interpreted as minimum performance.

- 6. Approval of proposed deviations or substitutions, if any, will be made at discretion of Architect.
- 7. If equipment is proposed for substitution that is not tested and rated according to industry-wide standards, the Architect shall have the right to have performance tests completed, at the Contractor's expense, to confirm the manufacturer's performance claims.
- G. Submittal Notations: Submittals will be returned from the Architect marked as illustrated below:

NO EXCEPTION TAKEN	ACCEPTED AS NOTED
NOT ACCEPTED	REVISE AND RESUBMIT

- 1. Checking is only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Any action shown is subject to the requirements of the Contract Drawings and Specifications. Contractor is responsible for dimensions which shall be confirmed and correlated at the job site; fabrication process and techniques of construction; coordination of his work with that of all other trades; and the satisfactory performance of his work.
- H. Schedule: Incorporate the Shop Drawing review period into the construction schedule so that work is not delayed. Contractor shall assume full responsibility for delays caused by not incorporating the following Shop Drawing review time requirements into his project schedule. Allow at least ten (10) working days, exclusive of transmittal time, for review each time Shop Drawing is submitted or resubmitted with the exception that fifteen (15) working days, exclusive of transmittal time, are required for the following:
  - 1. Motor control wiring diagram submittals.
  - 2. Short circuit and coordination studies.
  - 3. Coordination Drawings, if required by this Specification.
  - 4. If more than five (5) Shop Drawings of this trade are received in one (1) calendar week.
- I. List of Proposed Equipment and Materials: Within four (4) weeks after Award of Contract and before ordering materials or equipment, submit a complete list of proposed materials and equipment and indicate manufacturer's names and addresses. No consideration will be given to partial lists submitted out of sequence.
- J. Responsibility:
  - 1. The intent of submittal review is to check for capacity, rating, and certain construction features. Contractor shall ensure that work meets requirements of the

#### ELECTRICAL

Contract Documents regarding information that pertains to fabrication processes or means, methods, techniques, sequences and procedures of construction; and for coordination of work of this and other Sections. Work shall comply with submittals marked "REVIEWED" to extent that they agree with the Contract Documents. Submittal review shall not diminish responsibility under this Contract for dimensional coordination, quantities, installation, wiring, supports and access for service, nor the shop drawing errors or deviations from requirements of the Contract Documents. The Architect's noting of some errors while overlooking others will not excuse the Contractor for proceeding in error. Contract Document requirements are not limited, waived, nor superseded in any way by review.

- 2. Inform Subcontractors, Manufacturers, Suppliers, etc. of scope and limited nature of review process and enforce compliance with the Contract Documents.
- K. Material and equipment requiring Shop Drawing and/or Manufacturer's Data Submittals shall include but not be limited to:
  - 1. Light fixtures.
  - 2. Distribution panels and motor controls.
  - 3. Panelboards and Surge Protective Devices (SPD).
  - 4. Overcurrent and switching devices.
  - 5. Wiring devices and wall plates.
  - 6. Fire alarm system with wiring diagram and schedule.
  - 7. Emergency generator system, including automatic transfer switch.
  - 8. Cable trays.
  - 9. Wiring and cables.
  - 10. Conduit.
  - 11. Boxes and fittings.
  - 12. Safety switches.
  - 13. Lighting control.
  - 14. Lightning protection.
  - 15. Telecommunications system including Tel/Data and broadband cabling, outlets, equipment racks, and patch panels.
  - 16. Power systems study.

- 17. UPS system.
- 18. Emergency responder radio coverage system.
- 19. Temporary generator docking station.
- 1.9 SURVEYS AND MEASUREMENTS
  - A. Base all required measurements, both horizontal and vertical, on reference points established by the General Contractor and be responsible for the correct laying out of the Electrical work. In the event of a discrepancy between actual measurements and those indicated, notify the General Contractor in writing. Do not proceed with the work required until written instructions have been issued by the General Contractor.

#### 1.10 COORDINATION

- A. HVAC, Plumbing, Fire Protection, and Electrical Drawings are diagrammatic. They indicate general arrangements of Mechanical and Electrical systems and other work. They do not show all offsets required for coordination nor do they show the exact routings and locations needed to coordinate with Structural and other trades and to meet Architectural requirements.
- B. Work shall be performed in cooperation with other trades on the project and so scheduled as to allow speedy and efficient completion of the work.
- C. Furnish to other trades advance information on locations and sizes of all frames, boxes, sleeves and openings needed for their work. Furnish information and Shop Drawings necessary to allow trades affected by the work to install their work properly and without delay.
- D. In all spaces, prior to installation of visible material and equipment, including access panels, review Architectural Drawings for exact locations and where not definitely indicated, request information from Architect. Where the Electrical work shall interfere with the work of other trades, assist in coordinating the space conditions to make satisfactory adjustments before installation. Without extra cost to the Owners, make reasonable modifications to the work as required by normal Structural interferences. Pay the General Contractor for additional openings, or relocating and/or enlarging existing openings through concrete floors, walls, beams and roof required for any work which was not properly coordinated. Maintain maximum headroom at all locations. All piping, duct, conduit, and associated components to be as tight to underside of structure as possible.
- E. If any Electrical work has been installed before coordination with other trades so as to cause interference with the work of such trades, all necessary adjustments and corrections shall be made by the trades involved without extra cost to the Owners.
- F. Where conflicts or potential conflicts exist and engineering guidance is desired, submit sketch of proposed resolution to Architect for review and approval.

G. Protect all materials and work of other trades from damage which may be caused by the Electrical work, and repair all damages without extra cost to the Owners.

## 1.11 MECHANICAL AND ELECTRICAL COORDINATION

- A. The HVAC Subcontractor shall furnish and install various electrical items relating to the heating and ventilating equipment and control apparatus. The Electrical Subcontractor shall be required to connect power wiring to this equipment unless noted otherwise.
- B. The HVAC and Electrical Subcontractors shall coordinate their respective portions of the work, as well as the electrical characteristics of the heating, ventilating and air conditioning equipment.
- C. All power wiring and local disconnect switches will be provided by the Electrical Subcontractor for the line voltage power. All control and interlocking wiring shall be the responsibility of the HVAC Subcontractor.
- D. 120V and above power wiring sources extended and connected to HVAC control panels, transformers and switches shall be the responsibility of the Electrical Subcontractor. All low voltage thermostat, and any switch wiring shall be the responsibility of the HVAC Subcontractor.
- E. Temperature control and equipment wiring shall be installed by the Heating and Ventilating Subcontractor.
- F. Pipe heat tracing shall be furnished and installed by the Plumbing Subcontractor. Power connections shall be by the Electrical Subcontractor.
- G. The Electrical Subcontractor will provide all magnetic starters except those furnished as an integral part of packaged equipment.

### 1.12 MECHANICAL AND ELECTRICAL COORDINATION DRAWINGS

- A. Coordination Drawings:
  - 1. The Sheetmetal Subcontractor shall prepare a complete set of electronic type background Drawings at a scale not less than 1/8" equals 1'-0", showing structure and other information as needed for coordination. He shall show sheetmetal layout thereon. These will be the Coordination Drawings.
  - 2. The main paths of egress and for equipment removal, from main Mechanical and Electrical rooms must be clearly shown on the Coordination Drawings.
  - 3. Each of the below specialty trades shall add its work to these background Drawings with appropriate elevations and grid dimensions. Specialty trade information is required for fan rooms and mechanical rooms, horizontal exits from duct shafts, crossovers, and for spaces in and above ceilings where congestion of work may occur such as corridors, and even entire floors. Drawings shall indicate horizontal and

vertical dimensions, to avoid interference with structural framing, ceilings, partitions, and other services.

- a. Specialty Trades:
  - 1) Plumbing System.
  - 2) HVAC Piping and Associated Control System.
  - 3) Electrical.
  - 4) Sheet Metal Work.
  - 5) Sprinkler System.
- 4. Each specialty trade shall sign and date each Coordination Drawing. Return Drawings to the Sheetmetal Subcontractor, who shall route them sequentially to all specialty trades.
- 5. Where conflicts occur with placement of materials of various trades, the Sheetmetal Subcontractor will be responsible to coordinate the available space to accommodate all trades. Any resulting adjustments shall be initialed and dated by the specialty trade. The Sheetmetal Subcontractor shall then final date and sign each Coordination Drawing. If he cannot resolve conflicts, the decision of the General Contractor shall be final, subject to the approval of the Architect.
- 6. A Subcontractor who fails to promptly review and incorporate his work on the Contract Drawings shall assume full responsibility of any installation conflicts affecting his work and of any schedule ramifications.
- 7. The Sheetmetal Subcontractor shall make copies of all coordination Drawings. Fabrication shall not start until such copies of completed Drawings are received by the Architect/Engineer and have been reviewed.
- 8. Review of Coordination Drawings shall not diminish responsibility under this Contract for final coordination of installation and maintenance clearances of all systems and equipment with Architectural, Structural, Mechanical, and Electrical Contractors.

#### 1.13 INSTALLATION REQUIREMENTS

- A. The arrangement of all Electrical work shown on the Contract Drawings is diagrammatic only and indicates the minimum requirements of the work. Conditions at the building including actual measurements shall determine the details of the installation. All work shall be laid out and installed so as to require the least amount of cutting and patching.
- B. Review the Architectural Drawings and Specifications before ordering any material and equipment. Any discrepancies shall be brought to the attention of the Architect for his determination prior to proceeding with the work.

## 1.14 TYPICAL DETAILS

A. Typical details where shown on the Contract Drawings shall apply to each and every item of the project where such items are applicable. They are not repeated in full on the Contract Drawings, which in many cases are diagrammatic only, but with the intention

that such details shall be incorporated in full. Any alternate method proposed for use by the Contractor shall have the prior approval of the Architect.

## 1.15 SLEEVES, INSERTS

- A. Furnish and install all sleeves, inserts, anchor bolts and similar items to be set into masonry or concrete, as required for Mechanical and Electrical work. Internal diameter of sleeve ball shall be 1/2" larger than the outside diameter of the pipe or insulation covered line passing through it.
- 1.16 CORING, DRILLING
  - A. Core, cut and/or drill all small holes 4.5" diameter or less in walls, floors and ceiling required for the installation of sleeves, supports, and conduit for the Electrical work.
- 1.17 FIRESTOPPING, SMOKEPROOFING AND WATERPROOFING
  - A. All penetrations made through fire rated assemblies (structures or partitions) shall be completely and properly fire sealed with the appropriate firestop systems installed in accordance with the Manufacturer's recommendations. The firestop material UL listed fire rating shall match or exceed the fire rated assemblies. Verify with Architect if project is utilizing a specified product. If not, provide product manufactured by Hilti, Nelson or STI.
  - B. Provide waterproofing of all materials which penetrate a floor, exterior wall, slab or roof. All sleeves shall extend a minimum of 3 inches above floor or roof. All penetrations thru building foundation walls shall utilize Link-Seal products or approved equal.

## 1.18 COMMISSIONING OF SYSTEMS

- A. Provide the services of a factory authorized technician to instruct and direct the Owner in the operation and maintenance of indicated systems and/or equipment. The Electrical Subcontractor shall be available throughout the entire Commissioning Phase to operate the systems/equipment. Systems and/or equipment that shall be commissioned include the following:
  - 1. Panelboards.
  - 2. Circuit breaker.
  - 3. Disconnect switches.
  - 4. Toggle switches.
  - 5. Occupancy/Vacancy sensors.
  - 6. Access Control systems.
  - 7. Telecommunications systems.

- 8. Lighting Control systems.
- 9. Fire Alarm systems.
- 10. Diesel generators.
- 11. Automatic transfer switches.
- 12. Motor controls.
- 13. Surge protection devices.
- 14. UPS.
- B. Upon completion of all tests, the Electrical Subcontractor shall repair and/or replace any defective equipment. Once replaced and/or repaired, all Commissioning shall be performed.
- C. Refer to Section 26 00 00 paragraph 3.2 for additional requirements.
- 1.19 ACCESSIBILITY
  - A. Install all work such that parts requiring periodic inspection, operation, maintenance and repair are readily accessible.
  - B. Furnish all access panels appropriate to particular conditions, to be installed by trades having responsibility for the construction of actual walls, floors or ceilings at required locations.
- 1.20 SUPPLEMENTARY SUPPORTING STEEL
  - A. Provide all supplementary (non-structural) steelwork required for mounting or supporting equipment and materials.
  - B. Steelwork shall be firmly connected to building construction as required. Locations and methods of attachment shall be approved by the Architect.
  - C. Steelwork shall be of sufficient strength to allow only minimum deflection in conformity with manufacturer's published requirements.
  - D. All supplementary steelwork shall be installed in a neat and workmanlike manner parallel to floor, wall and ceiling construction: all turns shall be made at forty-five and ninety degrees, and/or as dictated by construction and installation conditions.
  - E. All manufactured steel parts and fittings shall be galvanized.
- 1.21 TOOLS AND EQUIPMENT
  - A. Provide all tools and equipment required for the fabrication and installation of the Mechanical and Electrical equipment at the site.

## 1.22 PORTABLE AND DETACHABLE PARTS

A. Contractors shall retain in their possession all portable and/or detachable parts and portions of materials, devices, equipment, etc. necessary for the proper operation and maintenance of the Mechanical and Electrical systems until final completion of the work, at which time they shall be handed over to the Owners.

## 1.23 RECORD DRAWINGS, PROJECT CLOSEOUT

- A. As work progresses and for the duration of Contract, maintain a complete and separate set of prints of Contract Drawings at job site at all times. Record work completed and all changes from original Contract Drawings clearly and accurately including work installed as a modification or addition to the original design. Work shall be updated on a weekly basis and shall be made available for review by Architect. Failure to perform this work shall be reason for withholding requisition payments. In addition, take photographs of all concealed equipment in gypsum board ceilings, shafts, and other concealed, inaccessible work. At completion of work, make copies of photographs with written explanation on back. These shall become part of Record Documents.
- B. At completion of work prepare a complete set of Record Drawings utilizing AutoCAD produced drawings showing all systems as actually installed, including all fire alarm and electrical circuitry. Submit three (3) sets of prints to Architect for comments as to compliance with this section.
- C. The Architect will not certify the accuracy of the Record Drawings. This is the sole responsibility of the Electrical Contractor.
- D. This trade shall submit the Record Drawings for approval by the Fire and Building Departments in a form acceptable to the departments, when required by the jurisdiction.
- E. Record Drawings shall show record condition of details, sections, riser diagrams, control changes and corrections to schedules. Schedules shall show actual manufacturer, make and model numbers of final equipment installation.

## 1.24 GUARANTEE/WARRANTY

- A. Guarantee and 24 Hour Service:
  - 1. Guarantee Work of this Section in writing for not less than one (1) year following the date of acceptance by the Owner. If the equipment is used for temporary power etc, prior to acceptance by the Owner, the bid price shall include an extended period of warranty covering the one (1) year of occupancy, starting from the date of acceptance by the Owner. The guarantee shall repair or replace defective materials, equipment, workmanship and installation that develop within this period, promptly and to the Architect's satisfaction and correct damage caused in making necessary repairs and replacements under guarantee within Contract Price.

- 2. In addition to guarantee requirements of Division 1 and of Subparagraph A above, obtain written equipment and material warranties offered in manufacturer's published data without exclusion or limitation, in Owner's name.
- 3. Upon receipt of notice from the Owner of failure of any part of the systems or equipment during the warranty period, the affected part or parts shall be replaced by this Contractor without any reimbursement.
- 4. Replace material and equipment that require excessive service during guarantee period as defined and as directed by Architect.
- 5. Provide 24 hour service beginning on the date the project is accepted by the Owner, whether or not fully occupied, and lasting until the termination of the guarantee period. Service shall be at no cost to the Owner. Service can be provided by this Contractor or a separate service organization. Choice of service organization shall be subject to Architect and Owner approval. Submit name and a phone number that will be answered on a 24 hour basis each day of the week, for the duration of the service.
- 6. Submit copies of equipment and material warranties to Architect before final payment.
- 7. At end of guarantee period, transfer manufacturer's equipment and material warranties still in force to Owner.
- 8. This paragraph shall not be interpreted to limit Owner's rights under applicable codes and laws and under this Contract.
- 9. PART 2 paragraphs of this Specification may specify warranty requirements that exceed those of this paragraph. Those paragraphs shall govern.
- 10. Use of systems provided under this Section for temporary services and facilities shall not constitute Final Acceptance of Work by Owner, and shall not initiate the guarantee period.
- 11. Provide manufacturer's engineering and technical staff at site to analyze and rectify problems that develop during guarantee period immediately. If problems cannot be rectified immediately to Owner's satisfaction, advise the Architect in writing, describe efforts to rectify situation, and provide analysis of cause of problem. The Architect and/or Engineer will direct course of action.

## 1.25 OPERATING, INSTRUCTION AND MAINTENANCE MANUALS

- A. Refer to Section 01700 CONTRACT CLOSEOUT for submittal procedures pertaining to operating and maintenance manuals.
- B. Each copy of the approved operating and maintenance manual shall contain copies of approved Shop Drawings, equipment literature, cuts, bulletins, details, equipment and engineering data sheets and typewritten instructions relative to the care and maintenance

for the operation of the equipment, all properly indexed. Each manual shall have the following minimum contents:

- 1. Table of Contents.
- 2. Introduction:
  - a. Explanation of manual and its purpose and use.
  - b. Description of the electrical systems.
  - c. Safety precautions necessary for equipment.
  - d. Illustrations, schematics and diagrams.
  - e. Installation drawing.
- 3. Maintenance:
  - a. Maintenance and lubricating instructions.
  - b. Replacement charts.
  - c. Trouble-shooting charts for equipment components.
  - d. Testing instructions for each typical component.
  - e. Two (2) typed sets of instructions for ordering spare parts. Each set shall include name, price, telephone number and address of where they may be obtained.
- 4. Manufacturer's Literature:
  - a. The equipment for which Shop Drawings have been submitted and approved.

## 1.26 SERVICE CHARACTERISTICS

- A. Primary Utility Voltage: 13.8 kv
- B. Secondary Building Voltage: 120/208.
- C. All equipment and wiring shall be suitable for the applied voltage.

#### 1.27 QUALITY ASSURANCE

- A. The requirements of the State Building Code and Local regulations establish the minimum acceptable quality of workmanship and materials, and all work shall conform thereto unless more stringent requirements are indicated or specified herein.
- B. All work shall comply with the latest editions of the codes as referenced herein.
- C. Follow manufacturer's directions for articles furnished, in addition to directions shown on Drawings or specified herein.
- D. Protect all work, materials, and equipment from damage during process of work. Replace all damaged or defective work, materials and equipment without additional cost to the Owner.
- E. All equipment and materials for permanent installation shall be the products of recognized manufacturers and shall be new.

- F. Equipment and materials shall:
  - 1. Where normally subject to Underwriters Laboratory Inc. listing or labeling services, be so listed and labeled.
  - 2. Be without blemish or defect.
  - 3. Not be used for temporary light and power purposes.
  - 4. Be in accordance with the latest applicable NEMA standards.
  - 5. Buy products which will meet with the acceptance of all Authorities having jurisdiction over the work. Where such acceptance is contingent upon having the products examined, tested and certified by Underwriters or other recognized testing laboratory, the product shall be so examined, tested and certified.
- G. Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material of one generic type shall be the product of one manufacturer throughout.
- H. For items which are to be installed but not purchased as part of the Electrical work, the Electrical work shall include:
  - 1. The coordination of their delivery.
  - 2. Their unloading from delivery trucks driven into any point on the property line at grade level.
  - 3. Their safe handling and field storage until the time of permanent placement in the project.
  - 4. The correction of any damage, defacement or corrosion to which they may have been subjected. Replacement, if necessary, shall be coordinated with the Contractor who originally purchased the item.
  - 5. Field erection and internal wiring as necessary for their proper operation.
  - 6. Mounting in place, including the purchase and installation of all dunnage, supporting members, and fastenings, necessary to adapt them to architectural and structural conditions.
- I. Items which are to be installed but not purchased as part of the electric work shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the electric work will be considered only if presented in writing within one (1) week of the date of delivery to the project of the items in question. The electric work includes all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

## 1.28 DELIVERY, STORAGE AND HANDLING

A. All materials for the work of this section shall be delivered, stored and handled so as to preclude damage of any nature. Manufactured materials shall be delivered and stored in their original containers, plainly marked with the products' and manufacturer's name. Materials in broken containers or in packages showing watermarks or other evidence of damage, shall not be used and shall be removed from the site.

## 1.29 TEMPORARY POWER AND LIGHTING

- A. The Electrical Subcontractor shall furnish and install feeders of sufficient size from the Utility Company's power lines for the electric light and power requirements for the building while under construction and until the permanent feeders and related equipment have been installed and are in operation. Temporary lighting shall be based on a minimum of one watt per square foot covering each and every square foot of floor area in the building. Sufficient wiring, lamps, and outlets shall be installed to insure proper lighting in all rooms, space, stairwells, and corridors. Minimum sized lamp used shall be 100 watt. Where higher lighting intensities are required by Federal or State Standards of Laws or otherwise specified, the above specified wattage shall be increased to provide these increased intensities.
- B. All necessary transformers, meters, cables, panelboards, switches, temporary lamp replacements and accessories required for the temporary light and power installation shall be provided by the Electrical Subcontractor.
- C. The Electrical Subcontractor shall provide and maintain on each floor of the building, a feeder or feeders of sufficient capacity for the requirements of the entire floor and he shall provide a sufficient number of outlets, located at convenient points so that extension cords of not over 50 feet in length will reach all work requiring temporary light or power.
- D. The Electrical Subcontractor shall install and maintain the wiring and accessories for the offices of the General Contractor and the Clerk of the Works as specified in the contract form.
- E. All temporary Electrical work shall meet the requirements of the National Electrical Code Article 590 Temporary Wiring, the Local Utility Company, and all Federal Standards and Laws.
- F. All temporary wiring and accessories thereto installed by the Electrical Subcontractor shall be removed after their purposes have been served.
- G. The General Contractor will pay for the cost of electric energy consumed by himself and by all of his Subcontractors, unless otherwise indicated.
- H. All lamps installed in permanent lighting fixtures and used for lighting during construction shall be replaced by the Electrical Subcontractor just prior to date of Use and Occupancy or Final Acceptance.

I. Provide all temporary lighting and power required above during the normal working hours of the project or a total of ten (10) hours per normal working day; Saturdays, Sundays and legal holidays are excluded. The ten hours per day shall include manning the temporary power and lighting 1/2 hour before and 1/2 hour after a normal eight (8) hour working day. In addition to the above, provide and maintain, to the satisfaction of the local Authorities having jurisdiction, all temporary lighting and power that may be required for safety purposes. The Electrical Subcontractor will be compensated by the General Contractor for any additional standby time, materials or equipment required by the General Contractor or other Subcontractors beyond the normal working hours, as defined above.

## 1.30 STAGING AND SCAFFOLDING

A. Provide staging and scaffolding for all the work of this section complying with Division 1 requirements.

## 1.31 EXTRA MATERIALS

- A. Furnish extra materials as indicated below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
  - 1. 10% of each total circuit breakers installed.
  - 2. 10% of each total fuses installed.
  - 3. Ten (10) toggle switches and duplex receptacles.
  - 4. 10% of total audio/visual appliances installed.
  - 5. 10% of each total pull stations and smoke detectors installed.
  - 6. Five (5) ceiling mounted OCC/VAC sensors and associated power supplies.
  - 7. Five (5) wall mounted OCC/VAC sensor switches.

## 1.32 SEISMIC REQUIREMENTS

A. Equipment and work shall meet the restraint requirements for the designated Seismic Design category. This shall include all installation and connections of material and equipment to the building structure. Refer to Structural Drawings for Seismic Design category and ASCE7 for electrical requirements.

## PART 2 – PRODUCTS

## 2.1 GENERAL

- A. Product Specifications are written in such a manner so as to specify what materials may be used in a particular location or application and therefore do not indicate what is not acceptable or suitable for a particular location or application. As an example: Non-metallic sheathed cable is not specified; therefore it is not acceptable.
- B. For purpose of establishing a standard of quality and not for purposes of limiting completion, the basis of this Specification is upon specified models and types of equipment and materials, as manufactured by specified manufacturers.
- C. In all cases, standard cataloged materials and systems have been selected. Materials such as lighting fixtures specially manufactured for this particular project, and not part of a manufacturer's standard product line, will not be acceptable. In the case of systems, the system components shall be from a single source regularly engaged in supplying such systems. A proposed system made up of a collection of various manufacturers products will be unacceptable.
- D. Where Specifications list manufacturers names and/or "as approved" or "equal approved by Designer", other manufacturers equipment will be considered if equipment meets Specification requirements and has all features of the specified items as are considered essential by the Architect.
- E. All materials shall be new and shall be UL listed.

#### 2.2 POWER SYSTEM STUDIES

- A. Short Circuit Studies, Protective Device Evaluation Studies, Protective Device Coordination Studies and arc flash analysis shall be provided by this Electrical Subcontractor. The studies shall be submitted to the Engineer prior to receiving final approval of the distribution equipment Shop Drawings and/or prior to release of equipment for manufacture. If formal completion of the studies may cause delay in equipment manufacture, approval may be obtained for a preliminary submittal of sufficient study data to ensure that the selection of device ratings and characteristics will be satisfactory.
- B. The studies shall include all portions of the electrical distribution system from the normal power source. Normal system connections and those which result in maximum fault conditions shall be adequately covered in the study.
- C. The short circuit study shall be in accordance with ANSI/IEEE guidelines, NFPA 70B and ANSI C2.
- D. The study input data shall include the power company's short circuit contribution, resistance and reactance components of the branch impedances, the X/R ratios, base quantities selected, and other source impedances.

- E. Short circuit momentary duty values and interrupting duty values shall be calculated on the basis of assumed three-phase bolted short circuits at each power center bus, distribution panelboards, pertinent branch circuit panel and other significant locations through the system. The short circuit tabulations shall include symmetrical fault currents, and X/R ratios. For each fault location, the total duty on the bus, as well as the individual contribution from each connected branch, shall be listed with its respective X/R ratio.
- F. A protective device evaluation study shall be performed to determine the adequacy of overcurrent and switching devices and automatic transfer switches, by tabulating and comparing the short circuit ratings of these devices with the calculated fault currents. Appropriate multiplying factors based on system X/R ratios and protective device rating standards shall be applied.
- G. A protective device coordination study shall be performed to provide the necessary calculations and logic decisions required to select or to check the selection of power fuse ratings, protective relay characteristics and settings, ratios and characteristics of associated current transformers, and low voltage breaker trip characteristics and settings. The objective of the study is to obtain optimum protective and coordination performance from these devices.
- H. The coordination study shall include all low voltage classes of equipment from the utility's incoming line protective device down to and including the devices in the 120/208 volt panelboards. The phase and ground overcurrent protection shall be included as well as settings of all other adjustable protective devices.
  - 1. Provide selective coordination for all emergency system overcurrent devices in accordance with NFPA 70, Articles 620, 645, 695, 700, 701 and 708.
- I. The time-current characteristics of the specified protective devices shall be drawn on Keuffel and Esser log-log paper. The plots shall include complete titles, representative one-line diagram and legends, associated power company's relays or fuse characteristics, significant motor starting characteristics, complete parameters of transformer withstand limits and significant symmetrical and asymmetrical fault currents. All restrictions of the National Electrical Code shall be adhered to and proper coordination intervals and separation of characteristic curves shall be maintained. The coordination plots for phase and ground protective devices shall be provided on a system basis. A sufficient number of separate curves shall be used to clearly indicate the coordination achieved.
- J. The selection and settings of the protective devices shall be provided separately in a tabulated form listing circuit identification, IEEE device number, current transformer ratios and recommended power fuse selection shall be provided for the medium voltage fuses where applied in the system. Any discrepancies, problem areas, or inadequacies shall be promptly brought to the Architect's attention.
- K. The results of the power system study shall be summarized in a final report. Six (6) bound copies of the final report shall be submitted:
- L. Report shall include the following selections:

- 1. Description, purpose, basis and scope of the study and a single diagram of that portion of the power system which is included within the scope of the study.
- 2. Tabulations of circuit breaker, fuse and other protective device ratings versus calculated short circuit duties, and commentary regarding same.
- 3. Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
- 4. Fault current calculations including a definition of terms and guide for interpretation of computer printout.
- 5. The Electrical Subcontractor shall test, calibrate, and adjust circuit breaker trip devices as recommended in the power system study.
- M. The arc flash analysis shall be performed in accordance with IEEE 1584. Based on results of this study, the Electrical Contractor shall provide labeling at all equipment outlined in NFPA 70E 130.5(c). Labeling shall indicate at a minimum, the required level of PPE, nominal system voltage and arc flash boundary.

## 2.3 RACEWAYS AND FITTINGS

- A. Raceways General:
  - 1. No raceway shall be used smaller than 3/4" diameter. No conduit shall have more than three (3) 90° bends in any one run, and where necessary, pull boxes shall be provided.
  - 2. Rigid metal conduit (RMC) conforming to, and installed in accordance with, Article 344 of NFPA 70 shall be heavy wall zinc coated steel conforming to American Standard Specifications C80-1 and may be used for service work, exterior work, slab work, and below grade level slab, wet locations, and in mechanical rooms and where raceway may be subjected to mechanical damage, i.e., loading docks, workshops, etc.
  - 3. Thin wall conduit (EMT), conforming to, and installed in accordance with, Article 358 of NFPA 70 shall be zinc coated steel, conforming to industry standards, may be used in masonry block walls, stud partitions, above furred ceilings where exposed but not subject to mechanical damage, and shall be used for fire alarm work.
  - 4. Flexible metal conduit (FMC) conforming to, and installed in accordance with Article 348 of NFPA 70 shall be used for connections to recessed light fixtures, vibrating equipment and motors. All FMC shall be secured and supported in accordance with Article 348 of NFPA 70.
  - 5. Liquidtight flexible metal conduit (LFMC) conforming to, and installed in accordance with Article 350 of NFPA 70 shall be used for connections to light fixtures, vibrating equipment and motors. All LFMC shall be secured and supported in accordance with Article 350 of NFPA 70. If used on roof applications, all LFMC shall be supported by sleepers approved by the Architect prior to installation.

- 6. Rigid non-metallic conduit may be used at the Contractor's option for underground electric and telephone services outside the foundation wall and shall be polyvinyl chloride (PVC) schedule 40 or 80, 90° C. If option of rigid non-metallic conduit is exercised, underground runs outside the foundation wall shall be concrete encased at Contractor's expense. Schedule 40/80 conduit shall be installed in conformance with Article 352 of NFPA 70. Use of type EB or A PVC conduit is not allowed.
- 7. PVC Schedule 40 may also be used for below grade slab circuits within building confines. Below slab rigid non-metallic conduits do not require concrete encasement. Rigid non-metallic conduits shall not be used in slabs. Rigid steel elbows or stubs shall be used for penetrations from below slab or through exterior walls into building. PVC shall not be installed within building. Raceways and fittings shall be produced by same manufacturer. All PVC conduit shall comply with ANSI/UL 651.
- 8. Acceptable Manufacturers:
  - a. Wheatland Tube Company
  - b. Allied Tube
  - c. Western Tube & Conduit
  - d. Carlon
  - e. Cantex
- 9. Fittings:
  - a. Provide insulated bushings on all raceways that house conductors #4 AWG or larger at all threaded fittings no matter what the size of the conductor.
  - b. Manufacturer's standard fittings shall be used for raceway supports.
  - c. Expansion Fittings: Expansion fittings shall be used where structural and concrete expansion joints occur and shall include a ground strap.
  - d. Couplings for rigid metal conduit and IMC shall be threaded type. Provide insulated bushings.
  - e. All fittings for EMT conduit shall be steel. No die-cast fittings are allowed. Set screw and compression connectors are allowed.
  - f. Threadless fittings for EMT shall be watertight compression type. All fittings shall be concrete tight.
  - g. Cable supports in vertical raceways shall be of the split wedge type. Armored cable supports for vertical runs to be of wire mesh basket design.
  - h. Wall entrance seals shall be equal to O.Z. Gedney type "WSK" or Link-Seal.
  - i. Couplings, elbows and other fittings used with rigid nonmetallic raceways shall be of the solvent cemented type to secure a waterproof installation.
  - j. Acceptable manufacturers:
    - 1) O.Z. Gedney
    - 2) Crouse Hinds
    - 3) American Fittings
    - 4) Hubbell
    - 5) Thomas & Betts

## 2.4 CABLE TRAY

- A. General: Except as otherwise indicated, provide metal cable trays, of types, classes and sizes indicated with splice hangers and all other necessary accessories. Provide cable trays with rounded edges and smooth surfaces in compliance with applicable standards, and with the following additional construction features.
- B. Materials and Finishes Aluminum: Rails and rungs shall be extruded from Aluminum Association Alloy 6063. All hardware and fasteners shall be zinc-plated steel.
- C. Rungs shall be spaced every 9 inches.
- D. Straight sections shall be supplied in 12 foot lengths.
- E. Cable tray width shall be 18 inches.
- F. Cable tray loading depth shall be 4 inches.
- G. Cable tray shall meet the loading requirements of NEMA 12C.
- H. Cable tray shall meet the requirements of NEMA VE-1 or CSA C22.2 No. 126-M91.
- I. Manufacturer: Subject to compliance with these Specifications, cable tray system shall be as manufactured by B-Line Systems, Square D, Huskey or equal.

## 2.5 WIRING MATERIALS

- A. Building Wire and Cable shall be copper with 600V insulation, THWN for branch circuitry and XHHW for feeders.
- B. Conductors shall be of soft drawn 98% minimum conductivity properly refined copper, solid construction where No. 10 AWG and smaller, stranded construction where No. 8 AWG and larger.
- C. Exterior of wires shall bear repetitive markings along their entire length indicating conductor size, insulation type and voltage rating.
- D. Exterior of wires shall be color coded, so as to indicate a clear differentiation between each phase and between each phase and neutral. In all cases, grounded neutral wires and cables shall be identified by the colors "white" or "gray". In sizes and insulation types where factory applied colors are not available, wires and cables shall be color coded by the application of colored plastic tapes in overlapping turns at all terminal points, and in all boxes in which splices are made. Colored tape shall be applied for a distance of 6 inches along the wires and cables, or along their entire extensions beyond raceway ends, whichever is less.
- E. Final connections to motors shall be made with 18" of neoprene sheathed flexible conduit.

- F. Minimum branch circuit conductor size shall be No. 12 AWG installed in conduit. Motor control circuit wiring shall be minimum No. 14 AWG installed in conduit.
- G. Fire alarm and security system wiring shall be per manufacturer's recommendations.
- H. Other wires and cables required for the various systems described elsewhere in this section of the Specifications shall be as specified herein, as shown on the Contract Drawings, or as recommended by the manufacturer of the specific equipment for which they are used, all installed in conduit.
- I. Metal clad sheathed cable NFPA 70, type MC may be used for branch circuitry where shown and where run concealed and not subject to physical damage. All type MC cable used shall contain a full size insulated ground conductor. All conductors shall be copper. All type MC cable insulation used shall have voltage rating of 600 volts, shall have a temperature rating of 75° C, and shall be thermoplastic material. Armor material shall be steel and armor design shall be interlocked metal tape. Fire alarm rated MC cable may be used for fire alarm work where concealed and acceptable to the Local Authority Having Jurisdiction.
- J. Wiring materials shall be manufactured by Southwire, Prysmian, General Cable, or equal.
- 2.6 OUTLET, JUNCTION, PULL BOXES AND WIRING TROUGHS FOR ALL SYSTEMS
  - A. Outlets:
    - 1. Each outlet in wiring or raceway systems shall be provided with an outlet box to suit conditions encountered. Boxes installed in normally wet locations shall be of castmetal type having hubs. Concealed boxes shall be cadmium plated or zinc coated sheet metal type. Old work boxes with Madison clamps are not allowed in new construction.
    - 2. Each box shall have sufficient volume to accommodate number of conductors in accordance with requirements of NFPA 70. Boxes shall not be less than 1-1/2" deep unless shallower boxes are required by structural conditions and are specifically approved by Architect. Ceiling and bracket outlet boxes shall not be less than 4" octagonal except that smaller boxes may be used where required by particular fixture to be installed. Flush or recessed fixtures shall be provided with separate junction boxes when required by fixture terminal temperature requirements. Switch and receptacle boxes shall be 4" square or of comparable volume.
    - 3. Acceptable Manufacturers:
      - a. Appleton
      - b. Crouse Hinds
      - c. Steel City
      - d. RACO
  - B. Pull and Junction Boxes: Where necessary to terminate, tap off, or redirect multiple raceway runs or to facilitate conductor installation, furnish and install appropriately

designed boxes. Boxes shall be fabricated from code gauge steel assembled with corrosion resistant machine screws. Box size shall be as required by Code. Where intermediate cable supports are necessary because of box dimensions, provide insulated removable core brackets to support conductors. Junction boxes are to be equipped with barriers to separate circuits. Where splices are to be made, boxes shall be large enough to provide ample work space. All conductors in boxes are to be clearly tagged to indicate characteristics. Boxes shall be supported independently of raceways. Junction boxes in moist or wet areas shall be galvanized type. Boxes larger than 4 inches square shall have hinged covers. Boxes larger than 12 inches in one dimension will be allowed to have screw fastened covers, if a hinged cover would not be capable of being opened a full 90 degrees due to installation location.

## 2.7 WIRING DEVICES

- A. Provide wiring device type plates for all wall-mounted devices. All wall plates shall be ivory, smooth unbreakable nylon for all areas with the following exceptions:
  - 1. Provide stainless steel device plates within Sallyport #118, Vehicle Processing #125, Elec. #126, Mech. #127, Cust. #144, Road Storage #B03, Dept. Storage Bay #B04, Fire Pump #165, Found Property Storage #B06, and Bulk Evidence Storage #B07.
- B. Wiring devices standard for the project (i.e., with no specific type indicated) shall conform to the following:
  - 1. Visible part colors of wiring devices shall be ivory in all areas with the following exceptions:
    - a. Provide gray wiring devices within Sallyport #118, Vehicle Processing #125, Elec.
      #126, Mech. #127, Cust. #141, Fire Pump #165, Road Supply Storage #B03, Dept.
      Storage Bay #B04, Found Property #B06, and Bulk Evidence Storage #B07.
  - 2. Exclude compact or "despard" type devices.
- C. Wiring device switches shall be toggle type, A.C. quiet design, specification grade, 20 amps on 120 volt circuits. Switches shall be mounted 48" to center line above finished floor unless noted otherwise.
  - 1. Single pole switch shall be equal to Hubbell No. 1221.
  - 2. Double pole switch shall be equal to Hubbell No. 1222.
  - 3. Three-way switch shall be equal to Hubbell No. 1223.
  - 4. Four-way switch shall be equal to Hubbell No. 1224.
  - 5. Single pole pilot light switch shall be equal to Hubbell No. HBL 1221PL.
- D. Standard duplex convenience receptacles shall be 125 volt, 20 amps, three wire (two circuit wires plus ground), "U-bar" ground NEMA slot configuration 5-20R specification

grade. Receptacles shall be mounted 18" to center line above finished floor unless noted otherwise.

- 1. Equal to Hubbell No. 5362.
- 2. Where indicated on plans provide receptacles with ground fault current interrupters, UL Class A; 20A, 125V to be equal to Hubbell No. GF5362. All GFI receptacles shall be self-testing type in compliance with UL 943.
- 3. Where indicated on plans, provide receptacles with integral USB charging ports; compliant with USB BC 1.2 rated 3A, 5VDC, 20A, 125V tamper resistant equal to Hubbell No. USB20X2W.
- E. Non-standard convenience receptacles and special purpose power supply receptacles shall be as listed on plans.
- F. Devices and device plates for flush wall devices which are not integrally equipped with same, shall be as directed by the Architect.
- G. For unfinished spaces, plates for surface-mounted wall devices which are not integrally equipped with same, shall be galvanized sheet steel, formed raised type which does not overlap box. Where for switches, such plates shall have toggle guards.
- H. Where more than one wiring device is indicated in the same location, the devices shall be mounted in gang under a common wall plate.
- I. Mount duplex convenience and power receptacles vertically with grounding posts at top of device unless otherwise indicated. Locate grounding post to left when horizontal mounting is indicated.
- J. Wiring devices and associated hardware shall be manufactured by Leviton, Hubbell or Pass and Seymour.
- K. Floor Outlets (Poke-Thru Type):
  - 1. Thru-floor assembly of floor outlets for power and communications shall be UL listed and have a two-hour fire rating. Core drilling shall be by Electrical Subcontractor.
  - 2. Complete assembly shall consist of a flange assembly, slide holder assembly, and insert assembly.
  - 3. Length of extension raceway shall be sufficient to penetrate bottom of slab. Coordinate ordering of raceway with type of slab.
  - 4. Thru-floor assemblies shall be as manufactured by Raceway Components, Inc., or equal.

## L. Dimmer Controls:

- 1. All devices shall be UL listed specifically for the required loads (i.e., incandescent, fluorescent, magnetic low voltage, electronic low voltage). Manufacturer shall provide file card upon request. Universal dimmers are not acceptable.
- 2. All dimmers and switches shall incorporate an air gap switch. The air gap switch shall be capable of meeting all applicable requirements of UL 20 for air gas switches in incandescent dimmers.
- 3. All dimmers and switches shall provide power failure memory. Should power be interrupted and subsequently returned, the lights will come back on to the same levels set prior to the power interruption. Restoration to some other default level is not acceptable.
- 4. Dimmers and switches shall meet ANSI/IEEE Std. C62.41-1980, tested to withstand voltage surges of up to 6000V and current surges of up to 200A without damage.
- 5. Dimmers and switches shall meet the UL 20 limited short circuit test requirement for snap switches.
- 6. Dimmer shall provide a smooth and continuous Square Law dimming curve.
- Dimmers shall be voltage regulated so that + 10% variation in line voltage shall cause not more than +5% variation in load voltage when dimmer is operating at 40V (5% light output).
- 8. Dimmers shall be 2000 watt equal to Lutron Nova Series. Single pole dimmers shall be "slide to off" type. Three-way dimmers shall be "preset" type used with appropriate 3 or 4-way linear slide switches.

### 2.8 GROUNDING REQUIREMENTS

- A. Ground all systems and equipment in accordance with best industry practice, the requirements of NFPA 70, Article 250 and the following:
  - 1. The ground bus of the main switchboard shall be connected to the main grounding electrode specified below by means of insulated conductors run in conduit.
    - a. Metal underground water pipes.
    - b. Metal frame of building.
    - c. Concrete encased electrode.
    - d. Rod and pipe electrodes.
    - e. Ground ring.
  - 2. Provide grounding bonds between all metallic conduits of the light and power system which enter and leave cable chambers or other non-metallic cable pulling and splicing boxes. Accomplish this by equipping the conduits with bushings of the grounding type individually cross connected.
- 3. Bond metallic conduits containing grounding electrode conductors and main bonding conductors to the ground bus service enclosure and/or grounding electrode at both ends of each run utilizing grounding bushings and jumpers.
- 4. Provide grounding bonds for all metallic conduits of the light and power system which terminate in pits below equipment for which a ground bus is specified. Accomplish this by equipping the conduits with bushings of the grounding type connected individually to the ground bus.
- 5. Provide supplementary ground bonding where metallic conduits terminate at metal clad equipment (or at the metal pull box of equipment) for which a ground bus is specified. Accomplish this be equipping the conduits with bushings of the grounding type connected individually by means of jumpers to the ground bus. Exclude the jumpers where directed. This exclusion will be required where an isolated ground for electronic equipment is to be maintained.
- 6. Each grounding type bushing shall have the maximum ground wire accommodation available in standard manufacture for the particular conduit size. Connection to bushing shall be with wire of this maximum size.
- 7. Bonding conductors on the load side of the service device and equipment grounding conductors shall be sized in relation to the fuses or trip size of the overcurrent device supplying the circuit.
- 8. The central equipment for the fire protective alarm system and telephone system shall have its grounding terminal connected to the grounding electrode by means of a No. 6 green coded insulated conductor, run in 3/4" conduit. Utilize a ground clamp of a type specifically manufactured for the purpose.

## 2.9 PHASING AND COLOR CODING

A. The insulation or covering of each wire or cable shall be color coded so as to provide for circuit identification as specified below:

120/208 V Circuits	Phase Circuits
Black	А
Red	В
Blue	С
White	Neutral
Green	Equipment Ground

- B. Color coding shall be achieved by one of the following methods:
  - 1. The insulation or covering shall be coded during manufacture by use of one of the following methods:
    - a. Colored compounds.
    - b. Colored coatings.

- 2. In sizes and insulation types where factory applied colors are not available, wires and cables shall be color coded by the application of colored plastic tapes in overlapping turns at all terminal points, and in all boxes in which splices are made.
- C. The same colored cable shall be connected to the same phase throughout the project.
- D. In general, building load centers and panelboards shall be phased "A", "B", "C", left to right. The neutral, although it may be in different locations for different equipment, shall be identified.
- 2.10 ENCLOSURES FOR INDIVIDUALLY MOUNTED OVERCURRENT AND SWITCHING DEVICES
  - A. Construction shall be NEMA Class I, where installed indoors.
  - B. Construction shall be NEMA Class IIIR, where installed outdoors, in mechanical rooms, in locations defined as damp or wet by NFPA 70 or where indicated as weatherproof.
  - C. Operating handles shall be front or side type to accommodate hand access space and flush or surface mounting requirements.
  - D. Each shall be equipped with padlock for locking operating handle in the open position.

## 2.11 PANELBOARDS

- A. Panelboards shall consist of factory completed dead front assemblies of back pans, main busses, overcurrent and switching units, sheet metal cabinets and trims. They shall be so designed that switching and overcurrent devices can be replaced without disturbing adjacent units and without removing the main bus connectors, so that circuits may be changed without machine drilling or tapping.
- B. Where indicated as power or distribution panels, they shall be as manufactured by Square D, Siemens, Eaton, or General Electric.
- C. Bus bars for their mains shall be of copper having current capacities as indicated and sized for such capacities in accordance with Underwriter Laboratory standards. Provide double size neutral bus bars and lugs for all 120/208 volt panelboards where fed from "K" rated transformers. Bus bar taps for panels with single pole branches shall be arranged for sequence phasing of the branch circuit devices. Bussing shall be braced throughout to conform to industry standard practice governing short circuit stresses in panelboards. Phase bussing shall be full height without reduction.
- D. A ground bus shall be provided for each panel. Each ground bus shall be of the same material as the phase and neutral buses.
- E. Cabinets shall be fabricated from industry standard gauge galvanized sheet steel with corners lapped and riveted, or fastened by approved methods.

- F. The inside and outside of the trims shall be factory painted with one (1) rust proofing primer coat and one (1) finish coat. The finish paint shall be of a type to which field applied paint will bond. All trims shall be hinged.
- G. Cabinets and trims shall be suitable for the required mounting. Trims shall be fastened to cabinets and shall be of a type that is self-supporting on cabinets. Trims for flush panels shall overlap cabinets by at least 3/4" all around. Where two section panels are required, cabinets shall be of equal height including those cases where there is one main for both sections.
- H. Cabinets and trims for lighting and appliance panels shall accommodate and conform to the following limited dimensions:
  - 1. Minimum wiring gutter width on each side: 5-3/4".
  - 2. Maximum overall width: 24".
  - 3. Maximum overall depth: 6".
- I. Where wires or cables are used within panelboards to make up internal connections (factory installed or otherwise) such wire or cable shall have copper conductors only.
- J. Any cabinet for a power or distribution panel shall (regardless of the actual devices required to be in it) have a width, depth and bussing adequate for a 3-pole branch device equal in rating to the panel mains. In no case shall the cabinet be wider than 42" or deeper than 18".
- K. Hinged doors covering all switching device handles shall be included in all panel trims.
- L. Doors in panelboard trims shall conform to the following:
  - 1. In making switching device handles accessible, doors shall not uncover any live parts.
  - 2. Doors shall have flush type paracentric cylinder locks and catches. Two (2) keys shall be supplied for each lock and each key shall open all panelboards. Locks and keys shall conform to a "standard keying policy" as directed.
- M. Where "spaces only" for overcurrent protection and switching devices are called for in a panel, its main bus, and backpan, as well as its cabinet and trim, shall be extended to accommodate these spaces and shall include all necessary hardware including bus connectors to add future devices.
- N. Panelboards shall comply with the following industry standards:
  - 1. UL Standards:
    - a. Panelboards UL67.
    - b. Cabinet & Boxes UL50.
  - 2. NEMA Standard PB1.

- O. Panelboards shall be labeled with UL short-circuit rating adequate for the available shortcircuit and based on the lowest panel mounted circuit breaker available UL listed interrupting current rating, but in no case less than 65 ka for 480 volt and 22 ka for 240 volt panelboards.
- P. Provide "lock on" clips for the toggle handles of certain branches serving the Fire Alarm System, security, etc.
- Q. Panelboards shall be manufactured by Eaton, Siemens, Square D, or General Electric.

## 2.12 MOLDED CASE CIRCUIT BREAKERS

- A. Molded case type circuit breakers shall consist of manually operated quick-make quickbreak mechanically trip free operating mechanisms for simultaneous operation of all poles, with contacts, arc interrupters and trip elements for each pole, all enclosed in molded phenolic plastic cases.
  - 1. Their tripping units shall be of the "thermal magnetic" type having bimetallic elements for time delay overload protection and magnetic elements for short-circuit protection.
  - 2. They shall be manually operable by means of toggle type operating handles having "tripped" position midway between the "on-off" positions.
  - 3. They shall each be contained in an individual case enclosing only the number of poles required for the particular breaker.
  - 4. All panels and individually mounted circuit breakers shall have short circuit ratings exceeding the available short-circuit of the values indicated in the "Power System Studies" in this section by a factor of 1.2 with a minimum as follows:
    - a. 240V class panels/breakers: 22 kAIC minimum.
  - 5. They shall be of the "bolted-in" type.
    - a. Where necessary, to accommodate other requirements, their frame sizes shall be increased to conform to such requirements, frame sizes being indicated only as a reference to the minimum acceptable interrupting ratings noted above.
    - b. Where single pole in trip sizes 20 amps or less, they shall be rated for switching duty.
    - c. They shall be equipped with 5 milliamp sensitivity ground fault interrupting features where so indicated.
    - d. All circuit breakers connected to lighting branch circuits shall be high magnetic type breakers.
  - 6. They shall be manufactured by Square D, Siemens, Eaton, or General Electric.

### 2.13 CARTRIDGE FUSES

A. Cartridge fuses shall be as follows:

- 1. Provide a complete set of fuses for each item of fusible type equipment. Fusible equipment furnished by other contractors will be complete with fuses.
- 2. Secondary system fuses, rated at 600 volts or less, shall be UL listed and constructed in conformance with the applicable standards set forth by NEMA and ANSI. All fuses of a particular class shall be of same manufacturer.
- 3. Regardless of actual fault current, they shall, at full recovery voltage, be capable of safely interrupting fault currents of 200,000 amperes RMS symmetrical or 340,000 amperes RMS asymmetrical, deliverable at the line side of the fuse.
- 4. Circuits 0-600 amperes shall be protected by the equal of Bussman "Low Peak" current limiting fuses, LPN-RK (250 volts), LPS-RK (600 volts), UL class RK-1.
- 5. Fuses shall be suitable for application to fuse gaps which reject other types of fusing.
- 6. Supply 10% spare fuses of each size and type 60 amps and less. Supply three (3) spare fuses for each size and type over 60 amps.
- B. Cartridge fuses shall be manufactured by Bussman, Gould or EFCO.

## 2.14 MOTOR CONTROLS

- A. Motor Controls Manual and Magnetic:
  - 1. Individually-mounted magnetic starters shall be across-the-line type with thermal overload on each phase, single-speed, two-speed, or reduced voltage start as indicated. Check exact type of two-speed or part-winding motors to be furnished by other contractors, and provide proper starter.
  - 2. Starters shall be of the replaceable contact double break type, of size and type required for particular motor horsepower and voltage. Minimum size starter to be size 1.
    - a. Starters shall have OL reset button, green pilot light to indicate "ON", and "HAND-OFF-AUTO" switch in cover. Pilot lights shall be push-to-test type.
    - b. Starters to have 120 volt control transformers with fused output being provided for those units operating on 277/480 volt system.
    - c. Provide proper rating of thermal overloads. Replace any overloads found to be of an incorrect rating. Provide a spare set of three (3) thermal overloads for each starter.
    - d. Provide four (4) sets of auxiliary contacts of convertible type N.O. to N.C. for each starter.
    - e. Motor starters installed in dry locations shall have NEMA I enclosures. Those in wet locations shall have NEMA IV enclosures.
    - f. Acceptable Manufacturers:
      - 1) Siemens
      - 2) Eaton
      - 3) Square D

4) General Electric

- 3. Manual motor starters shall have pilot lights and shall be furnished with thermal overloads on each phase.
- B. Motors: Each motor shall have disconnect switch and starter provided under this section. Starters which are a part of "factory assembled" control panel will be provided under section supplying equipment to be controlled but connected under this section.
- C. Disconnect Switches:
  - Disconnect (safety) switches shall conform to industrial standards of NEMA, be UL listed and shall be heavy-duty type, quick-make, quick-break type with interlocking cover mechanism and provisions for padlocking switch handle in "OFF" position. Three (3) pole toggle switches are not acceptable as substitute for disconnect switches.
  - 2. Disconnect switches shall be of fused or un-fused type as indicated with number of disconnecting poles indicated. The grounded conductor shall not be switched. Switches shall be for use with current limiting fuses with rejection type fuse clips and those shall be horsepower rated.
  - 3. Enclosures shall be of proper NEMA type for the intended location and shall be phosphate coated or equivalent code gauge galvanized sheet steel with gray baked enamel finish.
  - 4. Acceptable Manufacturers:
    - a. Eaton
    - b. Siemens
    - c. Square D
    - d. General Electric
- D. Combination Starter: Provide combination starters where indicated on the plans.
- E. Motor Control Circuitry:
  - 1. Except as noted below, select materials exactly as specified for feeders. Utilize No. 12 A.W.G. THWN conductors throughout minimum.
  - 2. Motor control circuit wires may be run in the same conduit as the wires of motor power circuits; however, exclude motor control wires from enclosures (other than motor starter enclosures) which contain power circuit overcurrent protection and switching devices; also from pull boxes and junction boxes containing the wires of main and sub main feeders. Utilize auxiliary pull boxes to separate motor control wires from motor power circuit wires before the power circuit wires enter the items from which motor control wires are excluded.
  - 3. Prior to installing any motor control circuitry for a particular motor, notify the Architect of any deviations between the control circuitry requirements of the trade

supplying the motor and the indicated electric work.

#### 2.15 ENGINE GENERATOR SYSTEM

- A. Manufacturers:
  - 1. Manufacturers: Subject to compliance with requirements, provide diesel generator set of one of the following:
    - a. Caterpillar Tractor Co.
    - b. Onan Corp., Division of McGraw Edison Co.
    - c. Cummins
- B. Scope:
  - Furnish and install one (1) standby electric generating system rated for continuous standby service as shown on the Contract Drawings. Voltage shall be 120/208 volts, 3 phase, 4 wire at 60 hertz. The system shall be a package of new and current equipment consisting of:
    - a. A four (4) cycle diesel engine driven electric plant to provide emergency electric power.
    - b. Start-stop control system.
    - c. Automatic and manual load transfer controls to provide automatic starting and stopping of the unit and switching of the loads.
    - d. Mounted accessories as specified.
    - e. Remote annunciator panel.
    - f. Generator housekeeping concrete pad.
    - g. Exhaust system and insulation.
    - h. Sub-base fuel storage system and piping.
- C. Source of Supply: This system shall be built, tested and shipped by the manufacturer and by the alternator so there is one source of supply and responsibility. The performance of the electric plant shall be certified by an independent testing laboratory as to the plant's full power rating, stability and voltage and frequency regulation. Submit certificate of compliance with Shop Drawings. Furnish detailed summary of testing of unit of this rating in accordance with NFPA-110T.
- D. Parts and Service: The supplier of this equipment shall maintain a full-time "in-house" parts and service organization within 100 miles of the job site. The manufacturer of this set shall have a minimum of five (5) years of experience in building similar units in this part of this country. This supplier shall have his name, address, and telephone number clearly and visibly located on all equipment. Service shall be available on a 24-hour a day, 7-day a week basis. The supplier shall be authorized by the engine generator manufacturer to provide service and warranty for all generator components.
- E. Shop Drawings:
  - 1. Enclosed with each submittal set shall be the following information:

- a. Unit Drawings of all major components showing exact dimension data.
- b. Catalog information on the engine, generator, battery charger, vibration isolators, exhaust silencer, flexible exhaust connector, and automatic transfer switch.
- c. A complete bill of material indicating exactly what is to be provided.
- d. A list of at least two (2) similar installations using the same major components as specified herein.
- e. Estimated time, in calendar days, for delivery after approval and release is received.
- f. Furnish engine heat rejection data to jacket water, exhaust, and ambient and total DB measurement of engine, generator, and radiator measured at 23 feet. Mechanical noise shall not exceed 88 DBA at 23 feet and exhaust noise shall not exceed 94 DBA at 23 feet before the exhaust silencer. Exhaust flow shall not exceed 2500 CFM.
- 2. Any notation marked on submission of the equipment is outlined in this section by Reviewing Authority must be responded to in writing, by the equipment manufacturer.
- 3. Complete engineering submittal, catalog cuts, wiring diagrams, interface Drawings, unit Drawings, A.C. & D.C. schematics, termination chamber Drawings, terminal strip Drawings, foundation plan, annunciator panel layout and wiring, etc. must accommodate all Shop Drawings.
- F. Intent: This Specification is for furnishing and installing one (1) diesel fueled engine driven generating set rated for continuous standby service 230 kW rating. The kW rating shall be continuously available during any power outage whether the duration be minutes, hours, or days. The unit shall be complete with all accessories, controls, attachments, fuel and exhaust systems. Rating shall be with engine driven radiator fan attached regardless of cooling system specified herein.
- G. General Operation:
  - 1. The operation of this unit shall be automatic such that upon the closing of a remote starting contact, the engine shall start and attain rated voltage and frequency within ten (10) seconds.
  - 2. All necessary accessories shall be provided to assure starting within the time described above under the ambient conditions described herein.
- H. Engine:
  - 1. The diesel engine shall be water-cooled, 4 cycle industrial type with removable cylinder liners, 1800 rpm type. Other than 1800 rpm type engines or engines which utilize reduction from a higher rpm down to 1800 rpm shall not be approved.
  - 2. Lubrication shall be a full pressure system, using an engine-driven gear-type lube oil pump with replaceable element full flow lube oil filter. Lube oil cooler shall be provided.

- 3. The engine-mounted fuel system shall include all equipment normally supplied and recommended by the generator set manufactured for emergency generator service. The engine-mounted fuel system equipment shall include the following:
  - a. Fuel injection system.
  - b. Fuel transfer pump.
  - c. Duplex fuel filters (replaceable type).
  - d. Hand priming pump.
  - e. Flexible fuel connections.
- 4. In addition to the engine-mounted fuel system, there shall be a sub-base fuel tank system.
  - a. The fuel tank system shall be a UL listed tank, pressure tested, double walled, trim line construction, sub-base fuel tank. All piping and venting shall be completed by the housing manufacturer prior to shipment. Tank system shall comply with all State and Local Codes and sized to provide 72 hours of run time at full load. Provide one (1) full tank of fuel after testing at the completion of the project for each generator.
- 5. Governor: The engine shall be equipped with a hydraulic/electronic isochronous governor capable of maintaining the engine speed from no load to full load within plus or minus .25% of the synchronous speed.
  - a. Starting System: The engine shall have a 24 VDC starting system with starting motor and starter solenoid switch.
  - b. Batteries: One (1) set of starting batteries with cables and steel battery rack and heater shall be included for each starter. Batteries shall be sized for operation at  $-20^{\circ}$  F.
    - 1) Batteries shall be heavy-duty lead acid type, rated not less than 210 ampere hours each.
    - 2) A float type battery charger shall maintain the starting batteries at full charge. The charger shall be suitable for wall-mounting and shall have a cranking disconnect relay or current limiting feature. The charger shall be Charles AE2420, Lamarche A46 or equal. The charger shall have high and low voltage alarm relays, and have 20 amp outlet.
    - 3) There shall be a belt-driven battery charging alternator with regulator and charge rate ammeter for charging the batteries while the engine is running.
- 6. Heaters:
  - a. Engine jacket water heaters and thermostats shall be provided to maintain the engine jacket water at a temperature high enough to assure starting the engine and attaining rated voltage and frequency within 10 seconds. The jacket heaters shall be of the capacity recommended by the engine generator manufacturer to meet above conditions. Input voltage to the heaters shall be 208 volts, 1 phase, 60 cycles.
  - b. Battery heater shall be thermostatically controlled and shall keep battery at optimum temperature for both operation and battery life.

- 7. Engine Cooling System:
  - a. Engine shall be provided with 130° F ambient unit mounted radiator. Radiator shall have sufficient capacity to dissipate not less than total British thermal units per hour rejected at 100% full-load under the condition specified. Filler cap shall be designed for pressure relief.
  - b. Cooling system shall be provided with initial charge of permanent type anti-freeze solution containing rust inhibitor.
  - c. Water-cooled manifold shall be furnished.
- I. Safety Shutdowns:
  - 1. The engine shall be equipped with safety shutdown contacts for:
    - a. Low lube oil pressure, pre-warn and shutdown.
    - b. High jacket water temperature, pre-warn and shutdown.
    - c. Over speed.
    - d. Over crank.
    - e. Low water level, pre-warn.
    - f. Low water temperature, pre-warn.
- J. Generator Control Panel:
  - 1. The following electrical instruments and devices shall be included in the generator control panel:
    - a. Digital metering with:
      - 1) Voltmeter.
      - 2) Ammeter.
      - 3) kVAR meter.
      - 4) Power factor meter.
      - 5) kW meter.
      - 6) RWH meter.
    - b. Line circuit breakers.
    - c. Auto start circuitry.
    - d. NFPA 99 alarm and shutdown system.
    - e. Emergency stop pushbutton.
    - f. Provide programmable protective relay functions for under and over voltage and frequency, reverse power, overcurrent (phase and total), kW, and three (3) spare LED's.
  - 2. The following engine instruments shall be included in the generator control panel:
    - a. Lube oil pressure.
    - b. Water temperature.
    - c. D.C. voltmeter.
    - d. Tachometer.
  - 3. Any other instruments and devices considered necessary by the Manufacturer shall be included.

## K. Exhaust System:

- 1. An exhaust silencer suitable for critical type silencing (complete with condensate drains) shall be supplied of the size recommended by the generator set manufacturer. Silencer shall be equal to Maxim Model M51. An octave band center frequency, in hertz, data sheet shall accompany all muffler Shop Drawings. Silencer shall include side inlet and companion flanges, nuts, boxes, and gaskets.
- 2. A section of seamless, flexible stainless steel exhaust piping of the size and type recommended by the generator set manufacturer.

### L. Mounting:

- 1. The engine and generator shall be close-coupled and mounted on a structural steel base designed to maintain proper alignment of the unit.
- 2. The unit shall be certified by the manufacturer to be free from any critical torsion vibrations within a range of plus or minus 10% of synchronous speed.
- 3. Vibration isolators of spring type shall be supplied with the unit. The number of isolators shall be as recommended by the generator set manufacturer, and shall be mounted within the enclosure.
- 4. Vibration isolators shall be Ace Mountings or equal.
- M. Generator:
  - 1. Rating as shown on the Contract Drawings and with the following characteristics:
    - a. Type-revolving field, 4 pole, single-bearing, drip proof, 93% efficiency at nameplate rating.
    - b. Exciter: Brushless, direct-connected, fully tropicalized, SCR rectifiers, static voltage regulator, rheostat, excellent motor starting capability.
    - c. Voltage Regulation: Plus or minus 1/2% of any preset valve over the 3 phase load range. Instantaneous voltage dip or rise when measured with an oscilloscope, will not exceed 20% upon full load application, and will return to preset valve within 0.5 seconds. Voltage regulator shall be 3 phase sensing, provide volts/hertz regulation, provide over-voltage and under-voltage protection, and shall include a solid state circuit to remove excitation when generator is overloaded for more than 10 seconds.
    - d. Waveform: Deviation factor of output voltage will not exceed 5% and the valve of any individual harmonic will not exceed 2% of the fundamental when operating with an unbalanced load.
    - e. Temperature Rise: Temperature rise of any component will not exceed the rise permitted by NEMA standards.
    - f. Rotor: One-piece lamination welded and secured to shaft by a key and press fit. Amortisseur windings installed and connected between poles as an acid to parallel operation and improve wave form during unbalanced loads. Field coil machine

wound on insulated pole body and securely braced. Rotor statically and dynamically balanced.

- g. Stator: One-piece lamination welded together. Stator coils from wound and place in insulated slots. Starter pressed and welded in a rigid steel frame.
- h. Bearing: Double-sealed ball bearing, lubricated for life.
- i. Insulation: NEMA Class F insulation.
- j. Varnish: Three (3) coats modified polyester type, will not support fungus growth.
- k. Cooling: Cast aluminum fan mounted on generator shaft.
- 1. Radio Suppression: Radiated or conducted radio interference will not affect normal commercial apparatus.
- m. Output Circuit Breakers: Provide electronic trip type with LSI (120/208V) or LSIG (277/480V) settings as applicable.
- N. Remote Annunciator Panel:
  - 1. The engine generator shall be supplied with a flush mount remote annunciator panel with faceplate mounted to annunciation terminal strip to give remote indication of the following:
    - a. Generator power.
    - b. Battery charger malfunction (red).
    - c. Annunciator "OFF" (red).
    - d. High jacket water temperature "Pre-warn" (amber).
    - e. Low water temperature "Pre-warn" (amber).
    - f. Low oil pressure "Pre-warn" (amber); "Shutdown" (red).
    - g. Low fuel/rupture.
    - h. Over speed (red).
    - i. Over crank (red).
    - j. Lamp test switch.
- O. Outdoor Weather-Protection Enclosure:
  - 1. The generator set shall be provided with an outdoor enclosure, with the entire package listed under UL2200. The package shall comply with the requirements of the National Electrical Code for all wiring materials and component spacing. The total assembly of generator set, enclosure, and sub-base fuel tank (when used) shall be designed to be lifted into place using spreader bars. Housing shall provide ample airflow for generator set operation at rated load in an ambient temperature of 100° F. The housing shall have hinged access doors as required to maintain easy access for all operating and service functions. All doors shall be lockable, and include retainers to hold the door open during service. Enclosure roof shall be cambered to prevent rainwater accumulation. Openings shall be screened to limit access of rodents into the enclosure. All electrical power and control interconnections shall be made within the perimeter of the enclosure.
  - 2. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturer's standard color using a two-step electrostatic paint process, or equal meeting the performance requirements specified below. All surfaces of all metal parts shall be primed and painted. The painting process shall result in a coating that meets the following requirements:

- a. Primer thickness, 0.5–2.0 mils. Top coat thickness, 0.8–1.2 mils.
- b. Gloss, per ASTM D523-89, 80% plus or minus 5%. Gloss retention after one year shall exceed 50%.
- c. Crosshatch adhesion, per ASTM D3359-93, 4B-5B.
- d. Impact resistance, per ASTM D2794-93, 120-160 inch-pounds.
- e. Salt Spray, per ASTM B117-90, 1000+ hours.
- f. Humidity, per ASTM D2247-92, 1000+ hours.
- g. Water Soak, per ASTM D2247-92, 1000+ hours.
- 3. Painting of hoses, clamps, wiring harnesses, and other non-metallic service parts shall not be acceptable. Fasteners used shall be corrosion resistant, and designed to minimize marring of the painted surface when removed for normal installation or service work.
- 4. Enclosure shall be constructed of minimum 12 gauge steel for framework and 14 gauge steel for panels. All hardware and hinges shall be stainless steel.
- 5. A factory-mounted exhaust silencer shall be installed inside the enclosure. The exhaust shall exit the enclosure through a rain collar and terminate with a rain cap. Exhaust connections to the generator set shall be through seamless flexible connections.
- 6. The enclosure shall include the following maintenance provisions:
  - a. Flexible coolant and lubricating oil drain lines that extend to the exterior of the enclosure, with internal drain valves.
  - b. External radiator-fill provision.
- 7. Provide an external emergency stop switch that is protected from accidental actuation.
- 8. Inlet ducts shall include rain hoods.
- 9. The generator set shall be provided with a sound-attenuated housing which allows the generator set to operate at full rated load in an ambient temperature of up to 100° F. The enclosure shall reduce the sound level of the generator set while operating at full rated load to a maximum of 80 dBA at any location 7 meters from the generator set in a free field environment.
- 10. The enclosure shall be insulated with non-hydroscopic materials.
- 11. Diesel base fuel tank shall be mounted beneath enclosure and pre-piped and vented in accordance with U.L.
- P. Submit detailed generator pad requirements with Shop Drawings. Refer to plans for minimum requirements.
- Q. Quality Assurance:
  - 1. The supplier of the equipment shall provide with no additional charge and information or supervision required for the proper installation of the equipment and training of operating personnel.

- 2. Tests:
  - a. Preliminary start-up and operating tests of the generator system with the building load shall be conducted for one (1) hour duration to assure that the system is complete and in proper working order, that all adjustments have been made, and that all deficiencies have been corrected.
  - b. Engine alarm and shutdown features shall be function tested, including low oil pressure, high water temperature, over speed and low water level.
  - c. Final tests to be witnessed by the A/E shall be scheduled only after preliminary tests have been successfully completed.
  - d. Upon completion of the preliminary test of the unit, a test run of three (3) hours duration shall be conducted by the equipment manufacturer's factory-trained servicemen. At this time, adjustments shall be made for correct operation of the equipment and the following readings taken at 15 minute intervals:
    - 1) Ambient temperature.
    - 2) Engine jacket water temperature.
    - 3) Generator temperature.
    - 4) Oil pressure.
    - 5) Battery charger rate.
    - 6) AC volts (all legs).
    - 7) AC amps (all legs).
    - 8) Engine air exhaust temperature.
    - 9) Decibel readings with sound meter at 50 feet in all directions.
  - e. This test shall be made with the door to the enclosure or room in which the generator is locked maintained in the closed position. The test shall be made of a load bank sized at the full kilowatt rating of the generator. This load bank shall be furnished by the supplier of the engine generator unit and shall be connected to the generator terminals as one complete and full unit of kilowatt load. This load bank shall be applied to the generator terminals only after the generator has reached its full voltage output.
- R. Provide complete maintenance and service contract for a period of 36 months from date of substantial completion. Price of maintenance and service contract shall be included in the bid. Maintenance and service contract shall include the following:
  - 1. Regular lubrication, adjustment, cleaning, and check-up.
  - 2. Repair/replace worn parts at no cost to Owner.
- S. Provide exhaustible materials and supplies not covered by warranty under maintenance contract.
- T. Include provision for 24 hour a day, 7 days a week service with service response within 2 hours after first notification and need for service.
- U. In addition to the testing procedures outlined in paragraph "Q" above, refer to Section 3.02 "Test Requirements and Instructions" for general requirements and procedures.
- V. The engine manufacturer shall provide the necessary lube oil for the crankcase and antifreeze for the cooling system to provide protection to -20° F.

### 2.16 AUTOMATIC TRANSFER SWITCHES

- A. General:
  - 1. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
  - 2. Summary: This Section includes transfer switches rated 600 V and less, including the following:
    - a. Automatic transfer switches.
    - b. Remote annunciation systems.
  - 3. Related Sections include the following:
    - a. Division 21 Section "Electric-Drive, Vertical-Turbine Fire Pumps" for automatic transfer switches for fire pumps.
  - 4. Submittals:
    - a. Product Data: For each type of product indicated. Include rated capacities, weights, operating characteristics, furnished specialties, and accessories.
      - Technical data on all major components of all transfer switches and other products described in this section. Data is required for the transfer switch mechanism, control system, cabinet, and protective devices specifically listed for use with each transfer switch. Include steady state and fault current ratings, weights, operating characteristics, and furnished specialties and accessories.
      - 2) Single-Line Diagram: Show connections between transfer switch, bypass/isolation switch, power sources, and load; and show interlocking provisions for each combined transfer switch and bypass/isolation switch.
    - b. Shop Drawings: Dimensioned plans, elevations, sections, and details showing minimum clearances, conductor entry provisions, gutter space, installed features and devices, and material lists for each switch specified.
      - 1) Dimensioned outline drawings of assembly, including elevations, sections, and details including minimal clearances, conductor entry provisions, gutter space, installed features and devices and material lists for each switch specified.
      - 2) Internal electrical wiring and control drawings.
      - 3) Interconnection wiring diagrams, showing recommended conduit runs and point-to-point terminal connections to generator set.
      - 4) Installation and mounting instructions, including information for proper installation of equipment to meet seismic requirements.
    - c. Manufacturer Seismic Qualification Certification: Submit certification that transfer switches accessories, and components will withstand seismic forces defined in Division 26 Section "Vibration and Seismic Controls for Electrical Systems." Include the following:
      - 1) Seismic certification, as required for site conditions. Seismic certifications shall be third-party certified, and based on testing. Certification based on calculations does not meet this requirement.

- a) The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational both during and after the seismic event."
- 2) Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
- 3) Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- d. Manufacturer and Supplier Qualification Data:
  - 1) The transfer switch manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.
  - 2) The manufacturer of this equipment shall have produced similar equipment for a minimum period of 10 years. When requested, an acceptable list of installations with similar equipment shall be provided demonstrating compliance with this requirement.
- e. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
  - 1) Features and operating sequences, both automatic and manual.
  - 2) List of all factory settings of relays, timers and protective devices; provide setting and calibration instructions where applicable.
- f. Warranty documents demonstrating compliance with the project's contract requirements.
- 5. Quality Assurance:
  - a. Only approved bidders shall supply equipment provided under this contract.
  - b. Manufacturer Qualifications: The equipment supplier shall maintain a service center capable of providing training, parts, maintenance and emergency repairs to equipment, including transfer switch generator sets and remote monitoring equipment (if applicable) at the site within a response period of less than (eight hours or appropriate time period designated for Project) from time of notification.
    - The transfer switch shall be serviced by technicians employed by, and specially trained and certified by, the generator set supplier and the supplier shall have a service organization that is factory-certified in both generator set and transfer switch service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call 24 hours per day, 365 days per year.
    - 2) Submit names, experience level, training certifications, and locations for technicians that will be responsible for servicing equipment at this site.
    - 3) The manufacturer shall maintain model and serial number records of each transfer switch provided for at least 20 years.
  - c. Source Limitations: All transfer switches are to be obtained through one source from a single manufacturer. The generator set manufacturer shall warrant transfer switches to provide a single source of responsibility for products provided.

- d. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked as suitable for use in emergency, legally required or optional standby use as appropriate for the connected load.
- e. The automatic transfer switch installation and application shall conform to the requirements of the following codes and standards:
  - 1) Transfer switches and enclosures shall be UL 1008 listed and labeled as suitable for use in emergency, legally required, and optional standby applications.
  - 2) CSA 282, Emergency Electrical Power Supply for Buildings, and CSA C22.2, No. 14-M91 Industrial Control Equipment
  - 3) NFPA 70, National Electrical Code. Equipment shall be suitable for use in systems in compliance with Articles 700, 701 and 702.
  - 4) Comply with NEMA ICS 10-1993 AC Automatic Transfer Switches
  - 5) IBC 2006 The transfer switch(es) shall be prototype-tested and third-party certified to comply with the requirements of IBC group III or IV, Category D/F. The equipment shall be shipped with the installation instructions necessary to attain installation compliance
  - 6) IEEE 446 Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
  - 7) EN55011, Class B Radiated Emissions and Class B Conducted Emissions
  - 8) IEC 1000-4-5 (EN 61000-4-5); AC Surge Immunity
  - 9) IEC 1000-4-4 (EN 61000-4-4) Fast Transients Immunity
  - 10) IEC 1000-4-2 (EN 61000-4-2) Electrostatic Discharge Immunity
  - 11) IEC 1000-4-3 (EN 61000-4-3) Radiated Field Immunity
  - 12) IEC 1000-4-6 Conducted Field Immunity
  - 13) IEC 1000-4-11 Voltage Dip Immunity
  - 14) IEEE 62.41, AC Voltage Surge Immunity
  - 15) IEEE 62.45, AC Voltage Surge Testing
- f. Comply with NFPA 99 Essential Electrical Systems for Healthcare Facilities
- g. Comply with NFPA 110 Emergency and Standby Power Systems. The transfer switch shall meet all requirements for Level 1 systems, regardless of the actual circuit level.
- h. The manufacturer shall warrant the material and workmanship of the transfer switch equipment for a minimum of one (1) year from registered commissioning and start-up, or eighteen (18) months from date of shipment.
- i. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, and etc. during the minimum noted warranty period described above.
- 6. Project Conditions: Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service:
  - a. Notify (Architect/Construction Manager/Owner) no fewer than (insert appropriate number) days in advance of proposed interruption of electrical service.
  - b. Do not proceed with interruption of electrical service without

(Architect/Construction Manager/Owner's) written permission.

- c. Do not energize any new service or distribution equipment without notification and permission of the (Architect/Construction Manager/Owner).
- 7. Coordination:
  - a. Size and location of concrete bases and anchor bolt inserts shall be coordinated. Concrete, reinforcement and formwork must meet the requirements specified in Division 03. See section 3.1 for additional information on installation
  - b. If Project calls for bypass switch(es) mounted on a concrete base, the base must be designed to accommodate the requirements of the drawout mechanism (extension rails and/or wheeled carriage) of the bypass switch.

# B. Products:

- 1. Manufacturers:
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) Cummins Power Generation
    - 2) Russelectric
    - 3) ASCO
  - b. Equipment specifications for this Project are based on automatic transfer switches manufactured by Cummins Power Generation. Switches manufactured by Russelectric or ASCO that meet the requirement of this specification are acceptable, if approved not less than two weeks before scheduled bid date. Proposals must include a line-by-line compliance statement based on this specification.
  - c. Transfer switches utilizing molded case circuit breakers do not meet the requirements of this specification and will not be accepted.
- 2. General Transfer-Switch Product Requirements:
  - a. Provide transfer switches in the number and ratings that are shown on the Contract Drawings. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer.
  - b. Fault-Current Closing and Withstand Ratings: UL 1008 WCR ratings must be specifically listed as meeting the requirements for use with protective devices at installation locations, under specified fault conditions. Withstand and closing ratings shall be based on use of the same set of contacts for the withstand test and the closing test.
  - c. Solid-State Controls: All settings should be accurate to +/- 2% or better over an operating temperature range of 40 to + 60 degrees C (- 40 to + 140 degrees F).
  - Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.41. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.
  - e. Electrical Operation: Accomplished by a non-fused, momentarily energized solenoid or electric motor operator mechanism, mechanically and electrically

interlocked in both directions (except that mechanical interlock is not required for closed transition switches).

- f. Switch Characteristics: Designed for continuous-duty repetitive transfer of fullrated current between active power sources.
  - 1) Switches using molded-case switches or circuit breakers, or insulated case circuit breaker components are not acceptable.
  - 2) Transfer switches shall be double-throw, electrically and mechanically interlocked, and mechanically held in the Source 1 and Source 2 positions.
  - 3) Main switch contacts shall be high pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishing. Arc chutes shall have insulating covers to prevent inter-phase flashover.
  - 4) Contacts shall be operated by a high-speed electrical mechanism that causes contacts to open or close within three electrical cycles from signal.
  - 5) The transfer switch operation shall include the ability to switch to an open position (both sources disconnected) for the purpose of load shedding from the generator set.
  - 6) The power transfer mechanism shall include provisions for manual operation under load with the enclosure door closed. Manual operation may be electromechanical or mechanical, but must be coordinated with control function.
  - 7) Transfer switch shall be provided with flame retardant transparent covers to allow viewing of switch contact operation but prevent direct contact with components that could be operating at line voltage levels.
  - 8) The transfer switch shall include the mechanical and control provisions necessary to allow the device to be field-configured for operating speed. Transfer switch operation with motor loads shall be as is recommended in NEMA MG1.
    - a) Phase angle monitoring/timing equipment is not an acceptable substitute for this functionality.
  - 9) Transfer switches designated on the Contract Drawings as "3-pole" shall have a full current-rated neutral bar with lugs.
- g. Control: Transfer switch control shall be capable of communicating with the genset control, other switches and remote programming devices over a high-speed network interface.
- Factory wiring: Transfer switch internal wiring shall be composed of premanufactured harnesses that are permanently marked for source and destination. Harnesses shall be connected to the control system by means of locking disconnect plug(s), to allow the control system to be easily disconnected and serviced without disconnecting power from the transfer switch mechanism
- i. Terminals: Terminals shall be pressure type and appropriate for all field wiring. Terminal arrangement and cabinet space must be such that feeder conductors can enter from the top, side or bottom of the switch, at the installer's discretion. Control wiring shall be equipped with suitable lugs, for connection to terminal strips.
- j. Enclosures: All enclosures shall be third-party certified for compliance to NEMA ICS 6 and UL 508, unless otherwise indicated:
  - 1) The enclosure shall provide wire bend space in compliance to the latest

version of NFPA70, regardless of the direction from which the conduit enters the enclosure.

- 2) Exterior cabinet doors shall provide complete protection for the system's internal components. Doors must have permanently mounted key-type latches. Bolted covers or doors are not acceptable.
- 3) Transfer switches shall be provided in enclosures that are third party certified for their intended environment per NEMA requirements.
  - a) Transfer switches mounted in a controlled indoor environment shall be provided in NEMA Type 1 enclosures (IEC type IP30).
  - b) Transfer switches installed indoors shall be NEMA Type 12 (IEC type IP61) if the Project environment requires dust-proof and/or drip-proof equipment.
  - c) Transfer switches located outdoors shall be supplied in NEMA Type 3R (IEC IP34) when dust-proof and/or rain-proof enclosures are required.
  - d) Transfer switches that are installed outdoors or in any other uncontrolled environment shall be supplied with NEMA Type 4 or 4X (stainless steel) enclosures (IEC IP65).
- 3. Automatic Transfer Switches:
  - a. Comply with requirements for Level 1 equipment according to NFPA 110.
  - b. Indicated current ratings:
    - 1) Refer to the Project drawings for specifications on the sizes and types of transfer switch equipment, withstand and closing ratings, number of poles, voltage and ampere ratings, enclosure type, and accessories.
    - 2) Main contacts shall be rated for 600 VAC minimum.
    - 3) Transfer switches shall be rated to carry 100% of rated current continuously in the enclosure supplied, in ambient temperatures of -40 to +60 degrees C (-40 to +140 degrees F), relative humidity up to 95% (non-condensing), and altitudes up to 10,000 feet (3000 meters).
  - c. Manual Switch Operation: The power transfer mechanism shall include provisions for manual operation under no load, de energized conditions. Manual operation may be electromechanical or mechanical, but must be coordinated with control function.
  - d. Relay Signal: Control shall include provisions for addition of a pre-transfer relay signal, adjustable from 0 to 60 seconds, to be provided if necessary for elevator operation, based on equipment provided for the project.
  - e. Control: Transfer switch control shall be provided with necessary equipment and software to communicate with the genset control, other transfer switches, remote annunciation equipment, and other devices over a high speed control network.
  - f. Neutral Switching: Transfer switches designated on the Contract Drawings as 4pole shall be provided with a switched neutral pole. The neutral pole shall be of the same construction and have the same ratings as the phase poles. All poles shall be switched simultaneously using a common crossbar. Substitute equipment using overlapping neutral contacts is not acceptable.
  - g. Transfer switches that are designated on the Contract Drawings as 3-pole shall be provided with a neutral bus and lugs. The neutral bus shall be sized to carry 100% of the current designated on the switch rating.

- h. The transfer switch physically located closest to the generator and not more than 50 ft. (15 meters) away, except those served by generator paralleling equipment, shall be provided with a battery charger suitable for the requirements of the application and in compliance with NFPA 110 requirements for Level 1 systems. If no transfer switch is located within this distance, a battery charger shall be installed on the generator set.
- i. Automatic Transfer Switch Control Features:
  - The transfer switch control system shall be configurable in the field for any operating voltage level up to 600 VAC. Voltage sensing shall be monitored based on the normal voltage at the site. Systems that utilize voltage monitoring based on standard voltage conditions that are not field configurable are not acceptable.
  - 2) All transfer switch sensing shall be configurable from an operator panel or from a Windows XP or later PC-based service tool. Designs utilizing DIP switches or other electromechanical devices are not acceptable.
  - 3) The transfer switch shall be configurable to accept a relay contact signal and a network signal from an external device for load shedding purposes. On receipt of this signal, the transfer switch shall switch to a neutral position when connected to Source 2. If Source 1 is available when the load-shed signal is received, the transfer switch shall connect to Source 1.
  - 4) The transfer switch shall be configurable to accept a relay contact signal and a network signal from an external device to prevent transfer to the generator service.
  - 5) The transfer switch shall provide a relay contact signal prior to transfer or retransfer. The time period before and after transfer shall be adjustable in a range of 0 to 50 seconds.
  - 6) The control system shall be designed and prototype tested for operation in ambient temperatures from 40 degrees C to + 60 degrees C (- 40 to +140 degrees F). It shall be designed and tested to comply with the requirements of the noted voltage and RFI/EMI standards.
  - 7) The control shall have optically isolated logic inputs, high isolation transformers for AC inputs and relays on all outputs, to provide optimum protection from line voltage surges, RFI and EMI.
  - 8) The transfer switch network monitoring equipment, when supplied, shall be provided with a battery-based auxiliary power supply to allow monitoring of the transfer switch when both AC power sources are non-operational. The battery power supply shall be monitored for proper condition, and the transfer switch shall include an alarm condition to indicate low battery condition.
- j. Transfer Switch Control Panel: The transfer switch shall have a microprocessorbased control with a sealed membrane panel incorporating pushbuttons for operator-controlled functions, and LED lamps for system status indicators. The panel shall also include an alphanumeric display for detailed system information. Panel display and indicating lamps shall include permanent labels.
  - 1) The indicator panel LEDs shall display:
    - a) Which source the load is connected to (Source 1 or Source 2).
    - b) Which source or sources are available?
    - c) When switch is not set for automatic operation, because the control is

disabled or the bypass switch is in use.

- d) When the switch is in test/exercise mode.
- 2) The indicator shall have pushbuttons that allow the operator to activate the following functions:
  - a) Activate pre-programmed test sequence.
  - b) Override programmed delays, and immediately go to the next operation.
  - c) Reset the control by clearing any faults.
  - d) Test all of the LEDs by lighting them simultaneously.
- 3) The alphanumeric digital display shall be vacuum fluorescent-type, clearly visible in both bright sunlight and no-light conditions over an angle of 120 degrees, and shall display the following:
  - a) AC voltage for all phases, normal and emergency.
  - b) Source status: connected or not connected.
  - c) Load data, including voltage, AC current, frequency, KW, KVA, and power factor.
- 4) The display panel shall be password-protected, and allow the operator to view and make adjustments:
  - a) Set nominal voltage and frequency for the transfer switch.
  - b) Adjust voltage and frequency sensor operation set points.
  - c) Set up time clock functions.
  - d) Set up load sequence functions.
  - e) Enable or disable control functions including program transition.
  - f) View real-time clock data, operation log (hours connected, times transferred, failures) and service history.
- k. Control Functions: Functions managed by the control shall include:
  - 1) Software adjustable time delays:
    - a) Engine start (prevents nuisance genset starts in the event of momentary power fluctuation): 0 to 120 seconds (default 3 sec).
    - b) Transfer normal to emergency (allows genset to stabilize before load is transferred): 0 to 120 seconds (default 3 sec).
    - c) Re-transfer emergency to normal (allows utility to stabilize before load is transferred from genset): 0 to 30 minutes (default 3 sec).
    - d) Engine cooldown: 0 to 30 minutes (default 10 min).
    - e) Programmed transition: 0 to 60 seconds (default 3 sec).
  - 2) Undervoltage sensing: three-phase normal, three-phase emergency source.
    - a) Pickup: 85 to 98% of nominal voltage (default 90%).
    - b) Dropout: 75 to 98% of nominal voltage (default 90%).
    - c) Dropout time delay: 0.1 to 1.0 seconds (default 0.5 sec).
    - d) Accurate to within +/-1% of nominal voltage.
  - 3) Over-voltage sensing: three-phase normal, three-phase emergency source.
    - a) Pickup: 95 to 99% of dropout setting (default 95%).
    - b) Dropout: 105 to 135% of nominal voltage (default 110%).
    - c) Dropout time delay: 0.5 to 120 seconds (default 3 sec).
    - d) Accurate to within +/- 1% of nominal voltage.
  - 4) Over/under frequency sensing:
    - a) Pickup: +/- 5 to +/-20% of nominal frequency (default 10%).
    - b) Dropout: +/-1% beyond pickup (default 1%).

## ELECTRICAL

- c) Dropout time delay: 0.1 to 15.0 seconds (default 5 sec).
- d) Accurate to within +/-0.2%.
- 5) Voltage imbalance sensing:
  - a) Dropout: 2 to 10% (default 4%).
  - b) Pickup: 90% of dropout.
  - c) Time delay: 2.0 to 20 seconds (default 5 sec).
- 6) Phase rotation sensing: Time delay: 100 msec
- 7) Loss of single-phase detection: Time delay: 100 msec
- 1. Control features shall include:
  - 1) Programmable genset exerciser: A field-programmable control shall periodically start the generator, transfer the load to generator for a preset time, then re-transfer and shut down the generator after a preset cool-down period.
    - a) Push-button programming control shall have a selection of eight different schedules for exercising generator, with or without load.
  - 2) In event of a loss of power to the control, all control settings, real-time clock setting and the engine start-time delay setting will be retained.
  - 3) The system continuously logs information including the number of hours each source has been connected to the load, the number of times transferred, and the total number of times each source has failed. An event recorder stores information, including time and date-stamp, for up to 50 events.
  - 4) Transfer Override Switch: Overrides automatic re-transfer control so automatic transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light to indicate override status.
- m. Control Interface:
  - 1) Provide one set Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250 VAC.
  - 2) The transfer switch shall be provided with a network communication card, and configured to allow network-based communication with the transfer switch and other network system components, including the generator set(s) provided for the Project.
  - 3) Unassigned Auxiliary Contacts: Two normally open, 1-pole, double-throw contacts for each switch position, rated 10A at 240 VAC.
- n. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10A at 32 VDC minimum.
- 4. Remote Annunciator System:
  - a. Functional Description: Remote annunciator panel shall annunciate conditions for indicated transfer switches. Annunciation shall include the following:
    - 1) Sources available, as defined by actual pickup and dropout settings of transfer-switch controls.
    - 2) Switch position.
    - 3) Failure of communication link.
  - b. Annunciator Panel: LED-lamp type with audible signal and silencing switch.
    - 1) Indicating Lights: Grouped for each transfer switch monitored.
    - 2) Label each group, indicating transfer switch it monitors, location of switch, and identity of load it serves.
    - 3) Mounting: Flush, modular, steel cabinet, unless otherwise indicated.

4) Lamp Test: Push-to-test or lamp-test switch on front panel.

- c. Malfunction of annunciator, annunciation and control panel, or communication link shall not affect functions of automatic transfer switch. In the event of failure of communication link, automatic transfer switch automatically reverts to standalone, self-contained operation.
- d. Automatic transfer-switch sensing, controlling, or operating function shall not depend on remote panel for proper operation. The remote annunciation system shall not prevent transfer to the alternate source when the primary power source fails, nor prevent return to the primary source if the alternate source fails.
- C. Execution:
  - 1. Installation:
    - a. Design each fastener and support to carry load indicated by seismic requirements and according to seismic-restraint details. See Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
    - b. Floor-Mounting Switch: Anchor to floor by bolting.
      - 1) Floor-mounted transfer switches (except drawout switches supported by wheeled carriages, which must be rolled out at floor level) shall be mounted on concrete bases complying with the following requirements:
        - a) Concrete Bases: 4 inches (100 mm) high, reinforced, with chamfered edges. Extend base no more than 4 inches (100 mm) in all directions beyond the maximum dimensions of switch, unless otherwise indicated or unless required for seismic support. Construct concrete bases according to Division 26 Section "Hangers and Supports for Electrical Systems."
    - c. Annunciator and Control Panel Mounting: Flush in wall, unless otherwise indicated.
    - d. Identify components according to Division 26 Section "Identification for Electrical Systems."
    - e. Set field-adjustable intervals and delays, relays, and engine exerciser clock.
  - 2. Connections:
    - a. Wiring to Remote Components: Match type and number of cables and conductors to control and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.
    - b. Field control connections shall be made on a common terminal block that is clearly and permanently labeled.
    - c. Transfer switch shall be provided with AL/CU mechanical lugs sized to accept the full output rating of the switch. Lugs shall be suitable for the number and size of conductors shown on the Contract Drawings.
    - d. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
    - e. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

- 3. Source Quality Control:
  - a. Prior to shipping, factory shall test and inspect components, assembled switches, and associated equipment to ensure proper operation.
  - b. Factory shall check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements.
  - c. Factory shall perform dielectric strength test complying with NEMA ICS 1.
- 4. Field Quality Control:
  - a. Manufacturer's Field Service: The supplier of the transfer switch(es) and associated equipment shall inspect, test, and adjust components, assemblies, and equipment installations, including connections, and report results in writing.
  - b. Manufacturer's representative shall perform tests and inspections and prepare test reports.
  - c. After installing equipment and after electrical circuitry has been energized, installer shall test for compliance with requirements.
    - 1) Perform recommended installation tests as recommended in manufacturer's installation and service manuals.
    - 2) After energizing circuits, demonstrate interlocking sequence and operational function for each switch.
      - a) Simulate power failures of normal source to automatic transfer switches and of emergency source with normal source available.
      - b) Verify time-delay settings.
      - c) Verify that the transfer switch is accurately metering AC voltage and current (when provided).
      - d) Test bypass/isolation unit functional modes and related automatic transferswitch operations.
      - e) Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.
    - Ground-Fault Tests (if integral to transfer switch): Coordinate with testing of ground-fault protective devices for power delivery from both sources.
      - a) Verify grounding connections and locations and ratings of sensors.
  - d. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, the contractor shall perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.
    - 1) Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.
    - 2) Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    - 3) Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken and observations after remedial action.

- 5. Demonstration:
  - a. After generator set installation, the generator and transfer switch supplier shall conduct a complete operation, basic maintenance, and emergency service seminar covering generator set and transfer switch equipment, for up to 10 people employed by the Owner.
    - 1) The seminar shall include instruction on operation of the transfer equipment, normal testing and exercise, adjustments to the control system, use of the PC based service and maintenance tools provided under this contract, and emergency operation procedures.
    - 2) The class duration shall be at least 8 hours in length, and include practical operation with the installed equipment.

## 2.17 LIGHTING FIXTURES

- A. All lighting fixtures shall be in accordance with identifications on the Contract Drawings and the following:
  - 1. Finishes shall be as selected by the Architect or as indicated on the plans.
  - 2. Any additional appurtenances required for installation and operation, where same are not covered by the identification used on the Contract Drawings, shall be included.
  - 3. Recessed fixtures shall be coordinated with ceiling construction.
  - 4. Exact location of all fixtures shall be confirmed with Architect prior to rough-in.
  - 5. Recessed fixtures throughout shall have their components, wiring and external connections coordinated for use in ceilings utilized as air handling plenums.
  - 6. Fixtures for use outdoors or in areas designated as damp locations, shall be suitably gasketed and UL listed for such applications.
  - 7. All fixtures shall be UL approved with labels attesting thereto.
  - 8. The Contractor shall obtain all information relative to the exact type of hung ceilings and suspension systems to be installed before ordering any recessed fixtures. This Contractor shall furnish the proper type fixtures applicable to the ceiling framing system. If, other than the type of fixtures specified are required for installation, due to the type of ceiling construction, this Contractor shall furnish and install the proper type fixtures and mounting appurtenances required at no extra charge.
  - 9. The Contractor shall coordinate the exact locations of all lighting fixtures with the ceiling pattern during the construction period and before installation of the fixtures. Interferences between lighting fixtures, and other equipment, shall be brought to the attention of the General Contractor.

- 10. Include the aiming and/or adjustments of all lighting fixtures requiring same in accordance with instructions issued by the Architect in the field.
- 11. All lamp sockets in lighting fixtures shall be suitable for the indicated lamps and shall be set so that the lamps are positioned in optically correct relation to all lighting fixture components.
- 12. Lighting fixtures shall be supported from building structure only, not from hung or suspended ceiling, by means of chains, threaded rods or #14 gauge tie wire.
- 13. All fixtures shall include seismic clips and shall be supported to comply with seismic regulations.
- 14. Lamps shall be manufactured by Eaton, Phillips. OSRAM, or Sylvania.
- B. LED Lamps and Luminaires:
  - 1. Solid State Lighting/Light Emitting Diode (LED) Lamps and Luminaries:
    - a. Luminaire manufacturer shall have a minimum of five (5) years' experience in the manufacture and design of LED products and systems and no less than one hundred (100) North American installations.
    - b. Unless otherwise specified, all LED luminaires and power/data supplies shall be provided by a single manufacturer to ensure compatibility.
    - c. All components, peripheral devices and control software are to be provided by and shall be the responsibility of a single entity. All components shall perform successfully as a complete system.
    - d. Include all components necessary for a complete installation. Provide all power supplies, synchronizers, data cables, and data terminators for a complete working system.
    - e. All LED sources used in the LED luminaire shall be of proven quality from established and reputable LED manufacturers and shall have been fabricated after 2007.
  - 2. Replacement and Spares:
    - a. Manufacturer will keep record of original bin for each LED module and have replacement modules from the same bin available for three (3) years after date of installation.
    - b. Manufacturer will keep an inventory of replacement parts (source assembly, power and control components).
    - c. Manufacturer's LED system will not become obsolete for ten (10) years.
    - d. Manufacturer will provide exact replacement parts, or provide upgraded parts that are designed to fit into the original luminaire and provide equivalent distribution and lumen output to the original, without any negative consequences.
    - e. Manufacturer has in place a written recycling and re-use program, and will accept returned product and/or components for recycling or re-use.
    - f. Manufacturer will properly dispose of non-recyclable components that are deemed harmful to the environment.

- g. System shall carry a full warranty for five (5) years. Manufacturer shall be responsible for cost of labor not to exceed \$50 per individual part, and cost of shipping, to replace any component of the system that fails within two (2) years of installation.
- 3. Products and Components Performance:
  - a. LED luminaires and components shall be UL listed or UL classified.
  - b. LED luminaires and components shall be CE certified.
  - c. LED luminaires and components shall be PSE marked.
  - d. All LED luminaires shall be subjected to the following JEDEC Reliability Tests for Lead-free Semiconductors: HTOL, RTOL, LTOL, PTMCL, TMSK, Mechanical Shock, Variable Vibration Frequency, SHR, Autoclave.
  - e. To ensure luminaire quality, luminaire shall have been tested under accelerated life test conditions including an operating temperature span of 360 degrees F, and cyclic loading up to 60G.
  - f. All products included in system shall use Mil-Std 810F, Random Vibration 7.698g as a minimum standard. In installations subject to vibration, luminaire shall be installed with vibration isolation hardware to sufficiently dampen vibrations.
  - g. All LED components shall be mercury and lead-free.
  - h. All manufacturing processes and materials shall conform to the requirements of the European Union's Restriction on the Use of Hazardous Substances in Electrical and Electronics Equipment (RoHS) Directive, 2002/95/EC.
  - i. LEDs shall comply with ANSI/NEMA/ANSLG C78.377-2008 Specifications for the Chromaticity of Solid State Lighting Products. Color shall remain stable throughout the life of the lamp. Color shall match approved sample.
  - j. LEDs shall comply with IESNA LM-80 Standards for Lumen Maintenance of LED Lighting Products.
  - k. White LEDs shall have a rated source life of 50,000 hours under normal operation conditions. RGB LEDs shall have a rated source life of 100,000 hours. LED "rated source life" is defined as the time when a minimum of 70% of initial lumen output remains.
  - 1. Luminaire assembly shall include a method of dissipating heating so as to not degrade life of source, electronic equipment, or lenses. LED luminaire housing shall be designed to transfer head from the LED board to the outside environment. Luminaire housing shall have no negative impact on life of components.
  - m. Manufacturer shall supply in writing a range of permissible operating temperatures in which system will perform optimally.
  - n. High power LED luminaires shall be thermally protected using one or more of the following thermal management techniques: metal core board, gap pad, and/or internal monitoring firmware.
  - o. LEDs shall be adequately protected from moisture or dust in interior applications.
  - p. For wet and damp use, LED-based luminaires itself shall be sealed, rated, and tested for appropriate environmental conditions, not accomplished by using an additional housing or enclosure. Such protection shall have no negative impact on rated life of source or components, or if so, such reductions shall be explicitly brought to the attention of the Designer.

- q. All hardwired connections to LED luminaires shall be reverse polarity protected and provide high voltage protection in the event connections are reversed or shorted during the installation process.
- r. The LED luminaire shall be operated at constant and carefully regulated current levels. LEDs shall not be overdriven beyond their specified nominal voltage and current.
- s. RGB LED luminaries shall utilize an equal combination of high brightness red, blue and green LEDs, unless otherwise noted, to provide up to 16.78 million additive RGB colors and shall be capable of at least 8-bit control.
- t. Manufacturer shall be able to provide supporting documentation of the product meeting third party regulatory compliance.
- u. Manufacturer shall ensure that products undergo and successfully meet appropriate design and manufacturability testing including Design FMEA, Process FMEA, Environmental Engineering Considerations and Laboratory Tests, IEC standards and UL/CE testing.
- v. All LED luminaires (100% of each lot) shall undergo a minimum twenty-four (24) hour burn-in during manufacturing, prior to shipping.
- w. Manufacturer shall provide Luminaire Efficacy (Im/W), total luminous flux (lumens), luminous intensity (candelas) chromaticity coordinates, CCT and CRI optical performance, polar diagrams, and relevant luminance and illuminance photometric data. Provide data in IES file format in accordance with IES LM-79-2008, based on test results from an independent Nationally Recognized Testing Laboratory.
- x. Power/Data supply shall have the following:
  - 1) Supply outputs shall have current limiting protection.
  - 2) Supply shall provide miswiring protection.
  - 3) Supply shall have power factor correction.
  - 4) Supply shall provide connections that are conduit-ready or clamp-style connections in the case of low-voltage wiring.
  - 5) Supply shall come with a housing that meets a minimum IP20 rating for dry location installation unless located in a damp or wet location.
  - 6) Supply shall be UL listed for Class 1 or Class 2 wiring.

# 2.18 LOW VOLTAGE LIGHTING RELAY CONTROL PANEL

- A. Scope: The Electrical Subcontractor, as part of the work of this section, shall coordinate, receive, mount, connect, and place into operation all equipment. The Electrical Subcontractor shall furnish all conduit, wire, connectors, hardware and other incidental items necessary for the complete and properly functioning lighting control system as described herein and shown on the project documents.
- B. Introduction: The work covered in this section is subject to the requirements in the General Conditions of the Specifications. Contractor shall coordinate the work in this section with the trades covered in other sections of the specification to provide a complete and operable system.
- C. System Description: Extent of lighting control system work is indicated by drawings and by the requirements of this section. It is the intent of this section to provide an integrated,

energy saving lighting control system including Lighting Control Panels, and Occupancy Sensors, from a single supplier. Contractor is responsible for confirming that the panels and sensors interoperate as a single system.

- D. Quality Assurance:
  - 1. Manufacturers: Firms regularly engaged in the manufacture of lighting control equipment and ancillary equipment, of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
  - 2. Comply with NEC, NEMA, and FCC requirements for Class A applications.
  - UL Approvals: Relay panels and accessory devices are to be UL listed under UL 916 Energy Management Equipment. Emergency relay panels shall be co-listed under UL 924 Emergency Lighting Equipment.
- E. Submittals: Submit manufacturer's data on lighting control system and components including shop drawings, detailed wiring diagrams, and cut sheets as required under related specification sections.
- F. Manufacturers: This specification is based on products from WattStopper, Santa Clara, CA. Complete information on any other system proposed as a substitute must be submitted in writing for approval a minimum of 10 days prior to bid. Prior approval does not guarantee final approval by the electrical engineer. The contractor shall be completely responsible for providing a system meeting this specification in its entirety. All deviations from this specification must be listed and individually signed off by the consultant.
- G. Equipment:
  - 1. Lighting Control Panel: Provide lighting control panel in the location and capacities as indicated on the plans and schedules. Each panel shall be of modular construction and consist of the following components:
    - a. Enclosure/Tub shall be NEMA 1, sized to accept an interior with 1 48 relays and 6 four-pole contactors.
    - b. Cover shall be configured for surface or flush wall mounting of the panel as indicated on the plans. The panel cover shall have a hinged and lockable door with restricted access to line voltage section of the panel.
    - c. Interior assembly shall be supplied as a factory assembled component specifically designed and listed for field installation. The interior construction shall provide total isolation of high voltage (Class 1) wiring from low voltage (Class 2) wiring within the assembled panel. The interior assembly shall include intelligence boards, power supply, DIN rails for mounting optional Class 2 control devices, and individually replaceable latching type relays. The panel interiors shall include the following features:
    - d. Removable, plug-in terminal blocks with screwless connections for all low voltage terminations.

- e. Individual terminal block, override pushbutton, and LED status light for each relay.
- f. Direct wired switch inputs associated with each relay and group channel shall support two-wire, momentary or maintained contact switches.
- g. Digital inputs (four RJ-45 jacks) shall support 1-, 2-, 3-, 4-, and 8-button digital switches, digital IO modules capable of receiving 0-5V or 0-10V analog photocell inputs, digital IO modules capable of receiving momentary or maintained contact closure inputs, digital photocell modules, and digital occupancy sensors.
- h. True relay state shall be indicated by the on-board LED and shall be available to external control devices and systems.
- i. Automatically sequenced operation of relays to reduce impact on the electrical distribution system when large loads are controlled simultaneously.
- j. Group, channel, and pattern control of relays shall be provided through a simple keypad interface from a handheld IR programmer. Any group of relays can be associated with a channel for direct on/off control or pattern (scene) control via a simple programming sequence using the relay and channel override pushbuttons and LED displays for channels 1 9 or a handheld IR programmer for channels 1 99.
- k. Relay group status for each channel shall be provided through red LED indicators for groups 1 9 and via BACnet for groups 1 99. Solid red indicates that the last group action called for an ON state and relays in the group are on or in a mixed state.
- 1. Single-pole latching relays with modular plug-in design. Relays shall provide the following ratings and features:
  - 1) Electrical:
    - a) 30 amp ballast at 277V
    - b) 20 amp ballast at 347V
    - c) 20 amp tungsten at 120V
    - d) 20 amp resistive at 347V
    - e) 1.5 HP motor at 120V
    - f) 14,000 amp short circuit current rating (SCCR) at 347V
  - 2) Mechanical:
    - a) Individually replaceable, <sup>1</sup>/<sub>2</sub>" KO mounting with removable Class 2 wire harness.
    - b) Actuator on relay housing provides manual override and visual status indication, accessible from Class 2 section of panel.
    - c) Dual line and load terminals each support two #14 #12 solid or stranded conductors.
    - d) Tested to 300,000 mechanical on/off cycles.
  - 3) Isolated low voltage contacts provide for true relay status feedback and pilot light indication.
- m. Power supply shall be a multi-voltage transformer assembly with rated power to supply all electronics, occupancy sensors, switches, pilot lights, and photocells as necessary to meet the project requirements. Power supply to have internal over-current protection with automatic reset and metal oxide varistor protection.
- n. Lighting control panels shall be WattStopper model LILM8, LILM24 or LILM48 as shown on the plans.

- 2. User Interface: Each lighting control panel shall be supplied with at least one (1) handheld IR remote programming interface consisting of a keypad and associated OLED display screen. The user interface shall allow setup, configuration, and diagnostics of the panel without the need for software or connection of a computer.
- 3. Digital Network Switches: Provide digital wall switches with 1, 2, 3, 4, or 8 buttons, in the colors as determined by the Architect. Switches shall connect to the panel via standard Cat 5e cable with RJ-45 terminations. Digital wall switches shall have the following features:
  - a. Available colors: white, ivory, light almond, grey or black.
  - b. Single gang device shall fit standard decorator opening and use standard wall plates.
  - c. LED indicator on each button for status and locator function.
  - d. Concealed configuration button with LED indicator for binding buttons to relays, no software or computer shall be required.
  - e. Infrared window for use with handheld two-way wireless configuration tool.
  - f. Selectable function mode per button shall be momentary toggle (on/off), on only, or off only.
  - g. Removable button assembly for field color change or substitution of engraved buttons.
  - h. Two RJ-45 ports for connection to panel or other switches and/or occupancy sensors.
  - i. Open topology digital network via Cat 5e wire.
  - j. Digital switches shall be WattStopper LMSW series as indicated on the plans.
  - k. Digital switch buttons shall be able to control groups and group actions shall be system global such that any digital switch station can affect the state of relays present in up to twelve (12) panels networked together via BACnet.
- 4. Digital Occupancy Sensors: Provide digital occupancy sensors to control relays in locations as shown on the plans. Sensors shall be either passive infrared, ultrasonic, or dual technology as indicated on the project documents. Sensors shall be either ceiling or wall mounded and connect to the panel using Cat 5e cable with RJ-45 terminations. Digital occupancy sensors shall have the following features:
  - a. Setup and calibration shall be digital and precisely repeatable from sensor to sensor.
  - b. User interface with pushbuttons and illuminated LCD screen for setup and calibration.
  - c. Ladder-free setup and calibration with optional handheld two-way infrared commissioning tool.
  - d. Sensitivity, 0 100% in 10% increments.
  - e. Time delay, 1 30 minutes in 1 minute increments.
  - f. Test mode with five-second time delay for simplified walk testing.
  - g. Digital occupancy sensors shall be WattStopper LM series as indicated on the plans.
- 5. Digital Network Clock: Each panel shall include a digital clock capability able to issue system wide automation commands to up to eleven (11) other panels for a total

of twelve (12) networked lighting control panels. The clock shall provide capability for up to 254 independent schedule events per panel for each of the ninety-nine (99) system wide channel groups.

- a. The clock capability of each panel shall support all of the energy saving features required of ASHRAE 90.1 2001, IECC 2003, as well as all State and Local Energy Codes.
- b. The clock module shall provide astronomic capabilities, time delays, blinking warning, daylight savings, and holiday functions and will include a battery backup for the clock function and EEPROM for program retention. Clocks that require multiple events to meet Local code lighting shut-off requirements shall not be allowed.
- c. The clock capability of each panel shall operate on a basis of ON/OFF or Normal Hours/After Hours messages to automation groups that implement pre-configured control scenarios. Scenarios shall include:
  - 1) Scheduled ON / OFF
  - 2) Manual ON / Scheduled OFF
  - 3) Astro ON / OFF (or Photo ON / OFF)
  - 4) Astro and Scheduled ON / OFF (or Photo and Scheduled ON / OFF)
- d. The user interface shall be a portable IR handheld remote control capable of programming any panel in the system.
- e. The clock capability of each panel shall employ non-volatile memory and shall retain user programming and time for a minimum of ten (10) years.
- f. Schedules programmed into the clock of any one panel shall be capable of executing panel local schedule or Dark/Light (photocell or Astro) events for that panel in the event that global network communication is lost. Lighting control panels that are not capable of executing events independently of the global network shall not be acceptable.
- 6. Application Sequence of Operations Support: The lighting control panel shall support relay behavior parameter configuration of such an extent as to allow digital switch, digital occupancy sensor, digital automatic photocells, and scheduled events to seamlessly implement, at a minimum, the following operational sequences:
  - a. Title 24 operation requiring Manual On 50%, Automatic on 100%, automatic shut-off vacancy shall be able to be implemented by using any two (2) relays in a given panel. The sensor(s) for that space will be bound to both relays, each of which shall be given an independent operation mode of Auto On and Manual On respectively, such that on occupancy only 50% of the lighting activates. The digital switch stations for the space, having at minimum two (2) buttons, shall be bound to both relays such that at least one (1) button controls only 50% of the lights and at least one (1) separate button controls only 50% of the lights allowing for independent zone control. The occupancy sensor(s) action on vacancy shall be to turn off both relays. Configuration of this operational sequence shall not require special software or tools and shall be accomplished using only the handheld IR remote control.
  - b. Open office spaces that must turn on automatically by sensor during the Normal Hours operating period and stay on until a scheduled sweep of the space on

#### ELECTRICAL

transition to the After Hours operating shall use the handheld IR remote control to create a group of the relays for that space with a group parameter type that automatically adjust the Normal House and After Hours run-time parameters to the required values. Relay operation during Normal Hours shall therefore by for a relay to turn on when its respective occupancy sensor(s) detect motion and to stay on until the After Hours sweep time. Once the After Hours sweep occurs, all relays shall operate as automatic ON/OFF in response to their respective sensors. Systems that require individual relay parameters to be adjusted on a per relay basis are not acceptable.

- 7. Schedule, Group, and Photocell Control of Relays: The lighting control panel shall support schedule, group, and photocell control functions via the network as configured in the optional Segment Manager Controller or building automation system. The lighting control panel shall be fully compatible with building automation systems that are BACnet compliant. See related specification sections for additional information on interfacing the lighting control panel(s) to the building automation system.
- 8. Installation:
  - a. Support Services:
    - 1) System Start Up and Commissioning:
      - a) Manufacturer shall provide a factory authorized technician to confirm proper installation and operation of the lighting control panels, switches, and occupancy sensors.
      - b) The technician shall provide training on the lighting control features of the system and shall verify that the panel(s) is communicating with the building automation system.
      - c) The system integrator or BAS vendor shall be responsible for all integration including the mapping of BACnet objects into the BAS logic, schedules and graphics.

# 2.19 LOW VOLTAGE LIGHTING CONTROL DEVICES

- A. Scope: The Electrical Subcontractor, as part of the work of this section, shall furnish and install low voltage lighting control devices as indicated on the project documents and described herein.
- B. Low voltage lighting control devices shall include but are not limited to the following devices:
  - 1. Dual technology (infrared and ultrasonic) occupancy/vacancy sensors, both ceiling mounted and/or wall mounted.
  - 2. Dual technology (infrared and ultrasonic) occupancy/vacancy wall switches, both single button and dual button types.
  - 3. Digital room controllers, self-configuring, digitally addressable one, two or three relay plenum rated controllers for ON/OFF or dimming controls.

- 4. Digital dimming wall switch compatible with digital room controllers.
- 5. Emergency lighting control unit (ELCU) shall allow a standard lighting control device to control emergency lighting in conjunction with Normal Lighting in any areas with a building.
- 6. Device and faceplate colors shall be as directed by the Architect.
- C. Submittals:
  - 1. Submit shop drawings and relevant product information as listed below:
    - a. Composite wiring and/or schematic diagram of each control circuit as proposed to be installed.
    - b. Catalog sheets, specifications and installation instructions for each device.
- D. Quality Assurance: The low voltage lighting control device manufacturer shall have a minimum of ten (10) years of experience in the manufacture of lighting control devices.
- E. Warranty: Provide a five (5) year manufacturer's warranty on all low voltage lighting control devices.
- F. Manufacturers:
  - 1. This specification is based on products as manufactured by WattStopper.
  - 2. Acceptable Manufacturers: Subject to the compliance with the requirements of the contract documents, acceptable manufacturers are listed below:
    - a. WattStopper
    - b. Sensor Switch
    - c. Cooper Wiring Devices
- G. Equipment:
  - 1. Dual technology (infrared and ultrasonic) occupancy/vacancy sensor.
    - a. Wall or ceiling mounted as indicated on project documents. Features shall include:
      - 1) Sensitivity: 0 100% in 10% increments.
      - 2) Time Relay: 1 30 months.
      - 3) Test Mode.
      - 4) Walk-through Mode.
      - 5) Auto or Manual On (occupancy or vacancy mode).
        - a) Provide WattStopper LMD series sensor as indicated on the project documents.
  - 2. Dual Technology (infrared and ultrasonic) occupancy/vacancy wall switch with 1 or 2 buttons.
    - a. Wall switch with 1 or 2 pushbuttons as indicated on project documents. Features shall include:

- 1) Sensitivity: 0 100% in 10% increments.
- 2) Time Delay: 1 30 minutes.
- 3) Test Mode.
- 4) Walk-through Mode.
- 5) Auto or Manual On (occupancy or vacancy mode).
- b. Provide WattStopper LMD series as indicated on the project drawings.
- 3. Digital Room Controllers (ON/OFF or dimming control).
  - a. Digital room controllers shall be provided to match room lighting control requirements as indicated on the project drawings.
  - b. ON/OFF room controllers shall have the following features:
    - 1) One, two or three relay configuration.
    - 2) Integral switching power supply.
  - c. ON/OFF/Dimming room controllers shall have the following features:
    - 1) One, two or three relay configuration.
    - 2) Integral power supply
    - 3) One (1) dimming output per relay.
      - a) 0-10 dimming per relay for control of compatible ballasts and LED drivers.
      - b) Each dimming output channel shall be independently configurable.
  - d. Provide WattStopper LMRC series digital room controllers as indicated on project documents.
- 4. Digital Dimming Wall Switch:
  - a. Low voltage digital dimming wall switch shall be compatible with the digital room controller. Features shall include:
    - 1) Dimming switch includes bi-level LED's to indicate load levels.
    - 2) Full functioning dimming control in multi-way applications such as 3-way, 4-way, etc.
    - 3) LED status indicator.
  - b. Provide WattStopper LMDM series digital dimming wall switch as indicated on the project documents.
- 5. Digital Wall Switches (ON/OFF).
  - a. Low voltage digital wall switch with momentary pushbuttons in 1, 2, 3, 4, 5 & 8 button configurations. Wall switches shall be compatible with the digital room controller and have the following features:
    - 1) Removable buttons for field replacement.
    - 2) LED's on each button to confirm status.
    - 3) Switches may be used for multi-way control applications such as 3-way, 4-way, etc.
  - b. Provide WattStopper LMSW series as indicated on the project documents.
- 6. Emergency Lighting Control Unit (ELCU):
  - a. Emergency lighting control unit, a UL 924 listed device that monitors a switched circuit providing Normal lighting to an area. Upon Normal power failure, the emergency lighting circuit will close, forcing the emergency lighting "ON" until
Normal power is restored. Features shall include:

- 1) 120/277 volts, 50/60 Hz, 200 amp ballast rating.
- 2) Push to test button.
- 3) Auxiliary contacts for remote test or fire alarm interface.
- b. Provide WattStopper ELCU-100, ELCU-200 as indicated on project documents.
- H. Installation:
  - 1. The Electrical Subcontractor shall install all devices and wiring in a professional workmanlike manner per the manufacturer's installation instructions.
  - 2. The Electrical Subcontractor shall test all devices before start-up to ensure proper and correct installation.
- I. The Electrical Subcontractor shall calibrate all sensor time delays and sensitivity settings to ensure proper detection of occupants and energy savings.
  - 1. Adjust sensor settings so that controlled area remains illuminated while occupied.

#### 2.20 INTEGRATED TECHNOLOGY INFRASTRUCTURE SUPPORT SYSTEM

- A. Awarding Authority shall be providing a separate vendor to furnish and install Integrated Technology devises, face-plates, wiring, patch panels, equipment racks, and terminations. Electrical Contractor shall be responsible for installing required infrastructure to support the Awarding Authority's Integrated Technology vendor. Any special backboxes that are required for Integrated Technology systems shall be provided by the Owner's Integrated Technology vendor and supplied to the Electrical Contractor for installation. All costs to furnish and install Integrated Technology infrastructure support system as identified herein shall be included within the Electrical Contractor's Base Bid amount.
- B. Integrated Technology Installations to include the following systems:
  - 1. CCTV devices and monitors
  - 2. Audio recording devices
  - 3. Intercom / Video Devices
  - 4. Interview Room recording systems
  - 5. Cell Check devices
  - 6. Duress Alarms and strobes
  - 7. Access Control devices
  - 8. Software and computer workstations
  - 9. Patch Panels

10. Equipment Racks to support the systems as described above only.

- C. Electrical Contractor to furnish and install a system of empty conduits within concealed spaces, mounting boards, and junction boxes for the integrated technology components. Provide 3/4" thick fire rated plywood mounting boards. Provide 3/16" diameter nylon pull-cord in empty conduits. Refer to Contract Drawings E-4.0 and E-4.1 for scope of devices requiring empty conduit system.
- D. Provide empty conduits from all devices shown on Sheets E-4.0 and E-4.1 to an accessible ceiling space above. All spaces with exposed ceilings indicated on the drawings shall have a conduit system throughout the exposed ceiling space and terminating within an adjacent accessible ceiling space.
- 2.21 FIRE ALARM SYSTEM
  - A. Scope:
    - 1. Provide complete networked analog/addressable fire detection, evacuation alarm and control network in compliance with all specifications, drawings and applicable code requirements.
    - 2. System shall be a networked microprocessor based fire alarm system which will integrate peripheral devices onto system via digital data communications.
    - 3. Each initiating device shall have full analog detection capabilities; identify its' exact location, and shall operate as described elsewhere in these specifications.
    - 4. Work in this section, as shown or specified, shall be in accordance with related contract documents.
    - 5. Provide automatic and manual, closed circuit, multiplex fire alarm communications according to contract documents, wired, connected and left in first class operating condition.
    - 6. Final connections, testing, and adjusting of system shall be done under direct supervision of system supplier.
      - a. System design and installation shall conform to following standards:
        1) Equipment shall be UL listed for its intended purpose, including UL 864 (UOJZ, UOXX, UOQY and UUKL), 1480 and 1971.
      - b. NFPA standards 70, 72, 90A, 92A, and 101.
      - c. Current State Building, Electrical and Life Safety Codes.
      - d. Americans with Disabilities Act (ADA).
      - e. Requirements of local authorities having jurisdiction, including permitting and acceptance procedures.
    - 7. Shop Drawings shall include:
      - a. Complete point-to-point riser diagram showing all equipment and size, type and number of conductors and devices.

- b. Large scale drawings of control panels, annunciators, transponders, showing module placement and spare capacity allowances.
- c. Complete, itemized bill of materials with quantities, descriptions.
- d. Original catalog data sheets to assure compliance with these specifications. This equipment shall be subject to approval, and no equipment shall be ordered without prior approval.
- e. Calculations to support size of standby batteries, notification appliance circuits (NAC) and audio amplifiers submitted. Circuit calculations shall demonstrate proper current draw, voltage drop, wire size considerations and spare capacity allowances. Calculations shall be based on UL nameplate RMS voltage ratings. NAC calculations shall demonstrate 25 percent spare capacity.
- f. Copy of Original Equipment Manufacturer's Warranty Statement.
- g. Complete description of system Sequence of Operation.
- h. Details of any special installation procedures.
- i. Complete floor plans showing network nodes and all device locations and corresponding addresses. Point identification lists shall be included to ensure proper coordination of alarm messages and shall include each device type address number and corresponding CCO text message.
- j. Confirmation that equipment supplier will provide on-site project management and supervision during system installation, and perform system testing and instruction.
- k. Operation and maintenance manuals.
- 8. Conform to UL and NFPA standards for testing of completed installation by UL approved testing company.
- 9. O & M Manuals shall include the following:
  - a. All information submitted in final reviewed shop drawings.
  - b. As-built documentation which incorporates all modifications to completed system, whether made as field change or by change order.
  - c. Include copy of final test report, Record of Completion, as-built documentation and Fire Alarm Support Contracts as described herein.
- B. Sequence of Operation:
  - 1. Operation of manual station or activation of any automatic alarm initiating device (system smoke, system heat detector, waterflow) shall initiate system-wide but only in respective building/ wing, response according to established response procedures and as follows:
    - a. Initiate transmission of alarm to Municipal Fire Station via on board Digital Alarm Communicator/Transmitter (DACT). Include the cost for monitoring at a UL listed central station for a period of one year.
    - b. Sound approved temporal code 3 horn signal over all audio circuits throughout entire building.
    - c. Upon any alarm condition, visual signals shall activate throughout the building. Visual notification shall be synchronized in accordance with applicable code requirements and latest NFPA 72 guidelines.

- d. Flash an alarm LED and sound an audible signal at each FACP and the Fire Command Location. Upon Acknowledgment, the alarm LED shall light steadily and the audible shall silence. Subsequent alarms shall re-initiate this sequence.
- e. Visually indicate alarm initiating device type and location via LCD display at all Fire Command Centers.
- f. Operate prioritized outputs to release magnetically held smoke doors and magnetically locked doors throughout building.
- g. Activate exterior W/P beacon.
- h. Store system events in event history file.
- i. Provide control signal to Lighting Control System to bring all lighting to full brightness.
- 2. Operation of any tamper switch, charging of pre-action system, or activation of other device designated to initiate system Supervisory condition shall cause the following to occur:
  - a. Flash Supervisory LED and sound audible tone at FACP and each network panel. Upon Acknowledgment, LED shall light steadily and audible shall silence. Subsequent Supervisory conditions shall re-initiate this sequence.
  - b. Visually indicate device type and location via LCD display located at FACP and remote annunciators.
  - c. Visually annunciate type of initiating device and its zone, floor or area as required on system annunciators. In addition, Supervisory LED and audible tone will sound. Upon Acknowledgment, LED shall light steadily and audible shall silence. Subsequent Supervisory conditions shall re-initiate this sequence.
  - d. Record event in event history log. Restorations shall likewise be recorded.
- 3. In event of System Trouble condition such as device removed, loss of AC Power or wiring fault, system Trouble condition shall occur as follows:
  - a. Flash Trouble LED and sound audible tone at FACP and each network panel. Upon Acknowledgment, LED shall light steadily and the audible shall silence. Subsequent Trouble conditions shall re-initiate this sequence.
  - b. Initiate reporting of event to designated staff members via email notification as required and described herein.
  - c. Visually indicate device type and location via LCD display located at FACP and network annunciator panel.
  - d. Visually annunciate type of initiating device and its zone, floor or area as required on all system annunciators. In addition, Trouble LED and audible tone shall sound. Upon Acknowledgment, LED shall light steadily and audible shall silence. Subsequent Trouble conditions shall re-initiate this sequence.
  - e. Record event in event history log. Restorations shall likewise be recorded.
- C. General Requirements:
  - 1. Fire alarm system shall be designed and UL and FM approved for Fire, Audio Evacuation and Security applications. System operational characteristics shall be stored in non-volatile EEPROM memory, shall be field programmable and capable of being edited with no factory involvement.

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- 2. System shall support analog sensing techniques to monitor individual devices which enables user to set sensitivity parameters. Inputs shall be subject to multi-level alarm verification. System shall be capable of reporting status and sensitivity of each device and vectoring this information to printer. System shall automatically identify any detector which becomes dirty (maintenance alert), prior to false alarming.
- 3. System shall be supported by standby batteries. In event of loss of primary power, batteries shall support 24 hours of full supervisory operation followed by 5 minutes of alarm.
- 4. System shall be capable of nine levels of alarm prioritization, and allow control by event, and may include cross zoning, stepping, and/or logic statement inputs.
- 5. Equipment shall be new and unused. Components and systems shall be designed for uninterrupted duty. Equipment, materials and accessories covered by these requirements shall be provided by single manufacturer, or if provided by different manufacturers, recognized as compatible by both manufacturers.
- 6. Control equipment shall have transient protection devices to comply with UL 864 requirements.
  - a. Isolated Loop Circuit Protector (ILCP): Provide isolated loop circuit protection device on all fire alarm circuits which extend beyond building by either aerial, underground or other methods (walkways, bridges or other above ground connectors).
  - b. ILCP shall be located as close as practical to point at which circuits leave or enter building. Grounding conductor shall be No. 12 AWG wire having maximum length of 28 feet and connected to unified ground per NEC.
- 7. Circuiting Guidelines. Each initiating device and indicating circuit shall be electronically supervised and individually addressable. Wiring shall match existing conventions as follows:
  - a. Individual Zone Addressable Modules shall be used to supervise and monitor waterflow, tamper, and status conditions from any related systems or devices.
  - b. Zone Addressable Control Modules and/or programmable relays shall provide auxiliary control functions.
  - c. Addressable loop wiring shall support all devices shown and allow for minimum of 25 percent spare capacity, and be wired in Class A, Style 7 fashion, with circuit isolation by floor and every 18 devices.
  - d. Entire system shall allow minimum of 25 percent spare capacity. This shall apply to all aspects of system including CPU, cabinets, power supplies, amplifiers and batteries.
  - e. Conventional Visual Appliance Circuits shall operate devices shown plus 25 percent spare capacity, and be wired in a Class A, Style Z fashion.
- D. Fire Alarm Control Panel:
  - 1. Provide a Fire Alarm Control System. System shall consist of the required Fire Alarm control and remote nodes, each sized to support a minimum of 1000 analog

points, expandable to 2500 points. Panels shall be provided with programmable soft switches and associated LED's for panel silence, alarm silence, system reset and drill. Provide lamp test button. Provide individual LED's for power-on, common alarm, supervisory, fault. Adjacent to the fire control panel, provide passive graphic map depicting architectural layout of building with stairwells, elevators, major corridors and egress points shown.

- 2. Provide each panel with integral power supplies, amplifiers, addressable loop interface cards and standby batteries sized to serve building and/or space as shown. Panel shall have following functions:
  - a. Monitor all initiating devices, report event to fire alarm network, annunciate alarmed device and its' location, capture elevators, conduct smoke control functions, and initiate audio/visual evacuation signaling and control sequences as described herein.
  - b. Conduct municipal and off-site notification from main network panel as described herein.
  - c. Initiating devices shall respond with their condition. Control relays shall be individually addressable by system to respond automatically in event of an alarm of related sensors. Manual override of control sequences and status feedback points shall be individually addressable.
- 3. Operator Controls: The control panel shall include an operator interface module consisting of 180 character backlit LCD display to display system wide alarm, trouble and supervisory conditions. Provide full system control from Fire Command Center, as well as control switches for status message scrolling, event acknowledgment, System Reset, and Alarm Silence. Display shall have LED's to indicate Power On, Fire Alarm, Supervisory, Trouble and Alarm Silenced status.
- 4. Addressable Loop Interface: Provide addressable loop interface card for each floor in each building. Each interface card shall be integral to network panel and support digital communications. Each circuit shall support a total circuit capacity of up to 250 analog/addressable detectors and wiring of twisted unshielded pair with distances of up to 12,500 feet.
- 5. Auxiliary Control / Annunciation: Provide required auxiliary switch and LED modules for discreet LED annunciation, zone disconnect, HVAC override, or related monitoring and control functions integral to each FACP. As a minimum, provide a minimum of 64 Auxiliary Override and Audio Control switches with status LED's and 8 HOA switches with corresponding status inputs and LED indicators for auxiliary functions, or as required. These are intended for use by Fire Department during events, or by authorized personnel during testing periods. Keypad entered commands for these functions shall not be acceptable
- 6. Field Power Supplies: Provide Field power supplies with 24VDC operating and NAC Circuits for Visual signals, 6 amps minimum. Each power supply module shall have 4 dedicated Class A NAC outputs rated at 3 amps each and charging circuit that will support up to 12AH batteries. Provide necessary interface to synchronize all power

supplies together and provide each power supply with independent monitor module for trouble supervision. Field Power Supplies shall be located on Floor/Section which they serve.

- 7. Provide hard copy printout of system program to be maintained on site.
- E. Remote LCD Annunciator.
  - 1. Each annunciator shall contain a supervised; back lit, liquid crystal with a minimum of 8 lines with 21 characters per line. Where required, the annunciator shall include additional zonal annunciation and manual control without additional enclosures. The annunciator shall support full ability to serve as the operating interface to the system and shall include the following features; Matched appearance with other system displays
- F. Intelligent System Devices:
  - 1. Provide intelligent analog addressable devices where shown and required. Analog devices shall utilize dual multi-color red/ green LED indicator which shall flash green to denote normal active communication and light red steadily to denote alarm condition. Devices shall be interchangeable with twist-lock bases that support discreet address-setting rotary decade switches. Each base shall support remote LED output, fault isolation circuitry, auxiliary relay contact, or sounder base with integral Piezo horn were such functions are required. Provide wire guards or other physical protection devices as shown on contract documents.
  - 2. Provide analog/addressable combination photoelectric smoke and carbon monoxide (CO) detectors at the locations shown on the Contract Drawings. The combination smoke and CO detector shall provide two independent signals (smoke & CO) to the control panel for programming system responses. When mounted in a sounder base, the detector shall be capable of initiating a temporal 3-3-3 when smoke is detected or temporal 4-4-4-4 when CO is detected. Detectors that transmit a common signal to the control panel for both smoke and CO alarms shall not be considered as equals. The detector shall be listed under standards UL-268 and UL-2075. Each smoke detector shall be individually programmable to operate at any one of five (5) sensitivity settings. The detector shall also store pre-alarm and alternate pre-alarm sensitivity settings. Pre alarm sensitivity values shall be configurable in 5% increments of the alarm and alternate alarm sensitivity settings respectively. The detector shall be able to differentiate between a long term drift above the pre alarm threshold and fast rise above the threshold. The detector shall monitor the sensitivity of the smoke sensor. If the sensitivity shifts outside the UL limits, a trouble signal shall be sent to the panel. It shall be possible to automatically change the sensitivity of individual intelligent addressable smoke detectors for day and night (alternate) periods. Each detector shall utilize an environmental compensation algorithm that shall automatically adjust for background environmental conditions such as dust, temperature, and pressure. The detector shall provide a maintenance alert signal when 80% (dirty) of the available compensation range has been used. The detector shall

provide a dirty fault signal when 100% or greater compensation has been used. The smoke chamber shall be UL listed for field replacement. The electro-chemical CO sensor shall generate a CO alarm in compliance with UL-2034 requirements. The sensor shall have a nominal six-year life. When the sensor approaches the end of its useful life, it shall transmit a maintenance condition to the control panel, indicating the CO sensor board replacement is required. Only when the sensor is no longer operational shall a trouble condition be sent to the control panel. Sensors that transmit a common trouble indication for both sensor end-of-life and other causes of detector trouble shall not be considered as equal. Performing a "sensitivity" check from the panel shall report the approximate number months of CO sensor life remaining. Placing the CO detector in test mode shall facilitate the use of direct injection of small quantities of CO to check detector functionality. The CO sensor board shall be UL listed as field replaceable. Replacement of the CO sensor shall not require any field calibration.

- 3. Photoelectric Smoke Detector: Provide analog addressable photoelectric smoke detectors with adjustable sensitivity range from 0.2 to 3.7 percent obscuration where shown and required. Detectors shall provide complete analog features including alarm verification, environmental compensation, and multi-stage operation, were required.
- 4. Analog Heat Detectors: Provide Analog Heat Detectors. Analog heat detectors shall be field selectable for fixed temperature rating of 135 or 190 degrees, rate of rise operation of 15 degrees/minute, and will also include a low temperature warning (Supervisory condition) when ambient temperature reaches 40 degrees F. Where otherwise required, provide conventional fixed temperature, weatherproof or explosion proof heat detectors in lieu of analog heat detectors. Conventional device shall be individually addressable via intelligent addressable module which shall be installed in heated, ventilated location.
- 5. Analog Duct Smoke Detector: Provide analog photoelectric duct-mounted smoke detectors mounted in air ducts where shown and required. Duct detectors shall be programmed for alarm event sequencing or required by AHJ. Each detector shall be supplied with duct-mount housing, remote indicator/test station and sampling tubes sized according to duct width. Provide necessary auxiliary relay outputs via addressable relay control modules with each detector in order to ensure required HVAC control, override and status reporting functions.
- 6. Intelligent Manual Pull Stations: Provide intelligent addressable manual stations where shown. Station shall be double action with screw terminals, toggle switch, and integral addressable electronics w status LED. Station shall be constructed of red Lexan with white raised letters and key reset switch. Station shall be keyed alike to FACP. Where ambient conditions preclude use of addressable devices, conventional weatherproof pull stations shall be used. Each conventional device shall be individually addressable via intelligent addressable module which shall be installed in heated, ventilated location.

- a. Provide tamperproof clear Lexan covers with red frame and spacer, and audible trouble alarm, Stopper II or equal where shown.
- 7. Monitor Module: Provide Zone Addressable input Modules to enable monitoring and supervision of related systems and devices via SLC addressable loop.
- 8. Relay Module: Provide Addressable Relay to provide supervised control of auxiliary circuits (AHU's, door holders, etc.) via SLC addressable loop. Relay shall provide supervised output rated for 3 amps @ 30VDC or .5 amps at 120VAC. Where current exceeds limitations, provide isolation relay (PAM-1 or equal) rated for required load.
- 9. Isolation Modules: Where additional circuit isolation is required beyond isolation of the addressable loop interface, provide field-mounted Isolator Modules every 20 devices to protect circuit integrity in event of a wiring fault and ensure Style 6 wiring conventions.
- 10. Drill Switch: Provide a two position keyed Drill switch with addressable monitor module located as shown on contract drawings. Switch shall be fully programmable to initiate a drill of programmed areas with-out transmitting Municipal Signal. Restoration of key switch to "normal" shall return FACP and associated control equipment to normal with no other user interface to system.
- G. Notification Appliances:
  - 1. Provide flush mounted combination Audio/Visual signaling appliances. Stand-alone devices may be used to augment combination units when necessary. Provide surface mount back boxes and alternate outdoor-rated appliances where ambient conditions dictate. Provide wire guards or other physical protection devices as shown on contract documents.
  - 2. Provide synchronized xenon strobes in compliance with NFPA 72, and rated per UL 1971 testing criteria. Strobes shall have effective intensity field selectable by installer in the range of 15CD to 115 CD.
  - 3. Provide audible detector mounting bases suitable for mounting on a 1-gang, 3½ or 4 inch octagon box and 4 inch square box at the locations shown on the Contract Drawings. The bases shall utilize a twist-lock design and provide screw terminals for all field wiring connections. Removal of the respective detector shall not affect communications with other detectors. The audible base shall support all detector types and shall be capable of single or group operation. The audible base shall emit a temporal 3-3-3 fire alarm tone when smoke or heat has been detected. The audible base shall emit a temporal 4-4-4-4 CO alarm tone when CO has been detected. The outputs shall be configurable for low or high output by moving a reversible jumper. The system shall be UL2017 listed for dual signaling for this purpose. The audible bases shall provide a UL-268 reverberant room sound output of 90.8 dBA at 10ft (3m) for temporal 3-3-3 fire alarm and 84.1 dBA at 10 ft.(3m) for temporal 4-4-4-4 CO alarm.

#### H. System Accessories:

- 1. Municipal Connection: Provide one (1) telephone dialer/digital Communicator unit for off-site transmission of supervisory signals. Provide the cost for monitoring at a UL listed central station for a period of one year.
- 2. Sprinkler System Devices: Coordinate following to ensure that required installation and wiring of waterflow and tamper switches is accomplished in manner that will result in complete operable and tested sprinkler system. Each device shall be monitored as separate and distinct point.
  - a. Waterflow shall activate alarm sequence.
  - b. Tamper switches shall activate supervisory condition.
- 3. Terminal Cabinets: Provide fire alarm terminal cabinets where necessary. Cabinets shall have removable hinged cover with key lock and red finish and are intended to house analog/addressable modules and facilitate filed wiring junctions.
- 4. Remote Alarm Indicators: Provide remote LED indicators for sensors located behind locked doors. Provide permanent label on each indicator identifying device type and actual location.
- 5. Exterior Strobe: Provide a flashing weatherproof strobe with minimum 150,000 candlepower output where shown. Strobe shall be properly installed on a weatherproof back box.
- 6. Auxiliary Power Supplies: Provide distributed network power supplies as required. Power supplies shall communicate directly to main Fire Alarm System via SLC communications to support network-based synchronization, and supervision of each panel for ground fault, loss of AC power and Battery Failure. Each notification circuit served shall be individually supervised via on-board circuitry.
- 7. Door Holders: Install flush, surface or floor-mounted 24VDC magnetic door holders where shown and required. Door holders will not be required to operate under standby power, following 30 second delay upon loss of primary AC power.
- 8. Key Repository: Provide Knox Box or approved equal key repository where shown and in accordance with local requirements.

## 2.22 SERVICE ENTRANCE SPD PROTECTION

- A. Summary: Section Includes: Provide surge protective device (SPD) external to main switchboard for the protection of building electrical system.
- B. References:
  - 1. ANSI/IEEE C.62.41 and C62.45.
  - 2. UL 1449 3rd Edition.

- 3. UL 1283.
- 4. NEC NFPA 70.
- 5. NEMA LS1.
- 6. NFPA.
- 7. OSHA.
- 8. IEEE Std. 1100.
- C. Submittals:
  - 1. Shop Drawings: Provide Shop Drawings with wiring diagrams, installation information, testing and maintenance procedures, and operational information for the transient protection system. Shop Drawings shall be submitted to Engineer for approval before starting actual fabrication.
  - 2. Submittal for Approval: Provide the following transient protection submittals:
    - a. Dimensional Drawing of each SPD type, indicating proposed mounting arrangements.
    - b. Written functional description of the transient protection circuit in terms of components, configuration, design approach, and performance capability per latest NEMA LS1.
    - c. The means of connection of the SPD to the electrical distribution system per latest NEMA LS1.
    - d. Manufacturer will provide UL-1449, Third Edition data card showing the Suppressed Voltage Rating (SVR) for the specific catalog number submitted. "Typical" UL 1449, Second Edition data is not acceptable.
    - e. Per the requirements of NEC Article 285.6, the devices shall be marked with the short circuit current rating. This rating shall meet or exceed the available fault current. Test data from an independent testing laboratory shall be provided to demonstrate the short circuit current rating has been tested on a complete device.
    - f. Submit test report data clearly demonstrating the maximum surge current rating has been tested on a COMPLETE SPD unit including all necessary fusing/overcurrent protection, thermal disconnects, integral disconnects and monitoring systems. Manufacturers who cannot provide this data will not be considered.
    - g. Submit data demonstrating the SPD unit, including all overcurrent protection, is fully capable of a minimum repetitive surge current rating of 10,000 ANSI/IEEE C62.41, Category C3 (10kA) impulses without failure or a change in performance characteristics of more than 10%.
    - h. Written detailed response to each paragraph of the specification indicating that the proposed product meets or exceeds this specification. If specific paragraphs are not met, provide written explanations as to why not.

- D. Warranty: Description: Manufacturer shall provide a product warranty for a period of not less than 5 years from data of installation.
- E. Manufacturers:
  - 1. Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufactures are as follows:
    - a. Liebert
    - b. Current Technology
  - 2. Quality: The Manufacturer shall be ISO 9001 certified, demonstrating world-class quality systems for the design and manufacture of the SPD units.
- F. Environmental:
  - 1. General Requirements:
    - a. No audible noise shall be generated.
    - b. No appreciable magnetic fields shall be generated. System shall be capable of use directly in computer rooms in any location without danger to disc units, disk packs, or tapes.
    - c. Operating Conditions:
      - 1) 30 130 Degrees F.
      - 2) 15-85 Percent Humidity Non-Condensing.
    - d. Enclosure: The unit shall have a heavy duty NEMA 12 dust-tight, drip-tight enclosure.
- G. Surge Suppressors:
  - 1. General Requirements:
    - a. Rated for a 208Y/120 volt, 60 Hertz, 3-phase, 4-wire switchboard.
    - b. Surge suppressors shall be in accordance with the following requirements:
      - Unit shall be parallel in design and connect in parallel to main switchboard. Each surge suppression element (MOV) shall be individually fused so that a failure of one element and/or fuse shall not affect other surge suppression elements.
      - 2) Unit shall be UL 1449, 3rd Edition Listed.
      - 3) Unit shall provide maximum UL 1449 2nd Edition Suppressed Voltage Rating (SVR) for 120, 120/208, or 120/240 volt system as follows:
        - a) L-N = 400V.
        - b) L-G = 400V.
        - c) N-G = 400V.
        - d) L-L = 700V.
      - 4) Unit shall provide maximum UL 1449 3rd Edition Suppressed Voltage Rating (SVR) for 240, 277 or 277/480 volt system as follows:
        - a) L-N = 700V.
        - b) L-G = 700V.
        - c) N-G = 700V.

- d) L-L = 1500V.
- 5) Unit shall provide maximum surge current rating of 100,000 amperes based on ANSI/IEEE C62.41 standard 8 by 20 microsecond current waveform.
- 6) Unit shall have a short circuit current rating, which equals or exceeds that of the Main Switchboard.
- 7) Unit shall be UL 1283 listed as an electromagnetic interference filter and provide 50 Ohm noise attenuation of at least 30 dB at 100 kHz, 50 dB at 1 MHz, 50 dB at 10 MHz, and 45 dB at 100 MHz.
- 8) Unit shall include solid-state, long-life externally mounted LED visual status indicators that indicate the on-line status and operational integrity of each phase of the unit.
- 9) Unit shall have a Form C summary alarm output contact rated for at least 1 amp at 120VAC for remote annunciation of SPD status.
- Systems shall be provided with an integral, non-fused disconnect system which causes no interruption to the protected load for testing and maintenance. Disconnect system shall not require removal or replacement for warranty or other repairs.
- 11) Unit shall have an audible alarm with an alarm on/off switch to silence the alarm and a push-to-test switch to test the alarm function.
- 12) An adjustable (resettable) counter shall be provided to totalize transient voltage surges in both the normal and common mode. The readout shall be at least a seven-digit LCD located on the unit front cover and provided with a 10 year battery backup to maintain counts in the event of power loss.
- H. Installation:
  - 1. General Requirements:
    - a. Contractor shall install suppression system immediately next to or on top of service equipment where so approved by the Engineer.
    - b. Conductors between suppressor and point of attachment to service equipment shall be sized in accordance with Manufacturer's Shop Drawings and conductor lengths shall be as short as possible, preferably not to exceed 24". Manufacturers who offer an integrated SPD in the main service entrance equipment will provide information that clearly shows lead lengths, including the neutral and ground connections
    - c. Grounding: Suppressor ground shall be bonded to the equipment grounding conductor and service entrance ground.

## 2.23 BRANCH PANEL SPD PROTECTION

- A. Provide surge protective devices for branch circuit panelboards as shown in Schedule in this Section or on the Contract Drawings.
- B. Provide surge protective devices for all panelboards designated as emergency in compliance with NEC Article 700.

- C. References:
  - 1. ANSI/IEEE C62.41 and C62.45.
  - 2. UL 1449 3rd Edition.
  - 3. UL 1283.
  - 4. NEC NFPA 70.
  - 5. NEMA LS1.
  - 6. NFPA.
  - 7. OSHA.
  - 8. IEEE Std. 1100.
- D. Submittals:
  - 1. Shop Drawings: Provide Shop Drawings with wiring diagrams, installation information, testing and maintenance procedures, and operational information for the transient protection system. Shop Drawings shall be submitted to Engineer for approval before starting actual fabrication.
  - 2. Submittal for Approval: Provide the following transient protection submittals:
    - a. Dimensional Drawings of each SPD type, indicating proposed mounting arrangements.
    - b. Written functional description of the transient protection circuit in terms of components, configuration, design approach, and performance capability per latest NEMA LS1.
    - c. The means of connection of the SPD to the electrical distribution system per latest NEMA LS1.
    - d. Manufacturer will provide UL-1449, Third Edition data card showing the Suppressed Voltage Rating (SVR) for the specific catalog number submitted. "Typical" UL 1449, Second Edition data is not acceptable.
    - e. Per the requirements of NEC Article 285.6, the devices shall be marked with the short circuit current rating. This rating shall meet or exceed the available fault current. Test data from an independent testing laboratory shall be provided to demonstrate the short circuit current rating has been tested on a complete device.
    - f. Submit test report data clearly demonstrating the maximum surge current rating has been tested on a COMPLETE SPD unit, including all necessary fusing/overcurrent protection, thermal disconnects, integral disconnects and monitoring systems. Manufacturers who cannot provide this data will not be considered.
    - g. Submit data demonstrating the complete unit, including all overcurrent protection, is capable of a minimum repetitive surge current rating of 8,000 ANSI/IEEE C62.41, Category C3 (10kA) impulses without failure or performance degradation of more than 10%.
    - h. Written detailed response to each paragraph of the specification indicating that the

proposed product meets or exceeds this specification. If specific paragraphs are not met, provide written explanation as to why not.

- E. Warranty:
  - 1. Description: Manufacturer shall provide a product warranty for a period of not less than 5 years from date of installation.
- F. Manufacturers:
  - 1. Acceptable Manufacturers: Subject to compliance with requirements of the Contract Documents, acceptable manufacturers are as follows:
    - a. Liebert
    - b. Current Technology
  - 2. Quality: The manufacturer shall be ISO 9001 certified, demonstrating world-class quality systems for the design and manufacture of the SPD units.
- G. Environmental:
  - 1. General Requirements:
    - a. No audible noise shall be generated.
    - b. No appreciable magnetic fields shall be generated. System shall be capable of use directly in computer rooms in any location without danger to disc units, disk packs, or tapes.
    - c. Operating Conditions:
      - 1) 30 130 Degrees F.
      - 2) 15 85 Percent Humidity Non-Condensing.
    - d. Enclosure: Unit shall have a NEMA 1 enclosure.
- H. Electrical Requirements:
  - 1. General Requirements:
    - a. Rated for a 208Y/120 volt, 60 Hertz, 3 phase, 4 wire.
    - b. Surge Suppressors shall be in accordance with the following requirements:
      - 1) Unit shall be parallel in design and connect in parallel to panelboard. Each surge suppression element (MOV) shall be individually fused so that a failure of one element and/or fuse shall not affect other surge suppression elements.
      - 2) Unit shall provide maximum UL 1449 Third Edition Suppressed Voltage Rating (SVR), for the 120/208V system:
        - a) L-N = 400V.
        - b) L-G = 400V.
        - c) N-G = 400V.
        - d) L-L = 800V.
      - 3) Unit shall provide maximum surge rating of 65,000 amperes based on ANSI/IEEE C62.41, standard 8 by 20 microsecond current waveform.
      - 4) Unit shall have a short-circuit current rating (amperes interrupting capacity) which equals or exceeds that of the panelboard.

- 5) Unit shall include solid-state, long-life externally mounted LED visual status indicators that indicate the on-line status and operational integrity of each phase of the unit.
- 6) Unit shall be UL 1283 listed as an electromagnetic interference filter and provide 50 Ohm noise attenuation of at least 30dB at 100 kHz, 50 dB at 1 MHz, 50 dB at 10 MHz, and 45 dB at 100 MHz.
- 7) Unit shall have a Form C summary alarm output contact rated for at least 1 amp at 120VAC for remote annunciation of SPD status.
- I. Installation:
  - 1. General Requirements:
    - a. The SPD will be mounted internal/external to the panelboard as close as possible to the panelboard neutral lug and wired to the panelboard through a 30 amp, 3-pole breaker that will serve as a maintenance disconnect. Lead lengths shall be as short as possible, preferably less than 18".
    - b. System shall be installed in accordance with the manufacturer's printed instruction to maintain warranty. All local and national codes shall be observed.

## 2.24 ACCESS PANELS

- A. Provide access panels for access to concealed junction boxes and to other concealed parts of system that require accessibility for operation and maintenance. In general, electrical work shall be laid out so access panels are not required.
- B. Access panels shall be located in a workmanlike manner in closets, storage rooms, and/or other non-public areas, positioned so that junction can be easily reached and size shall be sufficient for purpose (minimum size 12" x 16"). When access panels are required in corridors, lobbies, or other habitable areas, they shall be located as directed.
- C. Access panels shall be prime-painted and equipped with screwdriver operated cam locks.
- D. Acceptable Manufacturers:
  - 1. Inland Steel Products Company Milcor
  - 2. Miami Carey
  - 3. Walsh-Hannon-Gladwin, Inc. Way Locator
  - 4. Specific Types:
    - a. Acoustical Tile Ceiling "Milcor Type AT"
    - b. Plastered Surfaces "Milcor Type K"
    - c. Masonry Construction"Milcor Type M"
    - d. Drywall Construction "Milcor Type DW"
- E. Furnish access panel Shop Drawings.

#### 2.25 LIGHTNING PROTECTION SYSTEM

## A. Scope:

- 1. The work covered by this section of the specifications consists of furnishing all labor, components and items of service required for the completion of a functional and unobtrusive lightning protection system for the entire facility, as approved by the Architect and in strict accordance with this section of the specifications and the applicable Contract Drawings.
- 2. If any departure from the Contract Drawings or Submittal Drawings covered below are deemed necessary by the Contractor, details of such departures and reasons therefore shall be submitted as soon as practicable to the Architect for approval. No such departures shall be made without the prior written approval of the Architect.

#### B. Quality Assurance:

- 1. Listing of components and inspection and certification of installations: Applied Research Laboratories, Inc. shall list the components and shall inspect and certify the multipoint lightning protection systems for compliance with NFPA 780 Standard and UL Master Label requirements.
- 2. The system to be furnished under this specification shall be the standard product of a manufacturer regularly engaged in the production of lightning protection systems and shall be the manufacturer's latest approved design.
- 3. The equipment manufacturer shall be an approved manufacturer. All components specified for this work shall be manufactured by Heary Bros. Lightning Protection Co., Inc.
- C. Submittals:
  - 1. Complete Shop Drawings showing the type, size, and locations for all equipment, grounds, and cable routings, etc., shall be submitted to the Architect for approval prior to start of work.
  - 2. Samples and pertinent catalog data shall be submitted to the Architect for approval upon request.
  - 3. Products: All equipment shall be new, the product of a single manufacturer as outlined above, and of a design and construction to suit the application where it is used in accordance with accepted industry standards.
- D. Equipment:
  - 1. All components shall be copper or bronze and of the size, weight and construction to suit the application where used in accordance with requirements of Class I structures, and in accordance with manufacturer recommendations.

- 2. Conductors shall be copper, 29 strands, 17-gauge minimum, Heary Bros. Cat. No. CCHB-29-17.
- 3. Air terminals shall be solid round copper bar 3/8" x 12" minimum. Air terminals shall project 10" minimum above the object to be protected. Locate and space according to requirements.
- 4. Air terminal bases shall be copper or bronze with bolt pressure cable connectors and shall be securely mounted with stainless steel screws or bolts.
  - a. Bases on built-up tar and gravel roofs shall be secured with a proper adhesive and shall have a minimum surface contact area of 18.5 square inches.
- 5. Ground rods shall be 5/8" x 10'-0" minimum, Heary Bros. Cat. No. CGHB106GR. They shall be connected to the system with a two-bolt copper clamp having a minimum length of 1-1/2" and employing stainless steel cap screws.
- 6. Cable fasteners shall be substantial in construction, electrolytically compatible with the conductor and mounting surface and shall be spaced according to requirements. Heary Bros. Cat. No. CFHB66, 72, 64, etc.
- 7. Bonding devices, cable splicers and miscellaneous connectors shall be of copper or bronze with bolt pressure cable connectors.
- 8. Equipment on stacks and chimneys shall be protected from corrosion and sized in accordance with requirements.
- 9. All miscellaneous bolts, nuts and screws shall be stainless steel.
- E. Installation:
  - 1. The installation shall be accomplished by an experienced installer. The installer shall work under the direct supervision of a manufacturer as listed above or a qualified distributor of such manufacturer's products.
  - 2. All equipment shall be installed in a neat workmanlike manner in the most inconspicuous manner possible.
  - 3. The system shall consist of a complete cable network on the roof involving all air terminals, splices, and bonds with cable downleads routed concealed through the building's exterior to ground.
  - 4. Roof penetrations, flashings/pitch pans where necessary shall be furnished and installed by the Roofing Contractor.
  - 5. Copper equipment shall not be connected to aluminum surfaces except by means of a bimetal transition fitting. Lead coating is not an acceptable bimetal transition.

- F. Coordination:
  - 1. The lightning protection installer will work with other trades to insure a correct, neat and unobtrusive installation.
  - 2. It shall be the responsibility of the lightning protection installer to assure a sound bond to the main water service and to assure interconnection with other building ground systems, including both telephone and electrical.
  - 3. Proper arresters shall be installed on the power and telephone/data service by either the Utility or Electrical Contractor as applicable.
  - 4. Completion: The lightning protection installer shall secure and deliver the As-built Shop Drawings to the Architect for the Owner upon completion of the installation.

#### 2.26 EMERGENCY RESPONDER RADIO COVERAGE SYSTEM

- A. Scope of Work:
  - 1. Retain a qualified and experienced design build vendor to design, furnish, install, connect and test the Emergency Responder Radio Coverage system that is acceptable to the local Emergency Responders (e.g. fire/emergency medical, law enforcement that will respond to the building users), Authorities Having Jurisdiction; and in compliance with 780 CMR Chapter 9 requirements, NFPA 72 requirements, and local Emergency Responders requirements.
  - 2. Provide full fire survivability of the Emergency Responders distribution system cabling and primary equipment in accordance with NFPA 72.
  - The system shall include all necessary hardware, equipment, cabling, antennas, power supplies, mounting methods, sleeves, software, peripheral devices and all accessories required for a complete and operating Emergency Responder Radio Coverage for all buildings and structures in the project scope.
  - 4. Provide a dedicated 120 volt 20 amp branch circuit from the normal/emergency panelboard to the equipment.
  - 5. Provide fire alarm system supervisory monitoring of primary Emergency Responders Radio equipment status for loss of AC power, signal loss, low battery indication and battery charger.
- B. Manufacturer's Representative and Design Build Vendor Qualifications:
  - 1. The Electrical Subcontractor shall provide, at the appropriate time or as directed by Architect, the on-site services of a competent factory trained Engineer of the manufacturer of the Emergency Responder radio coverage equipment to inspect, test, adjust and place in proper operating condition any and all items of the same manufacturer. No additional compensation will be allowed for such services. A

written report shall be issued by the particular manufacturer with his findings for the Architect's record.

- 2. All final connections, testing and adjusting of the system shall be done under the direct supervision of the system supplier. After completion of the installation, a trained technician employed by the system supplier shall demonstrate the system to the satisfaction of the Owner's representative and shall make all additional adjustments to the system operation by the Owner's representative as a result of this demonstration.
- 3. The design build vendor shall be the primary equipment amplifier manufacturer's certified dealer and factory trained service representative, that has the resources to support a project of this scale, qualified and experienced with the local Emergency Responder Radio system requirements and able to offer full Maintenance Service Agreement to maintain such a system.
- C. Performance Requirements for Emergency Responder Radio System:
  - 1. The intent is to provide an Emergency Responder Radio Coverage system in compliance with local Emergency Responders requirements, 780 CMR Chapter 9 requirements and NFPA 72.
  - 2. The following information herein shall be considered as minimal performance requirements to be superseded with the latest standards, regulations, and performance requirements from the Emergency Responders serving the property. Consult with the relevant local Emergency Responders and Authority Having Jurisdiction, to determine all requirements including any specific transmit/receive radio frequencies and protocols, prior to bid.
  - 3. Signal Strength:
    - a. The Emergency Radio Coverage system shall be an integral component of the life safety equipment of a building or structure. The primary function shall be to provide reliable local Emergency Responders communications at the required signal strength within the specified areas.
    - b. The system shall be required to provide coverage at the specified level by the Authority Having Jurisdiction, with a minimum of within 95% of a building's floor area and also 95% of the stairwells. This Section is responsible to provide signal strength in a 100% of the building's floor area and stairwells if unable to determine specific local requirements prior to bid.
    - c. The system must provide a signal strength per the requirements of the Emergency Responders, with a minimum of the following:
      - 1) A minimum signal strength of -95 dBm available in at least 95% if the area of each floor when transmitted from the Emergency Responders.
      - A minimum signal strength of -95 dBm received at the Emergency Responders system from at least 95% of the area of each floor of the building.
  - 4. Permissible Emergency Responder Radio Coverage System:

- a. Systems shall be provided with an FCC Certificated Amplifier(s) as needed, with specific bi-directional frequency band ranges and FCC Class Type to match with Emergency Responders radio equipment.
- b. The distribution system may utilize a radiating cable system or an internal multiple antenna system. Fire survivability of the distribution system cabling shall be in compliance with NFPA 72.
- c. The downlink pass band of the system shall have a center frequency(s) required by the Emergency Responders.
- d. The uplink pass band of the system shall have a center frequency(s) required by the Emergency Responders.
- e. The system as installed must comply with all applicable sections of FCC Rules Part 22, Part 90 and Part 101.
- 5. Backup Power:
  - a. The system shall be capable of operating on an independent battery backup with time duration required by the Authority Having Jurisdiction, with a minimum of at least 24 hours.
  - b. The radio system shall be connected to the emergency generator during loss of normal power.
  - c. The battery system shall automatically charge in the presence of external power input.
- 6. Cabinet:
  - a. The primary equipment including the bi-directional amplifier(s) shall be installed in a NEMA 4 painted steel cabinet. The color shall be "Fire Engine Red" and bear the lettering as follows: "EMERGENCY RESPONDER RADIO COVERAGE SYSTEM" in bright yellow, unless indicated otherwise by the Authority Having Jurisdiction. Submit all nomenclature and designations to the local Fire Department for approval.
  - b. The maintenance vendor and telephone number shall be marked on the cabinet. The cabinet shall have a locking mechanism to keep the unit secure.
- 7. Primary Power:
  - a. Connection to primary power shall be with metallic conduit (hard-wired).
  - b. Each bi-directional amplifier shall be powered by a dedicated 20A-1P circuit.
- 8. System Monitoring:
  - a. Each amplifier unit shall have a monitoring system that monitors amplifier operation and primary power. A failure shall activate an audible device and white strobe light. The audible signal may be silenced but the strobe light shall remain illuminated until the fault has been corrected.
  - b. The strobe light shall be located in a common area. A sign shall be located at the strobe light with the name and telephone number of the equipment maintenance contractor.
  - c. Provide fire alarm system monitor modules to monitor equipment failure as a supervisory condition on the fire alarm system.

- 9. Antenna Distribution Network:
  - a. Provide a complete list of transit and receive frequencies along with an Intermodulation (IM) Study and other design documentation for the permit application.
  - b. The IM Study content shall be in accordance with the requirements by the Authority Having Jurisdiction with the minimum of the following calculations: IM=Q\*F, IM=F1+F2=F3, IM=F1+F2-F3, IM=Q1\*F1+Q2\*F2, and IM=Q1\*F1-Q2\*F2 for all frequencies uplink and downlink. These calculations shall be done to the 5<sup>th</sup> order or higher if required.
- D. Wiring and Raceways:
  - 1. Wiring: All system wiring and raceways shall meet the requirements of the Code and as recommended by the Emergency Responder Radio Coverage system manufacturer.
- 2.27 TEMPORARY GENERATOR DOCKING STATION
  - A. Scope: Contractor shall furnish, deliver, install and test the temporary generator docking station as specified herein and in accordance with the Contract Drawings.
  - B. Quality Assurance:
    - 1. Temporary generator docking station shall be UL listed and labeled under the UL 1008 standard.
    - 2. Temporary generator docking station shall provide a complete factory assembled, wired and tested manual transfer switch.
    - 3. Temporary generator docking station shall be factory Hi-pot tested for a period of not less than 60 seconds.
    - 4. Temporary generator docking station installation shall meet all applicable NEC standards.
  - C. Submittals:
    - 1. Contractor shall submit manufacturer's drawings and data of manual transfer switches for Engineer's approval prior to start of fabrication. Drawings and data shall include, as a minimum, dimensioned general arrangement drawings and wiring diagrams, UL listing information including UL control or file number, component data, mounting provisions, conduit entry locations and installation instructions.
    - 2. Upon installation of manual transfer switches Contractor shall submit manufacturer's Operating & Maintenance Manual which shall include as a minimum:
      - a. Certified as-built General Arrangement drawings and Wiring Diagram.
      - b. Materials / Component List including part numbers.
      - c. Maintenance and service requirements.
      - d. Certificate of Compliance and hi-pot test data.

- D. Warranty: Manual transfer switches shall be covered by manufacturer's warranty for a minimum period of (1) one year after shipment from manufacturer.
- E. General:
  - 1. All equipment shall be new.
  - 2. Temporary generator docking station manufacturer must have produced and sold generator docking stations and manual transfer switches as a standard product for a minimum of (3) years.
  - 3. Temporary generator docking station shall be molded case circuit breaker type; knife switch or fused switches are not acceptable.
  - 4. Contractor shall be responsible for the equipment until it has been installed and is finally inspected, tested and accepted in accordance with the requirements of this Specification.
  - 5. Temporary generator docking station shall be StormSwitch as manufactured by ESL Power Systems, Inc. or equal as approved by the Engineer.
- F. Temporary Generator Docking Station:
  - 1. Temporary generator docking station shall consist of (2) two mechanicallyinterlocked molded case circuit breakers, cam-style male connectors, power distribution block and grounding terminals, all housed within a padlockable enclosure.
  - 2. Temporary generator docking station enclosure shall be Type 3R, constructed of continuous seam-welded, powder coated 304 stainless steel. The main access shall be through an interlocked, hinged door that extends the full height of the enclosure. Access for portable generator cables with female cam-style plugs shall be via cable entry openings in the bottom of enclosure. A hinged flap door shall be provided to cover the cable openings when cables are not connected; the hinged flap door shall allow cable entry only after the main access door has been opened. Enclosure shall be powder coated after fabrication; color shall be light gray RAL 7038.
  - 3. Cam-style male connectors (inlets) shall be UL Listed single-pole separable type and rated 600 amps at 600VAC. Cam-style male connectors shall be color coded. Cam-style male connectors shall be provided for each phase and for ground, and shall also be provided for neutral if required. Each of the phase cam-style male connectors within the enclosure shall be factory-wired to a molded case switch. The ground cam-style male connectors shall be bonded to the enclosure, and a ground lug shall be provided for connection of the facility ground conductor. The neutral cam-style male connectors, if required, shall be factory wired to a power distribution block. None of the cam-style male connectors shall be accessible unless both molded case circuit switches are in the "OFF" position and the main access door is open.

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- 4. A power distribution block shall be provided for load-side field wiring. The power distribution block shall be factory wired to the molded case switches.
- 5. Molded case switches shall be UL Listed and the short circuit interrupt rating shall be a minimum of 65 kAIC at 240 VAC. Rating of the molded case switches shall be as shown on the Contract Drawings. One molded case switch shall be fed from utility power; the other molded case switch shall be fed from the cam-style male connectors to supply power from a portable generator. Both molded case switches shall include UL Listed door-mounted operating mechanisms, preventing the opening of the main access door unless both breakers are in the "OFF" position. Both molded case switches shall be mounted behind a deadfront panel. The load-side of the molded case switches shall not be energizable unless the main access door is closed and one of the molded case circuit switches is in the "ON" position. The (2) molded case switches shall be safety interlocked by mechanical means to ensure that only one breaker can be closed at any given time.
- 6. Temporary generator docking station shall be suitable for use as service equipment in the USA.
- G. Installation:
  - 1. Prior to installation of temporary generator docking station, Contractor shall examine the areas and conditions under which the temporary generator docking station is to be installed and notify the Engineer in writing if unsatisfactory conditions exist.
  - 2. Temporary generator docking station shall be installed as shown on the Contract Drawings and per the manufacturer's written instructions. In addition, the installation shall meet the requirements of local codes, the National Electrical Code and National Electrical Contractors Association's "Standard of Installation".
  - 3. Conduit entry into the temporary generator docking station shall be by Contractor; Contractor shall furnish and install listed watertight conduit hubs, as manufactured by MYERS or T&B, for each conduit entry on the manual transfer switch. The incoming hub size shall match the conduit size for feeders and ground as shown on the Contract Drawings. The outgoing hub size shall match the conduit size for loads and ground as shown on the Contract Drawings. Hubs shall be properly installed and tightened to maintain Type 3R integrity of the enclosure.
  - 4. Contractor shall terminate feeder conductors, load conductors and ground per the manufacturer's instructions. Use copper wire only for all conductors and grounds. All field wiring terminations shall be torqued as required per the instructions on the manual transfer switch's power distribution block, circuit breaker & ground lug.
- H. Field Testing:
  - 1. Prior to energizing temporary generator docking station, the Contractor shall perform the following checks and tests as a minimum:

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- a. Verify mounting and connections are complete and secure.
- b. Verify internal components and wiring are secure.
- c. Perform continuity check of all circuits.
- d. Perform 1,000 VDC megger test on feeder, load and ground cables.
- e. Verify deadfront is secure.
- f. With the temporary generator docking station deadfront in place and the main access door closed and properly latched, actuate both Operator Mechanisms; verify only (1) breaker at a time can be turned to the "ON" position.
- g. Confirm operation of the manual transfer switch ground receptacle by attaching a plug to the manual transfer switch ground receptacle and then verify that the plug is grounded to the facility ground.
- h. Once utility power has been applied, confirm operation of temporary generator docking station by following directions on main access door.

## 2.28 THREE-PHASE UNINTERRUPTIBLE POWER SYSTEM (UPS)

- A. General:
  - 1. Summary: This specification defines the electrical and mechanical characteristics and requirements for a continuous-duty three-phase, solid-state, uninterruptible power system (UPS). The UPS shall provide high-quality AC power for sensitive electronic equipment loads. The system shall be manufactured by Liebert (Emerson Network Power) or approved equal.
  - 2. Standards:
    - a. The UPS shall be designed in accordance with the applicable sections of the current revision of the following documents. Where a conflict arises between these documents and statements made herein, the statements in this specification shall govern.
      - 1) CSA 22.2, No. 107.1
      - 2) FCC Part 15, Class A
      - 3) IEC 61000-4-5
      - 4) ISO 9001
      - 5) National Electrical Code (NFPA-70)
      - 6) NEMA PE-1
      - 7) UL Standard 1778 4<sup>th</sup> Edition
      - 8) ISTA\_1H
  - 3. Provide one (1) single module 30 kVA/30 kW EXM UPS System as manufactured by Liebert with the following features:
    - a. System Input Voltage of 208/120V, 3 phase, 4 wire plus ground.
    - b. System Output Voltage of 208/120V, 3 phase, 4 wire plus ground.
    - c. Dual Input Single Source Configuration.
    - d. IntelliSlot Unity Dual Protocol Card offers a web interface to monitor. It allows you to select and configure two (2) of the available third party protocols SNMP, Modbus or BACnet.

- e. IS-RELAY Relay Contact Card: Dry contact outputs shall be provided for Summary Alarm, Bypass Active, Low Battery and AC Input Failure.
- f. Seismic anchor kits.
- g. Unity Power Factor Rating.
- h. Energy Optimization Mode (Eco-Mode).
- i. 65 kAIC Rating: Provides interrupting rating and labeling of 65kA.
- j. Active Power Factor Corrected IGBT Input Converter.
- k. PWM transistorized (IGBT) inverter.
- 1. Continuous Duty Static Bypass Switch.
- m. Automatic Retransfer: Provides return to inverter power after an overload.
- n. Backlit LCD Display: Monitors power conversion, UPS operation and utility conditions. Deviations are logged for troubleshooting.
- o. Temperature-Compensated Charging/Battery Load Test.
- p. Top-and-bottom-entry cable access.
- q. Front only service access.
- r. Local Emergency Power Off (EPO).
- s. Casters and leveling feet.
- t. UL and cUL Listed to UL Standard 1778 4<sup>th</sup> Edition.
- u. Certified Test Report.
- v. 13 minute internal battery for 30 kW load.
- w. Remote Dry contact monitor panel for remote indication of alarms.
- 4. Provide maintenance by-pass cabinet with the following features:
  - a. 3 Switching Devices (BIB, MBB, MIB).
  - b. 110 Amp Breaker Trip Rating.
  - c. Key Interlock (SKRU).
  - d. Cabinet Mounted Right Attached to Module with connecting cables factory supplied.
  - e. Front Access service design.
- 5. Warranty:
  - a. UPS Module: The UPS manufacturer shall warrant the UPS module against defects in materials and workmanship for 12 months after final acceptance.
  - b. Battery: The battery manufacturer's standard warranty shall be passed through to the end user.
- 6. System Start-up Services:
  - a. Start-up includes one (1) site trip by a manufacturer customer engineer after the UPS has been installed. The site trip includes the following services for one (1) UPS module: Non-powered inspection, UPS electrical and operational checkout, full parts and labor for any remedial work required on the UPS or battery cabinets, and customer operation training. Start-up also includes remedial on-site labor, parts, and travel for the full one-year warranty period.
  - b. Start-up shall include: Site Acceptance Test with Load Bank Retail. All equipment required to provide load bank test shall be provided by UPS manufacturer.

## B. Product:

- 1. Fabrication:
  - a. Materials:
    - 1) All materials of the UPS shall be new, of current manufacture, high grade and free from all defects and shall not have been in prior service except as required during factory testing.
    - 2) The maximum working voltage, current and di/dt of all solid-state power components and electronic devices shall not exceed 75% of the ratings established by their manufacturer. The operating temperature of solid-state component sub-assembly shall not be greater than 75% of their ratings. Electrolytic capacitors shall be computer grade and be operated at no more than 95% of their voltage rating at the maximum rectifier charging voltage.
  - b. Wiring:
    - Wiring practices, materials and coding shall be in accordance with the requirements of the National Electrical Code (NFPA 70). All bolted connections of busbars, lugs and cables shall be in accordance with requirements of the National Electrical Code and other applicable standards. All electrical power connections are to be torqued to the required value and marked with a visual indicator.
    - 2) Provision shall be made for power cables to enter or leave from the top or bottom of the UPS cabinet.
  - c. Construction and Mounting:
    - 1) The UPS unit, comprised of an input circuit breaker, rectifier/charger, inverter, static transfer switch and maintenance bypass switch, shall be housed in a single free-standing NEMA type 1 enclosure. Cabinet doors/covers shall require a tool for gaining access. Casters and stops shall be provided for ease of installation. Front access only shall be required for expedient servicing and adjustments. The UPS cabinet shall be structurally adequate and have provisions for hoisting, jacking and forklift handling.
    - The UPS cabinet shall be cleaned, primed and painted with the manufacturer's standard color. The UPS shall be constructed of replaceable subassemblies. Printed circuit assemblies shall be plug connections. Like assemblies and like components shall be interchangeable.
  - d. Cooling:
    - 1) Cooling of the UPS shall be by forced air using a redundant fan configuration. Fan power shall be provided by the UPS.
    - 2) The thermal design, along with all thermal and ambient sensors, shall be coordinated with the protective devices before excessive component or internal cabinet temperatures are exceeded.
  - e. Grounding: The UPS chassis shall have an equipment ground terminal. Provisions for local bonding shall be provided.

#### 2.29 UNDERGROUND ENCLOSURES

- A. Underground enclosures and covers are for use in residential sidewalks and/or driveways subject to occasional non-deliberate heavy traffic. The enclosures shall be suitable for direct buried applications in soil, concrete embedment, or asphalt embedment.
- B. The enclosures shall be concrete/cement gray in color, unless otherwise specified.
- C. Box Dimensions and Description:
  - 1. The box shall be -- inches in width, -- inches in length, and approximately -- inches in height.
  - 2. The box shall have an open bottom.
- D. Cover:
  - 1. The cover shall have a logo that reads "ELECTRIC" or "COMMUNICATIONS" as applicable.
  - 2. The cover shall have two lifting eyes/pull slots with the following dimensions -1/2" x 4" with a 1/4" center pin.
  - 3. The cover's surface shall be skid resistant and have a minimum coefficient of friction of 0.50, as specified in current ANSI/SCTE 77.
  - 4. The cover shall have two locking bolt slots, and two 3/8" 16 UNC hex head bolts to secure the cover into the box.
- E. Knockouts shall be notched to allow for a smooth edge upon removal.
- F. The enclosures (Box and Cover) shall comply with all of the environmental tests as per current ANSI/SCTE 77.
- G. Structural Requirements:
  - 1. The enclosures (Box and Cover) shall be current ANSI/SCTE 77 Tier 22 and shall be UL Listed to 66WF and tested to the full ANSI standard.
  - 2. The enclosures (Box and Cover) shall comply with all structural load tests as per current ANSI/SCTE 77 and shall be UL Listed to full ANSI standard 66WF.
- H. Approved Manufacturers:
  - 1. Quazite
  - 2. CDR
  - 3. Hubbell Enclosures

- 4. Strongwell
- 5. PenCell Plastics, Inc.
- I. Provide box collar around each underground enclosure. Box collars shall be tested to withstand a Tier 22 test load. Each collar shall meet or exceed the following requirements:
  - 1. ANSI/SCTE77 Section 6.0
  - 2. ASTM D2444
  - 3. ASTM 1028-06 Section 8.
- 2.30 EQUIPMENT RACKS
  - A. Provide equipment racks to house all security equipment, communication equipment, telephone/data equipment, and audio visual equipment. Racks shall be located in the Communication Room #114 and as shown on the Contract Drawings.
  - B. Manufacturer: Provide products meeting the requirements of the Contract Drawings and Specifications from one of the following manufacturers:
    - 1. Chatsworth, Great Lakes.
    - 2. Winsted
    - 3. Lowell
  - C. Free Standing Equipment Racks
    - Free standing equipment racks shall be seven feet (2134mm) high, EIA nineteen inch (518mm) wide, fifteen inch (381mm) deep, open bay as indicated on the Contract Drawings. These racks are also known as Primary Distribution racks, Remote Distribution racks, tel/data racks, CCTV racks, AV racks, etc. Rack features shall include the following:
      - a. Universal hole pattern on the front and rear flanges, and mounting holes on both sides of rack assembly for management brackets.
      - b. Racks shall be extruded (not sheet metal) with 10 32 threaded equipment mounting holes. Mounting holes that require supplemental threaded clips are specifically prohibited.
      - c. Shelves for electronic equipment with load carrying capacity to support at least 100 percent of each piece of electronic equipment weight. Shelves shall have adequate openings within them to dissipate heat and allow for adequate electronic equipment ventilation.
      - d. Mounting brackets specifically designed to support the equipment installed within the rack.
      - e. Hook and loop (Velcro) cable strain relief system on rear of rack to support

horizontal and backbone cables. Tie-wraps are specifically prohibited.

- f. Hook and loop (Velcro) horizontal and vertical cable management on front of rack for dressing patch cable and cross connect wiring. Tie-wraps are specifically prohibited.
- g. Hook and loop (Velcro) cable management system independent of telecommunications cabling management to properly dress the electronic equipment power cords through the rack maintaining as much clearances between the two as possible. Tie-wraps are specifically prohibited.
- h. Bonding and grounding cables for all equipment not directly bolted to equipment rack (i.e shelf mounted electronic equipment, etc.).
- i. Bonding and grounding bus bar with individual set screw terminals for at least a minimum of six #6 Cu. bonding cables.
- j. Surge protected power strip as described in this specification.
- k. Patch panels as described in this specification.
- 1. All hardware, supplementary steel, channel and supports as required to properly assemble the rack and support it to the building structure.
- m. Provide for all security components as specified herein as located in closets.
- D. All equipment racks and cabinets and their hardware shall be properly assembled and match in appearance and shall be provided by the same manufacturer.
- E. Equipment cabinets with cables entering from above shall have enclosed square raceway to above ceiling. Raceway shall be code gauge steel, sized per code, attached and terminated at equipment cabinet and building structure with approved bushed terminations. Raceway shall be painted to match equipment cabinets.

## 2.31 SURGE PROTECTED POWER STRIP

- A. Manufacturer: Provide products meeting the requirements of the Contract Drawings and Specifications from one of the following Manufacturers:
  - 1. Wiremold Sentrex, TrippLite or S.L. Weber.
- B. Surge protected power strip shall be rack mount type with 10' cord.
- C. Surge protected power strip with six NEMA 5-15R outlets 15 amp capacity, 120 volts, UL 1449 listed, maximum surge current of 33,000 amps, clamping voltage of 260 volts, maximum 5 pico-second response time, resettable overload circuit breaker, surge suppression warning light, surge protection for line to neutral, line to ground, neutral to ground, EMI/RFI filters. One required for each load up to 1200 watts (total of individual equipment loads).

## 2.32 CABLE SUPPORTS

- A. Manufacturer: Provide products meeting the requirements of the Contract Drawings and Specifications from one of the following manufacturers:
  - 1. J-Hooks: Caddy, Chatsworth, Mono-System

- 2. Hook and Loop Fasteners: Chatsworth, Ortronics, Siemons
- 3. Cable Ties: DEK, Panduit, Amp, 3M, T&B
- 4. Beam Clamps: Burndy, Minerallac, Kindorff, Steel City, OZ/Gedney
- 5. Split Mesh Strain Reliefs (Kellums): Hubbell, Woodhead
- B. J-Hooks shall be sized to correctly support the number of cables, which pass through them. Under no circumstances shall cable quantity exceed 50 in any given support. Fill capacity shall be as required by code for conduit. That is to say that every J-Hook shall have a maximum of 40 percent fill capacity. Install additional supports as required.
- C. Hook and loop fasteners shall be designed for their specific application. For example, if a hook and loop fastener is used to support cables to a rack, it shall have a grommet outlet for use with a 10-32 rack mounting screw.
- D. Cable-ties shall be correctly sized to support the quantity and types of cables installed.
- E. Beam clamps shall be steel with threaded bolt type closure. Spring steel or "quick¬ clip" type clamps are prohibited.
- F. Split mesh strain reliefs shall be properly sized for each cable that they support. Only one cable shall be installed in each split mesh strain relief.

#### 2.33 BONDING AND GROUNDING JUMPER CABLE

- A. Manufacturer: Provide products meeting the requirements of the Contract Drawings and Specifications from one of the following manufacturers:
  - 1. Belden (No. 8669) or equal.
- B. Jumper cable shall be hollow braided, 60 amp capacity, copper.
- C. Provide equal conduct of as described in "B" above for aluminum equipment.
- D. Jumpers shall have compression or exothermic type terminals on both ends of cables. Terminals shall be compatible with jumper cable material and equipment material in order to not have any degenerative reaction.

#### 2.34 UNSHIELDED TWISTED PAIR (UTP) CABLING SYSTEMS

- A. Provide all security data cabling as specified herein and shown on the security drawings.
- B. Manufacturer: Provide products meeting the requirements of the Contract Drawings and Specifications from one of the following manufacturer's:
  - 1. Wire and Cable: AT&T, Belden, Berk-Tek, CommScope, General Cable, Mohawk, Prestolite.

- 2. Modular Jacks: Shall be provided by the Work Area Outlet Manufacturer.
- 3. Patch Panels: AT&T, Amp, Hubbell, Krone, MOD-TAP, Ortronics, Panduit, Siemon.
- 4. Patch Cables: Shall be provided by patch panel, Work Area Outlet or wire and cable manufacturer.
- 5. Cable Management: Shall be provided by patch panel manufacturer.
  - a. Note: Each of the products listed above shall be provided by a single manufacturer.
- C. UTP Pin/pair Termination Assignment:
  - 1. The UTP cabling systems shall have EIA/TIA 568B Series standard pin/pair termination assignment. All conductors provided shall be properly and consistently terminated at both ends throughout the entire systems.
- D. Horizontal Cable:
  - 1. Provide & terminate cabling from each camera location to applicable Low Voltage rack location in Communication Room #114.
  - 2. Camera Cable shall be TIA/EIA-568-B.2-1 Category 6 Unshielded Twisted Pair (UTP) as specified.
    - a. Cable shall meet or exceed the approved TIA/EIA-568-B.2-1 Category 6 Unshielded Twisted Pair (UTP) cable standard for 24AWG four pair Category 6 cable.
    - b. Acceptable equal cables shall be General Cable Command LINX 6; and GenSPEED 6000 Category 6 cables.
    - c. Plenum rated cable CMP rated jacket for Plenum applications.
- E. Cable Management:
  - 1. Each equipment rack and equipment cabinet shall have cable management panels with horizontal and vertical brackets.
    - a. Cable management shall be EIA nineteen inch (518mm) rack mounted 3.5 inch (88mm) high panel with horizontal and vertical patch cable, distribution rings, or approved equivalent and shall be provided above and below each patch panel in the equipment rack.
    - b. Equipment rack cable management shall be furnished by patch panel manufacturer.
    - c. Cable management for high density, IDC Type cross-connect block panels shall be distribution rings integral to the panel or approved equivalent. Cable management shall be provided above and below each cross connect block in the equipment rack.

- F. Modular Jacks:
  - 1. Jacks shall be TIA/EIA Category 6 (UL Category 6) with printed circuit board technology and integral board mounted, color-coded, high density, IDC type terminations. Provide 8 position modular jacks. Keyed jacks are not allowed. Jacks shall be able to withstand at least a minimum of 2000 mating cycles without any transmission degradation.
  - 2. Modular jacks color shall be selected by Architect. Modular faceplates shall match standard wiring device color/material unless otherwise directed.
  - 3. Each Work Area Outlet and modular jack shall have jack-opening dust cover. Modular jacks that do not have integral dust covers shall have dust covers installed on each unused modular jack.
  - 4. Each 8-position modular jack shall have color-coded icons.
  - 5. Modular jacks that allow pre-connectorized cables to be connected to the jacks are specifically prohibited. Cables shall have single point IDC Type connection to the jacks only.
  - 6. Modular jacks for Work Area Outlets shall be integral to a jack module either having one or two jacks per module. Single jacks shall be located in the center of the module while double jacks shall be side-by-side horizontally. Jack modules with a single jack and a blank in the opening where a second jack would normally be located are specifically prohibited.
  - 7. Jack modules shall be flame retardant thermoplastic with integral cable strain relief. Color shall be selected by Architect.
- G. Patch Panels:
  - 1. Patch panels shall be EIA nineteen inch (518mm), rack mounted, TIA/EIA Category 6, UL Category 6 type patch panels with integral printed circuit board, color-coded, high density, IDC type terminations and 8 position modular jacks. Keyed jacks are not allowed. Jacks shall be able to withstand at least a minimum of 2000 mating cycles without any transmission degradation.
  - 2. Provide high density rack mounted patch panels.
  - 3. Modular Jacks that allow pre-connectorized cables to be connected to the jacks are specifically prohibited. Cables shall have single point IDC type connection to the jacks only.
  - 4. Each port shall have color-coded identification label. Continuous label strips for multiple in-line ports are acceptable. Silk screened identifiers "l" through "96" are acceptable.

- 5. Patch panel shall have horizontal strain relief bar on mounted rear.
- H. Patch Cables and Line Cords:
  - 1. Patch cables and line cords shall be factory pre-connectorized, TIA/EIA Category 6 (UL Category 6), 4 UTP, 8-position modular jack, stranded conductors. Patch cables and line cords shall be able to withstand at least a minimum of 2000 jack mating cycles without any transmission degradation.
- I. Cross Connect Cabling:
  - 1. Cross-connect cabling shall be NRTL certified that it meets or exceeds the TIA/EIA UL category rating of the system installed.
- 2.35 BROADBAND RF CABLING SYSTEMS
  - A. General: Provide broadband RF system as shown on the Contract Drawings and specified herein.
  - B. Manufacturer: Provide products meeting the requirements of the Contract Drawings and Specifications from one of the following:
    - 1. Wire and Cable: CommScope, Belden, Lucent Technologies, Ber-Tek, General Cable.
    - 2. Connector Modules: Shall be provided by manufacturer of UTP Work Area Outlets.
    - 3. Broadband Connector: Amp, Amphenol, Cambridge, Regal, Gilbert.
    - 4. Line Cords: CommScope, Lucent Technologies, AT&T, Berk-Tek, General Cable, Champlain.
    - 5. Splitting Devices: General Instruments/Jerrold, Regal.
  - C. All required components shall be provided for the reception and distribution of signal for all rooms equipped with outlets.
  - D. The system including all of its components shall be broadcast quality and shall provide for reception of monochrome (black and white) and color TV transmission and FM (at every outlet) equal to or superior to that obtainable on a single standard receiver connected directly to the system antennas (CATV).
  - E. The system design minimum shall be a 43 dB carrier-to-noise ratio and minus 46 dB (0.5%) cross-modulation level at output of the last amplifier in the distribution system.
  - F. The system shall be designed so subsequent expansion to additional VHF of UHF channels shall require modifications of head-end equipment only.

- G. All active equipment shall be designed and rated for 110V to 125V, 60 Hz, AC operation and shall be NRTL listed.
- H. The system shall provide for distribution of up to 100 + television channels from a feed provided by a CATV company or satellite dish.
- I. The system shall meet or exceed the technical standards set forth in the FCC Rules, Part 76.
- J. The system shall also be capable of providing two-way communication (Bi¬-directional video distribution) over a single cable.
- K. Bandwidth of all passive devices shall be from 5 MHZ to 1.2 GHz. Bandwidth of amplifiers shall be from 54 MHZ to 1 GHz in the forward direction and from 5 MHZ to 30 MHZ in the reverse path.
- L. The system shall be designed for minus 57 dB cross-modulation or greater and carrier-tonoise ratio of at least 46 dB.
- M. The broadband RF cable shall be coaxial copper-clad center conductor, foam polyethylene dielectric, quad-shield aluminum-Mylar-aluminum foil type, aluminum braid shield and non-contaminating polyvinyl chloride jacket. Cable shall have 75 ohm impedance with 80 dB shielding. No discontinuity shall exist within 54-216 MHZ and 470-890 MHZ bands. Cable shall be used as follows:
  - 1. Drop Cable, shall be equivalent to CommScope RG-6/U, utilize quad-shielding.
    - a. Plenum-Rated Cable: #2227K\V CMP rated jacket for Plenum applications.
    - b. Drop Cable shall meet or exceed the following nominal attenuation specifications:
      - 1) 1mhz: .21db/100'
      - 2) 10mhz: .65 db/100'
      - 3) 50mhz: 1.46 db/100'
      - 4) 100mhz: 2.04 db/100'
      - 5) 200mhz: 2.98 db/100'
      - 6) 400mhz: 4.46 db/100'
      - 7) 700mhz: 5.89 db/100'
      - 8) 900mhz: 7.47 db/100'
      - 9) 1000mhz: 8.02 db/100'
  - 2. Broadband CATV Cable Provide cable equivalent to CommScope RG-11/U Coax Cable.
    - a. Provide cable from Entrance Protection/Demarcation location to Communication Room #114 for interface to Broadband Video Distribution System.
    - b. Provide cable from Communication Room #114 to Broadband Video Distribution System Headend location.
  - 3. High Speed HDMI Cable with Ethernet Provide cable equal to Legrand C2G select high speed HDMI cable with Ethernet, 4k, 60 Hz in wall CL2 rated.

# CARVER POLICE DEPARTMENTCARVER, MAELECTRICAL

- a. Provide HDMI with Ethernet cabling where indicated on plans. Coordinate conduit requirements with connector size of actual cables utilized on project.
- N. Signal Level, calculated and tested signal level shall fall between +2dBmv and +11dBmv. Submit signal level test results to specifying authority for approval. Channel to Channel differential shall not exceed 2dB nor shall it exceed 10dB from 50 MHZ to 550 MHZ.
- O. Television Outlets, provide television outlets as indicated on plans and as per Work Area Outlets section.
- P. Broadband Connector Modules:
  - 1. Broad band connectors for work area outlets shall be integral to a connector module either having one or two connectors per module. Single connectors shall be located in the center of the module while double jacks shall be located side by side horizontally.
  - 2. Connector modules shall be high impact, flame-retardant thermoplastic with "F" type connectors. Modules shall be interchangeable with UTP cabling jack modules.
    - a. Refer to Work Area Outlets, section for connector modules.
- Q. Broad Band Connectors:
  - 1. Refer to Work Area Outlets, section for termination/connector type.
  - 2. Connector type shall be compatible with cable type.
  - 3. Connector Types:
    - a. "F" connector 75 ohm with hexagonal 3/4 inch compression termination.
- R. Line Cords:
  - 1. Each work area outlet shall be provided with a line cord, field measured for proper length, which meets the following:
    - a. Line cords shall be Type 6U, quad shielded, stranded, (extra flexible), copper-clad core cable with an "F" type connector with solid center conductor terminated on each end.

## PART 3 EXECUTION

- 3.1 BASIC REQUIREMENTS
  - A. Adhere to best industry practice and the following:
    - 1. All work shall be concealed.
- 2. Route circuitry runs embedded in concrete to coordinate with structural requirements.
- 3. Equip each raceway intended for the future installation of wire or cable with a nylon pulling cord 3/16" in diameter and clearly identify both ends of the raceway.
- 4. Provide all outlet boxes, junction boxes, and pull boxes for proper wire pulling and device installation. Include those omitted from the Contract Drawings due to symbolic methods of notation.
- 5. Utilize lugs of the limited type to make connections at both ends of cables installed on the line side of main service overcurrent and switching devices. Provide cable limiters for each end of each service entrance cable.
- 6. Beyond the termination of raceways, fireproof the following:
  - a. All wires and cables within pad-mounted transformer enclosure.
  - b. All service feeder cables ahead of main service overcurrent protection devices, and elsewhere where not in raceways.
  - c. Fireproofing of wires and cables shall be by means of a half-lapped layer of arc proof or by means of sleeving of a type specifically manufactured for the purpose. Ends of tape or sleeving shall be severed with twine. Fireproofing shall be extended up into raceways. After conductors have been finally shaped into their permanent configuration, fireproofing tape or sleeving shall be coated with silicate of soda (water glass). Fireproofing shall be applied in an overall manner to raceway groupings of conductors.
- 7. Provide all sleeves through fireproof and waterproof slabs, walls, etc., required for electric work.
  - a. Provide waterproof sealing for the sleeves through waterproof slabs, walls, etc.
  - b. Provide fireproof sealing for the sleeves through fireproof walls, slabs, etc.
  - c. Provide fireproof sealing for the openings in fireproof walls, slabs, etc., resulting from removal of existing electrical sleeves, conduits, poke-thru's etc.
- 8. No splicing of wires will be permitted in Fire Alarm System.
- 9. Bundle wiring passing through pull boxes and panelboards in a neat and orderly manner.
- 10. Turn branch circuits and auxiliary system wiring out of wiring gutters at 90 degrees to circuit breakers and terminal lugs.
- 11. In electric rooms with equipment rated 800 amps or more and over 6 feet wide that contains overcurrent devices, the Electrical Contractor shall provide a powered Exit sign at 18" AFF at each door.
- 12. All building mounted photovoltaic equipment shall be installed, tested and maintained in accordance with NFPA 1 Section 11.12.
- 13. All panelboards shall be labeled in accordance with NFPA 70 Article 408.

# 3.2 TESTING REQUIREMENTS & INSTRUCTIONS

- A. The Electrical Subcontractor shall provide supervision, labor, materials, tools, test instruments and all other equipment or services and expenses required to test, adjust, set, calibrate, and operationally check work and components of the electrical systems and circuitry throughout Division 26 work.
- B. The Electrical Subcontractor shall pay for all tests specified in Division 26, including expenses incident to retests occasioned by defects and failures of equipment to meet Specifications, at no additional cost to the Owner. Any defects or deficiencies discovered in any of the Electrical work shall be corrected.
  - 1. The Electrical Subcontractor shall:
    - a. Replace wiring and equipment found defective (defined as failing to meet specified requirements) at no additional cost to the Owner.
    - b. Submit three (3) copies of test results to the Engineer.
  - 2. Do not void equipment warranties or guarantees by testing and checkout work. Checks and tests shall be supplemental to and compatible with the Manufacturer's installation instructions. Where deviations are apparent, obtain the Manufacturer's approved review of procedures prior to testing. Where any repairs, modifications, adjustments, tests or checks are to be made, the Contractor shall contact the Engineer to determine if the work should be performed by or with the Manufacturer's Representative.
  - 3. Tests are to:
    - a. Provide initial equipment/system acceptance.
    - b. Provide recorded data for future routine maintenance and trouble-shooting.
    - c. Provide assurance that each system component is installed satisfactorily and can be expected to perform, and continue to perform its specified function with reasonable reliability throughout the life of the facility.
      - At any stage of construction and when observed, any electrical equipment or system determined to be damaged, or faulty, is to be reported to the Engineer. Corrective action by the Contractor requires prior Engineer approval, retesting, and inspection.
      - 2) Prior to testing and start-up, equipment and wiring shall be properly and permanently identified with nameplates, and other identification as specified in Section 3.7. Check and tighten terminals and connection points, remove shipping blocks and thoroughly clean equipment, repair damaged or scratched finishes, inspect for broken and missing parts and review and collect Manufacturer's Drawings and instructions for delivery to the Engineer. Make routine checks and tests as the job progresses to ensure that wiring and equipment is properly installed.
      - 3) Testing and checkout work is to be performed with fully qualified personnel skilled in the particular tests being conducted. Personnel are to have at least five (5) years of experience with tests of same type and size as specified.
      - 4) Inspections and tests shall be in accordance with the following applicable codes and standards as amended to date, unless otherwise specified.

#### CARVER POLICE DEPARTMENT CARVER, MA

#### ELECTRICAL

- a) National Electrical Manufacturer's Association NEMA.
- b) American Society for Testing and Materials \_ ASTM.
- c) Institute of Electrical and Electronic Engineers IEEE.
- d) National Electrical Testing Association NETA.
- e) American National Standards Institute ANSI.
- f) C2: National Electrical Safety Code.
- g) Z244-1: American National Standard for Personnel Protection.
- h) Insulated Cable Engineers Association ICEA.
- i) Association of Edison Illuminating Companies AEIC.
- j) Occupational Safety and Health Administration OSHA.
- k) OSHA Part 1910; Subpart S, 1910.308.
- 1) OSHA Part 1926; Subpart V, 1926.950 through 1926.960.
- m) National Fire Protection Association NFPA.
- n) 70B: Electrical Equipment Maintenance.
- o) 70E: Electrical Safety Requirements for Employer Workplaces.
- p) 70: National Electrical Code.
- q) 78: Lightning Protection Code.
- r) 101: Life Safety Code.
- s) Inspections and tests shall utilize the following references:
- t) Contract Drawings and Specifications.
- u) Contractor's Short Circuit and Construction Study, in accordance with Section 26 00 00D.
- v) Manufacturer's printed test procedures for respective equipment.
- 4. Test Equipment:
  - a. Test equipment used by the Contractor is to be inspected and calibrated.
  - b. Perform calibration and setting checks with calibrated test instruments of at least twice that of the accuracy of the equipment, device, relay or meter under test. Dated calibration labels shall be visible on test equipment. Calibrations over six (6) months old are not acceptable on field test instruments. Inspect test instruments for proper operation prior to proceeding with the tests. Record serial and model numbers of the instruments used on the test forms.
- 5. Test Procedures:
  - a. The Electrical Subcontractor is responsible for the preparation of the procedures and schedules for the work specified herein. This work is to be coordinated and compatible with both the work and schedule of the other crafts. Sequence the tests and checks so that the equipment can be energized immediately after the completion of the application tests.
  - b. Submit proposed testing and checkout forms. The procedures shall provide specific instructions for the checking and testing of each electrical component of each system. Schedule tests and inspections as the job progresses. Test procedures submitted shall include job safety rules.
  - c. After each electrical system installation is complete, perform the tests to determine that the entire system is in proper working order and in accordance with applicable codes, Manufacturer's instructions, Drawings, and Specifications. Tests are in addition to shop tests of individual items at the Manufacturer's plant.

Perform insulation and ground resistance tests before operating tests.

- d. Perform insulation tests on electrical equipment, apparatus, cables, motors, generators, transformers, circuit breakers and switches, switchgear, motor control centers, and similar electrical equipment, at the following items and conditions:
- e. Prior to energization and/or placing into service.
- f. When damage to the insulation is suspected or known to exist.
- g. After repairs or modifications to the equipment affecting the insulation.
- h. Where lightning or other surge conditions are known to have existed on the circuit.
- i. Make openings in circuits for test instruments and place and connect instruments, equipment, and devices, required for the tests. Upon completion of tests, remove instruments and instrument connections and restore circuits to permanent condition.
- j. List each circuit and measured resistance as test data. Maintain record of insulation resistance values. Identify conductor, or equipment, date that value was taken and resistance value. Arrange information in tabular form and submit to Engineer.
- k. Report inspections, tests, and calibrations in writing on Engineer approved reports/forms. The recorded data form shall have the signatures of the persons conducting the tests, authorized witnesses and the Engineer. The forms shall serve as the test and inspection checklist.
- 1. When the electrical tests and inspections specified or required within Division 26 are completed and results reported, reviewed, and approved by the Engineer, the Contractor may consider that portion of the electrical equipment system or installation electrically complete. The Contractor will then affix appropriate, approved, and dated completion or calibration labels to the tested equipment and notify the Engineer of electrical completion. If the Engineer finds completed work unacceptable, he will notify the Contractor in writing of the unfinished or deficient work, with the reason for his rejection, to be corrected by the Contractor. The Contractor will notify the Engineer in writing when exceptions have been corrected. The Contractor will prepare a "Notification or Substantial Electrical Completion" for approval by the Engineer following Engineer's acceptance of electrical completion. If later in-service operation or further testing identified problems attributable to the Contractor, these will be corrected by the Contractor, at no additional cost to the Authority.
- C. Specific Tests: Perform the following specified tests. De-energize and isolate equipment and cable prior to performing the tests.
- D. Motors:
  - 1. Before energizing any machine, visually inspect for serviceability. Check Manufacturer's instruction manual for correct lubrication and ventilation. Align motor with driven equipment. Check nameplate for electrical power requirements.
  - 2. Test run motors uncoupled or unloaded, before placing into operation. Check the motor for rotation, speed, current and temperature rise under normal load and record the results. Maintain the proper color codes for phase identifications. This may

require swaps at the motor for proper rotation. Use motor phase rotation meter prior to lead connection at motor in order to minimize later swaps.

- E. Grounding Systems:
  - 1. Test main building loops and major equipment grounds to remote earth, directly referenced to an extremely low resistance (approximately 1 ohm) reference ground benchmark. Perform a visual inspection of the systems, raceway and equipment grounds to determine the adequacy and integrity of the grounding. Ground testing results shall be recorded, witnesses, and submitted to the Engineer.
  - 2. Perform ground tests using a low resistance, null-balance type ground testing ohmmeter, with test lead resistance compensated for. Use the type of test instrument which compensates for potential and current rod resistances.
  - 3. Test each ground rod and measure ground resistance. If resistance is not 25 ohms or less, drive additional rods to obtain a resistance of 25 ohms or less. Submit tabulation of results to Engineer. Include identification of electrode, date of reading and ground resistance valve in the test reports.
  - 4. Test each building and major equipment grounding system for continuity of connections and for resistance. Ground resistance of conduits, equipment cases, and supporting frames, shall not exceed 5 ohms to ground. Submit all readings to the Engineer.
  - 5. Where ground test results identify the need for additional grounding conductors or rods that are not indicated or specified, design changes will be initiated to obtain the acceptable values. The Contractor is responsible for the proper installation of the grounding indicated and specified.
  - 6. Wire and Cable: (All conductors originating from main switchboard and distribution panels).
    - a. Before energizing any cable or wire, megger the insulation resistance of every external circuit wire to each other and to ground. Tests shall be conducted at voltages of 500 volts or lower. Continuity test each wire and cable to verify the field-applied tag per conductor. Continuity test each wire and cable to verify the field-applied tag per conductor. Minimum insulation resistance valves shall not be less than two (2) megohms.
    - b. Take insulation resistance measurements for motor feeders. With motors disconnected, measure insulation resistance from load side of contactors or circuit breakers.
    - c. Check cables and wires for the proper identification numbering and/or color coding.
    - d. Inspect cables for physical damage and proper connection in accordance with single line diagram.

- F. Power Distribution System:
  - 1. Main Distribution Panelboard:
    - a. Inspect for physical, electrical and mechanical condition.
    - b. Compare equipment nameplate information with latest single-line diagram and report discrepancies in writing to Engineer within 24 hours.
    - c. Check for proper anchorage, required area clearance, physical damage, and proper alignment.
    - d. Inspect all doors, panels and sections for paint, dents, scratches, fit and missing hardware.
    - e. Verify that fuse and/or circuit breaker sizes and types correspond to Drawings. Report deviations to Engineer in writing within 24 hours.
    - f. Inspect all bus connections for high resistance. Use low resistance ohmmeter, or check tightness of bolted bus joints by calibrated torque wrench method. Refer to manufacturer's instructions for proper torque levels.
    - g. Clean entire switchgear using manufacturer's approved methods and materials prior to energizing system and a second time just prior to turning over system to Owner.
    - h. Inspect insulators for evidence of physical damage or contaminated surfaces.
    - i. Verify proper barrier and shutter installation and operation.
    - j. Verify appropriate contact lubricant on moving current carrying parts.
    - k. Exercise all active components.
    - 1. Inspect all indicating devices for proper operation.
    - m. Perform ground resistance tests.
    - n. Perform insulation resistance tests on each bus section, phase-to-phase and phase-to-ground for one (1) minute. Test voltage shall be 1000 volts minimum, and insulation resistance shall be 100 megohms minimum.
    - o. Perform an over-potential test on each bus station, each phase-to-ground, for five (5) minutes at manufacturer's recommended potential. Test results are evaluated on a go, no-go basis by slowly raising the test voltage to the required value. The final test voltage shall be applied for five (5) minutes for DC test potentials, and one (1) minute for AC test potentials.
  - 2. Circuit Breakers Molded Case:
    - a. Circuit breaker shall be checked for proper mounting, conductor size and feeder designation.
    - b. Operate circuit breaker to ensure smooth operation.
    - c. Inspect case for cracks or other defects.
    - d. Check tightness of connections with calibrated torque wrench. Refer to manufacturer's instruction for proper torque levels.
    - e. Perform a contract resistance test or measure millivolt drop at rated current.
    - f. Perform an insulation resistance test at 1000 volts DC for one (1) minute from pole-to-pole and from each pole-to-ground with breaker closed and across open contract in each phase 500V DC if circuit breaker is solid state.
    - g. Adjustable trip breakers shall have minimum pickup current determined by primary current injection where applicable.

#### CARVER POLICE DEPARTMENT CARVER, MA

- h. Perform long time delay time-current characteristic tests by passing 300% rated current through each pole separately. Determine trip time.
- i. Determine short time pickup and delay by primary current injection if applicable to the particular breaker.
- j. Determine ground fault pickup and time delay by primary current injection if applicable to the particular breaker.
- k. Determine instantaneous pickup currently by primary injection using run-up or pulse method. Clearing times shall be within four (4) cycles.
- 1. Verify trip unit reset characteristics.
- m. Perform adjustments for final settings in accordance with breaker setting sheet if applicable to the particular breaker.
- n. Compare contract resistance or millivolt drop valves to adjacent poles and similar breakers. Investigate deviations of more than 50%. Investigate any value exceeding Manufacturer's recommendations.
- o. Insulation resistance shall not be less than 100 megohms.
- p. Trip characteristics of adjustable trip breakers shall fall within Manufacturer's published time-current characteristic tolerance band.
- q. All circuit breakers mounted in switchboards and distribution boards shall be time-current tested by primary current injection where possible, and also any remotely mounted breakers of frame size 400 ampere and larger.
- r. Adjust settings and calibrate all circuit breakers as recommended in the short circuit analysis and coordination study.
- 3. Motor Control:
  - a. Inspect for physical damage, proper anchorage and grounding.
  - b. Compare equipment nameplate data with design plans or starter schedule.
- 4. Motor Running Protection:
  - a. Compare overload heater rating with motor full-load current rating to verify proper sizing
  - b. If motor running protection is provided by fuses, verify proper rating considering motor characteristics.
  - c. Check tightness of bolted connections.
  - d. Measure insulation resistance of each bus section phase-to-phase and phase-to-ground for one (1) minute.
  - e. Measure insulation resistance of each starter section phase-to-phase and phase-toground with the starter contacts closed and the protective device open.
  - f. Measure insulation resistance of each control circuit with respect to ground.
  - g. Test motor overload units by injecting primary current through overload unit and monitoring trip time at 300% of motor full-load current.
  - h. Perform operational tests by initiating control devices to affect proper operation.
  - i. Bolt torque levels shall be in accordance with Manufacturer's recommendations.
  - j. Perform insulation resistance test, 1000 VDC minimum test voltage and 100 megohms minimum insulation resistance.
  - k. Control wiring insulation test voltage shall be 1000 VDC. Manufacturer shall be consulted for test voltage where solid-state control devices are utilized.

- 1. Perform overload tests at 300% of motor full-load current. Trip times shall be in accordance with Manufacturer's tolerances. Investigate values in excess of 120 seconds.
- 5. Automatic Transfer Switch:
  - a. Inspect for physical damage.
  - b. Verify that the short circuit withstand rating exceeds the available short circuit duty.
  - c. Compare equipment nameplate information and connections with single-line diagram and report any discrepancies.
  - d. Check switch to ensure positive interlock between normal and alternate sources. (Mechanical and Electrical.)
  - e. Check tightness of all control and power connections.
  - f. Perform manual and electrical transfer operation.
  - g. Ensure manual transfer warnings are attached and visible to operator.
  - h. Perform insulation resistance tests phase-to-phase and phase-to-ground with switch in both source positions.
  - i. Measure contact resistance in normal and alternate source position.
  - j. Insulation resistance test voltages and minimum values to be in accordance with Manufacturer's published data.
  - k. Determine contact resistance in micro-ohms. Investigate any value exceeding 500 micro-ohms or any values which deviate from adjacent poles by more than 50%.
- 6. Panelboards:
  - a. Inspect for physical damage and proper grounding.
  - b. Compare nameplate information with schedules and report any discrepancies.
  - c. Inspect all panelboards for cleanliness, workmanship, etc.
- 7. Low Voltage Systems: Include, but not limited to the following: Communication/telephone - sound systems, cable/media - TV system.
  - a. Visually inspect all components for physical damage, dents, scratches and missing hardware.
  - b. Check all wiring for proper identification numbering and/or color coding.
  - c. Thoroughly clean all components.
  - d. Inspect all wiring for tightness of connections.
  - e. Operate and perform each of the system components and functions to verify system operation per plans and specs.
- 8. The following systems shall adhere to the general requirements of this section in addition to complying with the specific test requirements outlined in the respective sections listed:
  - a. Fire Alarm System.
  - b. Emergency Generator System.
  - c. Lighting Controls.
- 9. Operating Instructions: Furnish operating instructions to Owner's designated representative with respect to operations, functions and maintenance procedures for equipment and systems installed. Cost of such instruction up to a full five (5) days of

Electrical Subcontractor's time shall be included in contract. Cost of providing a Manufacturer's Representative at site for instructional purposes shall also be included.

# 3.3 BRANCH CIRCUITRY

- A. For all lighting and appliance branch circuitry, raceway sizes shall conform to industry standard maximum permissible occupancy requirements except where these are exceeded by other requirements specified elsewhere.
- B. Circuits shall be balanced on phases at their supply as evenly as possible.
- C. Feeder connections shall be in the phase rotation which establishes proper operation for all equipment supplied.
- D. Reduced size conductors indicated for any feeders shall be taken as their grounding conductors.
- E. Feeders consisting of multiple cables and raceways shall be arranged such that each raceway of the feeder contains one (1) cable for each leg and one (1) neutral cable, if any.
- F. For circuitry indicated as being protected at 20 Amps or less, abide by the following:
  - 1. All 20 amp, 120/208 volt, 3-phase, 4-wire combined branch circuit homeruns shall be provided with a #8 AWG neutral conductor.
  - 2. Minimum conductor size shall be No. 12 AWG copper.
  - 3. Conductors operating at 120 volts extending in excess of 100 ft. or at 277 volts extending in excess of 200 ft., or the last outlet or fixture tap shall be No. 10 AWG copper throughout.
  - 4. Lighting fixtures and receptacles shall not be connected to the same circuit.
  - 5. Circuits shall be balanced on phases at their supply point as evenly as possible.
- G. Type MC Cable Installation:
  - 1. Where cable is permitted under the products section, the installation of same shall be done in accordance with code and the following:
    - a. Cable shall be supported in accordance with code. Tie wire is not an acceptable means of support. Cable supports such as Caddy WMX-6, MX-3, and clamps such as Caddy 449 shall be used. Where cables are supported by the structure and only need securing in place, then ty-raps will be acceptable. Ty-raps are not acceptable as a means of support. All fittings, hangers, and clamps for support and termination of cables shall be of type specifically designed for use with cable, i.e., romex connectors not acceptable.

- b. Armor of cable shall be removed with rotary cutter device equal to roto-split by Seatek Co.; not with a hacksaw.
- c. Use split "Insuliner" sleeves at terminations.

# 3.4 SHORT-CIRCUIT COORDINATION STUDIES

- A. Scope of Services:
  - 1. Provide a current and complete short-circuit study, equipment-interrupting or withstand evaluation, and a protective-device coordination study for the electrical distribution system.
    - a. The study shall include all portions of the electrical distribution system from the normal and alternate sources of power throughout the low-voltage distribution system. Normal system operating method, alternate operation, and operations which could result in maximum-fault conditions shall be thoroughly covered in the study.
  - 2. Short-Circuit Study:
    - a. The study shall be in accordance with applicable ANSI and IEEE standards.
    - b. The study input data shall include the utility company's short-circuit single- and three-phase contribution, with X/R ratio, the resistance and reactance components of each branch impedance, motor and generator contributions, base quantities selected, and all other applicable circuit parameters.
    - c. Short-circuit momentary duties and interrupting duties shall be calculated on the basis of maximum available fault current at each switchgear bus, switchboard, motor control center, distribution panelboard, pertinent branch circuit panelboards, and other significant locations through the system.
  - 3. Equipment Evaluation Study: An equipment evaluation study shall be performed to determine the adequacy of circuit breakers, controllers, surge arresters, busways, switches, and fuses by tabulating and comparing the short-circuit ratings of these devices with the maximum short-circuit momentary and interrupting duties. Evaluation study should be submitted prior to final approval of equipment submittals.
  - 4. Protective-Device Coordination Study:
    - a. A protective-device coordination study shall be performed to select or to verify the selection of power fuse ratings, protective-relay characteristics and settings, ratios, and characteristics of associated voltage and current transformers, and low-voltage breaker trip characteristics and settings.
    - b. The coordination study shall include all voltage classes of equipment from the utility's incoming line protective device down to and including each motor control center and/or panelboard. The phase and ground overcurrent protection shall be included as well as settings for all other adjustable protective devices.
    - c. Coordination shall be in accordance with requirements of the National Electrical Code and the recommendations of the IEEE Standard 399.

- d. The selection and settings of the protective devices shall be provided separately in a tabulated form listing circuit identification, IEEE device number, current transformer ratios, manufacturer, type, range of adjustment, and recommended settings. A tabulation of the recommended power fuse selection shall be provided for all fuses in the system. Discrepancies, problem areas, or inadequacies shall be promptly brought to the Owner's attention.
- e. The overcurrent relays in the existing incoming switchgear shall be included in this study. New settings for existing relays shall be covered within this study.
- 5. Arc Flash Analysis Study:
  - a. An arc flash study shall be performed to select the proper PPE labeling.
  - b. Study shall follow procedures as outlined in IEEE 1584.
  - c. Provide labeling at all equipment as required by NFPA 70E 130.5.
  - d. Labeling shall indicate required level of PPE, nominal system voltage and arc flash boundary.
- 6. Study Report:
  - a. The results of the power-system studies shall be summarized in a final report.
  - b. The report shall include the following sections:
    - 1) Description, purpose, basis, and scope of the study and a single-line diagram of the portion of the power system which is included within the scope of study
    - 2) Tabulations of circuit breaker, fuse, and other equipment ratings versus calculated short-circuit duties and commentary regarding same.
    - 3) Protective device time versus current coordination curves, tabulations of relay and circuit breaker trip settings, fuse selection, and commentary regarding same.
    - 4) Fault-current tabulations including a definition of terms and a guide for interpretation.
- 7. Implementation: The Contractor shall engage an independent testing firm for the purpose of inspecting, setting, testing, and calibrating the protective relays, circuit breakers, fuses, and other applicable devices as recommended in the power-system study report.

# 3.5 REQUIREMENTS GOVERNING ELECTRICAL WORK IN DAMP OR WET LOCATIONS

- A. Outlets and outlet size boxes shall be of galvanized cast ferrous metal only.
- B. The finish of threaded steel conduit shall be galvanized only.
- C. Wires for pulling into raceways for lighting and appliance branch circuitry shall be limited to "THWN".
- D. Wires for pulling into raceways for feeders shall be limited to "THWN".
- E. Plates for toggle switches and receptacles shall have gasketed snap shut covers suitable for wet locations while in use.

- F. Final connections of flexible conduit shall be neoprene sheathed.
- G. Apply one (1) layer of half looped plastic electric insulating tape over wire nuts used for joining the conductors of wires.
- H. Enclosures, junction boxes, pull boxes, cabinets, cabinet trims, wiring troughs and the like, shall be fabricated of galvanized sheet metal, shall conform to the following:
  - 1. They shall be constructed with continuously welded joints and seams.
  - 2. Their edges and weld spots shall be factory treated with cold galvanizing compound.
  - 3. Their connection to circuitry shall be by means of watertight hub connectors with sealing rings.
- I. Enclosures for individually mounted switching and overcurrent devices shall be NEMA Class IV weatherproof construction.
- J. The covers, doors and plates and trims used in conjunction with all enclosures, pull boxes, outlet boxes, junction boxes, cabinets and the like shall be equipped with gaskets.
- K. Panels shall be equipped with doors without exception.
- L. The following shall be interpreted as damp or wet locations within building confines:
  - 1. Spaces where any designations indicating weatherproof (WP) or vapor proof appear on the Contract Drawings.
  - 2. Below waterproofing in slabs applied directly on grade.
  - 3. Spaces defined as wet or damp locations by Article 100 of the National Electric Code.

### 3.6 REQUIREMENTS GOVERNING ELECTRIC WORK IN AIR HANDLING SPACES

- A. Within air handling plenums:
  - 1. Abide by the requirements specified for electric work in damp locations within building confines.
  - 2. All cabling and electrical equipment installed within plenums shall be listed for plenum use.
  - 3. Exclude the installation of type NM or NMC cable.
- B. In spaces within suspended ceilings used for air handling purposes, abide by the requirements specified for normal electric work conditions except:
  - 1. Lighting fixtures recessed into the ceilings shall be certified as being suitable for this purpose.

# 3.7 UNDERGROUND CONDUIT BANKS

- A. The Electrical work required in conjunction with underground conduit banks shall include providing all conduits.
- B. Conduits for underground banks shall be:
  - 1. Trade diameter size as indicated but in no case less than one inch.
  - 2. Polyvinyl chloride Schedule 40 (approved for encased burial) duct, rigid steel conduit for vertical elbows and straight sections used to penetrate equipment pads, building foundation walls and concrete slabs.
- C. All conduits indicated as being incorporated into conduit banks unless specifically noted as rigid steel conduits shall be encased in a concrete envelope which accommodates the indicated configuration of conduits and which encompasses dimensions as follows:
  - 1. Outside surfaces of conduits to outside surface of envelope where reinforcement of encasement is required -6" minimum.
  - 2. Outside surfaces of conduits to outside surface of envelope where no reinforcement of encasement is required 3" minimum.
  - Spacing between centerlines of conduits assigned to different categories of use primary feeders, secondary feeders, communications and signaling – 10-1/2" minimum.
  - 4. Spacing between centerlines of conduits assigned to the same category of use -7 1/2" minimum.
- D. Reinforcement of the concrete encasement for conduit banks where required shall consist of No. 4 longitudinal reinforcing bars located 3" from the outside surface of the envelope and spaced 6" on centers all around. No. 8 wire reinforcing hoops set 8" apart shall be used to tie the longitudinal bars together.
- E. Install conduit in such a manner as to provide a minimum cover of 30 inches after final grading except the cover may be reduced to a minimum of 18 inches to:
  - 1. Tie into existing work.
  - 2. Pass over other underground utilities.
  - 3. Pass over underground obstructions.
  - 4. Assist in the avoidance of low points.
- F. Increase the minimum cover where required by field conditions.

- G. Lay conduit to avoid low points during run. Pitch at a minimum of 3 inches per 100 feet away from building.
- H. Provide reinforcement for the concrete encasement of a conduit bank where:
  - 1. It passes under or over underground utilities.
  - 2. It passes under or over underground obstructions.
  - 3. Its cover is reduced to less than 30 inches.
  - 4. It runs through foundation walls and other building construction.
- I. Concrete encasement reinforcing shall extend in each case 5 feet beyond the points at which the determining conditions terminate.
- J. Bends in conduit shall have minimum radii as follows:
  - 1. For primary feeder 15'-0" except where specifically indicated otherwise or where turning up at termination point.
  - 2. For primary feeder turning up at termination point  $-4^{\circ}-0^{\circ}$ .
- K. Install conduit so that adjacent joints are staggered at least 6 inches from one another.
- L. Offsets to accommodate field conditions shall be accomplished with two (2) bends of not more than ten (10) degrees each.
- M. Plug both ends of all conduit stubs.
- N. Seal the end of each conduit run terminating inside a building utilizing a water and gastight sealant manufactured specifically for the purpose.
- O. After conduit has been installed with concrete encasement completed, clear each conduit of all obstructions and foreign matter by pulling a flexible mandrel (12" minimum length and a diameter 1/4" less than that of the conduit) and brush through it. In the event that obstructions are encountered in any conduit which will not permit the mandrel to pass, remove and replace the blocked section. Include in the electric work all excavation, backfilling, repair of concrete encasement and restoration of surface at grade involved in the conduit replacement.
- P. Provide a nylon cord for the pulling of cable in each conduit in which no cable is to be installed as part of the electric work.
- Q. The Electrical Subcontractor shall provide all insulated racks as required for proper support of all cables and wires.
- R. Provide magnetic warning tape above each full length of duct bank 12 inches below grade.

#### 3.8 IDENTIFICATION AND TAGGING

- A. Identify individually:
  - 1. Each transformer.
  - 2. Each panelboard.
  - 3. Each switch and circuit breaker.
  - 4. Each feeder, wire or cable or all systems.
  - 5. Each switchboard.
  - 6. Each end of nylon pullwire in empty conduit.
  - 7. Each receptacle.
  - 8. Each tel/data outlet.
- B. Each wire or cable in a feeder shall be identified at its terminal points of connection and in each pullbox, junction box and panel gutter through which it passes.
- C. The nomenclature used to identify panelboards or load center shall designate the numbers assigned to them.
- D. The nomenclature used to identify switches or circuit breakers shall:
  - 1. Where they disconnect mains or services designate this fact.
  - 2. Where they control feeders, designate the feeder number and the name of the load supplied.
  - 3. Where they control lighting and appliance branch circuitry, designate the name of the space and the load supplied.
- E. The nomenclature used to identify feeder wires and cables shall designate the feeder number.
- F. Identification for panelboards or load centers shall be by means of engraved Lamacoid nameplates showing 1/4" high white lettering on a black background fastened to the outside face of the front.
- G. Identification for switches or circuit breakers shall be by means of the following:
  - 1. Where individually enclosed engraved Lamacoid nameplates showing 1/8" high white lettering on a black background fastened on the outside front face of the enclosure.

- 2. Where in panelboards or load centers without doors same as for individually enclosed.
- 3. Where in panelboards or load centers with doors typewritten directories mounted behind transparent plastic covers, in metal frames fastened on the inside face of the doors.
- H. Identification for wires and cables shall be by means of wrap around "brady" type labels.
- I. Device plates for local toggle switches, toggle switch type motor starters, pilot lights and the like, whose function is not readily apparent shall be engraved with 1/8" high letters suitably describing the equipment controlled or indicated.
- J. Phase identification letters shall be stamped into the metal of the bus bars of each phase of the main busses of each switchboard and each panelboard. The letters shall be visible from at least one (1) "normal posture" location without having to demount any current carrying or supporting elements.
- K. Equip the front face of all switchboard pull boxes junction boxes and the like containing cables, busing or devices operating in excess of 600 volts with enameled sheetmetal "red on white" signs reading "DANGER-HIGH VOLTAGE."
- L. Equip all electric closets and the like with enameled sheet metal "red on white" signs reading "Electrical Equipment Room No Storage Permitted". Signs shall be mounted at clearly visible locations within the rooms.
- M. Provide a sign at the service entrance equipment room indicating the type and location of all on-site emergency or standby power sources.
- N. Identify each outlet box, junction box, and cabinet used in conjunction with empty raceway for wires of a future system by means of indelible markings on the inside denoting the system.
- O. The nomenclature used to identify receptacles shall:
  - 1. Indicate the associated panelboard and branch circuit number via an adhesive label affixed to the receptacles wall plate (at top).
  - 2. Labels shall be black text on clear tape equal to Brother P-Touch Extra Strength Adhesive TZ laminated tape.
- P. The nomenclature used to identify tel/data outlets shall:
  - 1. Consist of two adhesive labels affixed to the outlets wall plate (one at top, one at bottom). The top label shall indicate the room number and the bottom label shall indicate the port number.
  - 2. Labels shall be black text on clear tape equal to Brother P-Touch Extra Strength Adhesive TZ laminated tape.

Q. Prior to installing identifying tags and nameplates, submit their nomenclature for approval. Conform to all revisions issued by the Architect.

# 3.9 LIMITING NOISE PRODUCED BY ELECTRICAL INSTALLATION

- A. Perform the following work in accordance with field instructions issued by the Architect to assure that minimal noise is produced by electrical installations due to equipment furnished as part of the Electrical work.
- B. Check and tighten the fastenings of sheet metal plates, covers, doors and trims used in the enclosures of electrical equipment.
- C. Remove and replace any individual device containing one or more magnetic flux path metallic cores (e.g., discharge lamp ballast, transformer, reactor, dimmer, solenoid) which is found to have a noise output exceeding that of other identical devices installed at the project.

# 3.10 SUPPORTS AND FASTENINGS

- A. Support work in accordance with best industry standards, Local Electric Code and the following:
  - 1. Include supporting frames or racks for equipment, intended for vertical surface mounting, which is required in a freestanding position.
  - 2. Supporting frames or racks shall be of standard angle, standard channel or specialty support system steel members. They shall be rigidly bolted or welded together and adequately braces to form a substantial structure. Racks shall be of ample size to assure a workmanlike arrangement of all equipment mounted on them.
  - 3. No work intended for exposed installation shall be mounted directly on any building surface. In such locations, flat bar members or spaces shall be used to create a minimum of ¼" air space between the building surfaces and the work. Provide ¾" thick exterior grade plywood painted with two (2) coats of fire-retardant gray paint for mounting of panelboards.
  - 4. Nothing (including outlet, pull and junction boxes and fittings) shall depend on electric conduits, raceways or cables for support.
  - 5. Nothing shall rest on, or depend for support on, suspended ceiling media.
  - 6. Support less than 2" trade size, vertically run, conduits at intervals no greater than 8'. Support such conduits, 2-1/2" trade size or larger, at intervals no greater than they story height, or 15', whichever is smaller.
  - 7. Where they are not embedded in concrete, support less than 1" trade size, horizontally run, conduits at intervals no greater than 7'. Support such conduits, 1" trade size or larger, at intervals no greater than 10'.
  - 8. Support all lighting fixtures directly from structural slab, intermediate decking or

framing member as directed by the Architect. No light fixtures shall be supported directly from the roof deck.

- 9. Where fixtures and ceilings are such as to require fixture support from ceiling openings frames, include in the electric work the members necessary to tie back the ceiling opening frames to ceiling suspension members or slabs so as to provide actual support for the fixtures noted above.
- 10. Support all runs of conduit and/or circuitry directly from structural slabs, intermediate decking or framing members.
- 11. Fasten electric work to building structure in accordance with the best industry practice.
- 12. Floor mounted equipment shall not be held in place solely by its own dead weight. Include floor anchor fastenings in all cases.
- 13. For items which are shown as being ceiling mounted at locations where fastenings to the building construction element above is not possible, provide suitably auxiliary channel or angle iron bridging tying to building structural elements.
- 14. As a minimum procedure, where weight applied to the attachment points is 100 lbs. or less, fasten to concrete and solid masonry with bolts and expansion shields.
- 15. As a minimum procedure, where weight applied to building attachment points exceed 100 lbs., but is 300 lbs. or less, conform to the following:
  - a. At field poured concrete slabs, utilize inserts with 20' minimum length slipthrough steel rods, set transverse to reinforcing steel.

# 3.11 SPLICING AND TERMINATING WIRES AND CABLES

- A. Maintain all splices and joints in removable cover boxes or cabinets where they may be easily inspected.
- B. Locate each completed conductor splice or joint in the outlet box, junction box, or pull box containing it, so that it is accessible from the removal cover side of the box.
- C. Join solid conductors No. 8 AWG and smaller by securely twisting them together and soldering, or by using insulated coiled steel spring "wire nut" type connectors. Exclude "wire nuts" employing non-expandable springs. Terminate conductors No. 8 AWG and smaller by means of a neat and fast holding application of the conductors directly to the binding screws or terminals of the equipment or devices to be connected.
- D. Join, tap and terminate standard conductors No. 6 AWG and larger by means of solder sleeves, taps, and lugs with applied solder or by means of bolted saddle type or pressure indent type connectors, taps and lugs. Exclude connectors and lugs of the types which apply set screws directly to conductors. Where equipment or devices are equipped with set screw type terminals which are impossible to change, replace the factory supplied set

screws with a type having a ball bearing tip. Apply pressure indent type connectors, taps and lugs utilizing tools manufactured specifically for the purpose and having features preventing their release until the full pressure has been exerted on the lug or connector.

- E. Except where wire nuts are used, build up insulation over conductor joints to a value, equal both in thickness and dielectric strength, to that of the factory applied conductor insulation. Insulation of conductor taps and joints shall be by means of half-lapped layers of rubber tape, with an outer layer of friction tape; by means of half-lapped layers of approved plastic electric insulating tape; or by a means of split insulating casings manufactured specifically to insulate the particular connector and conductor, and fastened with stainless steel or non-metallic snaps or clips.
- F. Exclude splicing procedures for neutral conductors in lighting and appliance branch circuitry which utilize device terminals as the splicing points.
- G. Exclude joints or terminations utilizing solder in any conductors used for grounding or bonding purposes.
- H. Exclude all but solder or pressure indent type joints in conductors used for signaling or communication purposes.
- I. Lugs for conductors used to make phase leg connections on the line side of the main service overcurrent and switching device shall be of the limiter type.

# 3.12 PULLING WIRES INTO CONDUITS AND RACEWAYS

- A. Delay pulling wires or cables in until the project has progressed to a point when general construction procedures are not liable to injure wires and cables, and when moisture is excluded from raceways.
- B. Utilize nylon snakes or metallic fish tapes with ball type heads to set up for pulling. In raceways 2" trade size and larger, utilize a pulling assembly ahead of wires consisting of a suitable brush followed by a 3-1/2" diameter ball mandrel.
- C. Leave sufficient slack on all runs of wire and cable to permit the secure connection of devices and equipment.
- D. Include circular wedge-type cable supports for wires and cables at the top of any vertical raceway longer than 20 feet. Also include additional supports spaced at intervals which are no greater than 10'. Supports shall be located in accessible pull boxes. Supports shall be of a non-deteriorating insulating material manufactured specifically for the purpose.
- E. Pulling lubricants shall be used. They shall be products manufactured specifically for the purpose.
- F. Slack on wires and cables located in cabinets and pull boxes shall be formed and set in place in groupings corresponding to their occupancy of raceways. They shall also be arranged, with insulators and supports provided where necessary, such that cable shims or

other such temporary expedients do not have to be left permanently in place to prevent the wires and cables from shifting when covers or trims are removed.

- 3.13 REQUIREMENTS FOR THE INSTALLATION OF JUNCTION BOXES, OUTLET BOXES AND PULL BOXES
  - A. Flush wall-mounted outlet boxes shall not be set back to back but shall be offset at least 12" horizontally regardless of any indication on the Contract Drawings.
  - B. Locate all boxes so that their removable covers are accessible without necessitating the removal of parts of permanent building structure, including piping, ductwork, and other permanent mechanical elements.
  - C. In conjunction with concealed circuitry, abide by one of the following instructions (as may be applicable to the conditions) in order to assure the aforementioned accessibility. (Not required for circuitry concealed by removable suspended ceiling tiles.)
    - 1. For a small (outlet size) box on circuitry concealed in a partition or wall, locate box or fitting so that its removable cover side, (or the face of any applied raised cover) penetrates through to within 1/8" of the exposed surface of the building materials concealing the circuitry and apply a blank or device plate to suit the functional requirements.
    - 2. For a large box on circuitry concealed in a partition, suspended ceiling, or wall, locate box totally hidden but with its removable cover directly behind an architectural access door or panel (included for the purpose, separate from the electric work) in the building construction which conceals the circuitry.
    - 3. For a small (outlet size) box on circuitry concealed above and intended as an outlet for a surface mounted lighting fixture or other such electrical item, locate box so that its removable cover side penetrates through to the exposed surface of the building materials concealing the circuitry. Arrange the mounting of the lighting fixture or other item so that it completely covers the opening in the building construction caused by the box.
    - 4. For a small (outlet size) box on circuitry concealed in a suspended ceiling, and intended as an outlet for a non-demountable type of recessed lighting fixtures or other such electrical items, locate box totally hidden but with its removable cover not more than 1' away from the building construction opening occupied by the demountable items.
  - D. Apply junction and pull boxes in accordance with the following:
    - 1. Include all pull boxes in long straight runs of raceway to assure that cables are not damaged when they are pulled in.
    - 2. Include junction and pull boxes to assure a neat and workmanlike installation of raceways.

- 3. Include junction and pull boxes to fulfill requirements pertaining to the limitations to the number of bends permitted in raceway between cable access points, the accessibility of cable joints and splices, and the application of cable supports.
- 4. Include all required junction and pull boxes regardless of indications on the Contract Drawings (which, due to symbolic methods of notation, may omit to show some of them).
- E. Apply outlet boxes in accordance with the following:
  - 1. Unless noted below or otherwise specifically indicated, include a separate outlet box for each individual wiring device, lighting fixture and signal or communication system outlet component. Outlet boxes supplied attached to lighting fixtures shall not be used as replacements for the boxes specified herein.
  - 2. A continuous row of fixtures of the end-to-end channel type, designed for "through wiring", and wired in accordance with the specification hereinafter pertaining to circuitry through a series of lighting fixtures, may be supplied through a single outlet box.
  - 3. A series of separate fixtures, designed for "through wiring", spaced not more than 4' apart, and inter-connected with conduit or raceway and circuitry which is in accordance with the Specifications hereinafter pertaining to circuitry through a series of lighting fixtures, may be supplied through a single outlet box.
  - 4. Connection to recessed ceiling fixtures supplied with pigtails may be arranged so that more than one (1), but not more than four (4) such fixtures are connected into a single outlet box. When adopting this procedure:
    - a. Utilize an outlet box no smaller than 5" square by 2-1/2" deep.
    - b. Allow no fixture to be supplied from an outlet box in another room.
  - 5. Multiple local switches indicated at a single location shall be gang-mounted in a single outlet box.
  - 6. Include all required outlet boxes regardless of indications on the Contract Drawings (which due to symbolic methods of notation, may omit to show some of them).
- F. Install junction boxes, pull boxes and outlet boxes in conjunction with concealed circuitry.
  - 1. Exclude surface-mounted outlet boxes in conjunction with concealed circuitry.
  - 2. Exclude unused circuitry openings in junction and pull boxes. In larger boxes each such opening shall be closed with a galvanized sheet steel plate fastened with a continuous weld all around. In small outlet type boxes, utilize plugs as specified for such boxes.
  - 3. Close up all unused circuitry openings in outlet boxes. Unused openings in cast

boxes shall be closed with approved cast metal threaded plugs. Unused openings in sheet metal boxes shall be closed with sheet metal knock-out plugs.

- 4. Outlet boxes for switches shall be located at the strike side of doors. Indicate door swings are subject to field change. Outlet boxes shall be located on the basis of final door swing arrangements.
- 5. Boxes and plaster covers for duplex receptacles shall be arranged for vertical mounting of the receptacle.
- 6. Equip outlet boxes used for devices which are connected to wires of systems supplied by more than one set of voltage characteristics with barriers to separate the different systems.
- G. Barriers in junction and pull boxes of outlet size shall be of the same metal as the box.
  - 1. Barriers in junction and pull boxes which are larger than outlet size shall be of the polyester resin fiberglass of adequate thickness for mechanical strength, but in no case less than 1/4" thick. Each barrier shall be mounted, without fastenings, between angle iron guides so that they may be readily removed.

# 3.14 LOCATING AND ROUTING OF CIRCUITRY

- A. In general, all circuitry shall be run concealed except that it shall be run exposed where the following conditions occur:
  - 1. Horizontally at the ceiling of permanently unfinished spaces which are not assigned to mechanical or electrical equipment.
  - 2. Horizontally and vertically in mechanical equipment spaces.
  - 3. Horizontally and vertically in electric equipment rooms.
- B. Concealed circuitry shall be so located that building construction materials can be applied over its thickest elements without being subject to spalling or cracking.
- C. All circuitry and raceways shall not be run within slabs. If field conditions requires raceways to be embedded in field-poured structural building construction concrete fill or slab shall conform to the following:
  - 1. All proposed embedded raceways shall be indicated on plan and elevation and submitted to the Architect and Structural Engineer for review and written approval prior to installation. Any costs associated with the review and approval shall be borne by the Electrical Subcontractor.
  - 2. They shall be run "single layer" with their outside surface no closer than 1" to any surface of the structural concrete.
  - 3. They shall not be located in any configuration which places the outside surface of one

closer than 3" to outside surface of another, except at tees, crosses or other single level wide angle junction points.

- 4. Where crossovers or close grouping are unavoidable, circuitry shall be carefully field coordinated so as not to cause structural weakness.
- 5. Where turned up or down into a wall or partition they shall, before entering same, be routed parallel for a long enough distance to assure that no relocation of the wall or partition will be necessary to conceal the required bend.
- 6. They shall be routed in such a manner as to coordinate with the structural requirements of the building.
- 7. They shall be routed in accordance with field instructions issued by the Architect where such instructions differ from Specifications set forth herein.
- D. Circuitry run exposed shall be routed parallel to building walls and column lines.
- E. Exposed circuitry located overhead shall be run in a completely accessible manner on the underside of all piping and ductwork.
- F. Circuitry run in suspended ceilings shall be routed parallel to building walls, column lines, etc.
- G. Circuitry shall be routed so as to prevent electric conductors from being subject to high ambient temperature. Minimum clearances from heated lines or surfaces shall be maintained as follows:
  - 1. Crossing where uninsulated: 3".
  - 2. Crossing where insulated: 1"
  - 3. Running parallel where uninsulated: 36".
  - 4. Running parallel where insulated: 6".
- H. Circuitry shall not be run in elevator shafts, hoistways, and the like. Where outlets for trail cables, pit lights, run be level lights, and the like, are involved, only the "final connection" outlet boxes themselves shall be located within or open into, the confines of the shaft.
- I. Circuitry for miscellaneous systems indicated without notation as to location and routing shall be run as per the requirements and notations governing the adjacent light and power circuitry.
- 3.15 INSTALLING CIRCUITRY
  - A. The outside surface of circuitry, which is to be embedded in cinder concrete, shall be coated with asphaltum paint.

- B. In runs of conduit or raceway including flexible limit the number of bends between cable access points to a total which does not exceed the maximum specified for the particular system. Where no such maximum is specified, limit the number to four (4) right angle bends or the equivalent thereof.
- C. In each conduit or raceway assigned for the future pulling in of wires, include a nylon drag cord. In raceways 2" trade size and larger, the cord shall be pulled in utilizing a suitable brush, followed by an 85% diameter ball mandrel ahead of the cord in the pulling assembly. In the event that obstructions are encountered, which will not permit the drag cord to be installed, the blocked section of raceway shall be replaced and any cutting and patching of the structure involved in such replacement shall be included as part of the electric work.
- D. Circuitry shall be arranged such that conductors of one feeder or circuitry carrying "going" current are not separated from conductors of the same feeder or circuitry carrying "return" current by any ferrous or other metal. Where not within raceways, all "going" and "return" current conductors of one feeder or circuit shall be laced together so as to minimize induction heating of adjacent metal components.
- E. Sleeves used where circuitry is to penetrate waterproof slabs, decks and walls, shall be of a type selected to suit the water condition encountered in the field.

# 3.16 EXCAVATION AND BACKFILLING FOR UNDERGROUND ENCLOSURES

A. Provide excavation and backfilling include minimum 6" gravel Base under the hand hole assembly with the gravel 3" to 4" wider than the sides of the hand hole. (Internal Bracing may be warranted for any manufacturer's underground enclosure if 95% compaction is required or if heavy vehicles are going to be present during construction and/or throughout the life of the enclosure. See manufacturer recommended practices and instruction including applicable sizes that would require internal bracing).

# 3.17 TELECOMMUNICATIONS EQUIPMENT RACKS, CABINETS AND BRACKETS

- A. Securely mount equipment racks, cabinets and wall mounted relay brackets to the building structure. Proper supports such as 3/8" lag screws and expansion anchors shall be used. Proper quantity of supports shall be utilized. Dry wall screws and other types of supports not specifically approved to support equipment are specifically prohibited. Submit mounting supports for approval before installation.
- B. Position racks, cabinets and wall mounted relay brackets in order to have minimum 3 foot clearance for easy access. Equipment racks, cabinets and relay brackets mounted on or against walls shall have 3 foot clearance in front of deepest component. Free standing equipment racks and cabinets shall have 3 foot clearance in front and rear of deepest components. Provide 3 foot clearance between free standing equipment racks or cabinets and any other obstruction to allow access from front to rear of rack or cabinet for maintenance.

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- C. The Electrical Subcontractor shall provide cable tray over each rack and cabinet as required to facilitate a neat and orderly installation of cables and to secure the top of the racks to the structure. Cables shall drop straight down to equipment racks. Cable trays shall be secured at both ends to the structure and connected together as required for a complete contiguous installation. Utilize proper supports to support the cable tray to the building structure as well as the equipment rack and cabinet. Submit mounting supports for approval before installation.
- D. Install terminating components such as patch panels (UTP, Fiber optic); cable management, etc. into the racks, cabinets and wall mounted relay brackets.
- E. Patch Panels: Mount patch panels onto the rack(s) in top-to-bottom fashion with the first patch panel mounted at the top of the rack. Uniquely label each patch panel according to the numbering convention outlined in the SECTION on labeling. Each port shall also have color coded identifiers. Refer to details on the Contract Drawings.
- F. Cable Management: All cables shall enter the wiring closet to within the equipment racks and/or brackets. Secure the bundle(s) to the rack strain relief and wire management behind the patch panels and cross connect block panels. Install horizontal and side-mounted vertical cable management panels and brackets for routing and management of patch cables. Maintain EIA/TIA and BICSI standards on bundling, supporting and bend radii.
- G. Once the cabling system has been installed and terminated, install all active components and surge protected power strips into the racks, cabinets and wall mounted relay brackets.
- H. Surge Protected Outlet Strips: Mount UPS and surge protected outlet strips per Manufacturer's directions. Refer to details on the Contract Drawings for mounting location.
- 3.18 TELECOMMUNICATIONS CABLE TERMINATIONS
  - A. All copper or fiber conductors of every cable shall be completely terminated at both ends.
- 3.19 TELECOMMUNICATIONS CABLE PATHWAYS
  - A. Provide all equipment and cabling for a complete installed operating system. In general, pathways, outlet boxes and grounding are provided by the Electrical Subcontractor.
  - B. All pathways provided under this Section shall comply with fill capacities as per Code, EIA/TIA 569A and BICSI.
  - C. Cable bending radius shall not be less than minimum required by EIA/TIA and BICSI.
  - D. Cabling installed concealed shall be supported from the building structure (e.g. cable trays, J-Hooks, snake tray, etc.).
  - E. Cables shall be installed no closer than 12 inches (305mm) to electrical equipment and wiring. When cables are required to cross power wiring, they shall only do so

perpendicular to the power wiring. Telecommunications cabling and power wiring shall only cross each other the minimal number of times as required due to building design limitations.

- F. Clearances: Clearances between cabling and other building systems as required by EIA/TIA 569A and BICSI shall be maintained throughout the building.
- G. All cables shall be installed in a neat and workman-like manner. Cables shall be installed parallel and perpendicular to building elements.
- H. Provide expansion fittings and adequate cable slack at all building expansion joints.
- I. Fire/smoke seal all conduits, raceways, sleeves, slots etc. where cables pass from one location to another, provided by electrical subcontractor.

# 3.20 SEALING OF PENETRATIONS AND OPENINGS

- A. Environmental Seals:
  - 1. Provide seals on raceways exposed to widely different temperatures, as in refrigerated or cold storage areas. Install seal to prevent circulation of air from warmer to colder sections through the raceway.
  - 2. Provide seals under device plates for outlets on walls between conditioned and nonconditioned spaces.
  - 3. Provide outlet plate gasket seals at all work area outlets on interior and exterior walls.
- B. Smoke and Fire Stopping Seals:
  - 1. Provide a seal around raceways or cables penetrating full height walls (slab to slab), floors or ventilation or air handling ducts so that the spread of fire or products of combustion shall not be substantially increased.
  - 2. Penetrations through fire-resistant-rated walls, partitions, floors or ceilings shall be fire stopped using approved methods and NRTL listed products to maintain the fire resistance rating.
  - 3. Installation restrictions of the listing agencies shall be strictly adhered to (e.g. 24 inch (610 mm) minimum horizontal separation between boxes on opposite sides of the wall, maximum square inch opening in wall).
  - 4. Fire stopping in sleeves or in areas having small openings that may require the addition or modification of installed cables or raceways shall be a soft, pliable, non-hardening fire stop putty. Putty shall be water resistant and intumescent.
  - 5. Fire stopping in locations not likely to require frequent modification shall be a NRTL listed putty or caulk to meet the required fire resistance rating.

- 6. Box penetrations into a fire rated wall or shaft shall have a fire stopping pad installed on the back of the box.
- 7. Fire stopping of cable trays and snake trays through walls shall be with NRTL listed bags to meet the required fire resistive rating and that will not allow products of combustion to pass through the protected opening. The NRTL listed bags shall be installed inside and on both sides of the opening as required to meet the required resistive fire rating of the wall.
- 8. Fire stopping materials shall be NRTL listed to UL 1479 (ASTM E814). Installation methods shall conform to a UL fire stopping system. Submit specifications and installation drawings for the type of material to be used. Fire stopping materials shall be as manufactured by 3M, International Protective Coatings Corp., Specified Technologies, Inc., Carborundum Company, RayChem, Nelson Fire Stop or approved equal.

# 3.21 SEISMIC SUPPORTS, SUPPLEMENTARY STEEL AND CHANNELS

- A. Provide all supports, supplementary steel and channels required for the proper Seismic installation, mounting and support of all work installed under this Section.
- B. All supports, supplementary steel and channels shall be furnished, installed and secured with all fittings, support rods and appurtenances required for a complete support or mounting system.
- C. Supplementary steel and channels shall be firmly connected to the building construction in a manner approved by the Architect prior to the installation of same. Submit to the Architect, via the General Contractor, the locations proposed for using supplementary steel and channels for the support of equipment, fixtures and raceways. The submittal shall indicate the mounting methods, size and details of the supports, channels and steel; it shall indicate also that weight which the supports, channels and supplementary steel is to carry.
- D. The type and size of the supporting channels and supplementary steel shall be of sufficient strength and size for seismic restraint and to allow only a minimum deflection in conformance with the channel and supplementary steel manufacturer's requirements for loading.
- E. All supplementary steel and channels shall be installed in a neat and workmanlike manner parallel to the walls, floor and ceiling construction. All turns shall be made with 90 degrees and 45 degrees fittings, as required to suit the construction and installation conditions.
- F. All supplementary steel, channels, supports, and fittings, shall be Underwriters' Laboratories, Incorporated, approved, be galvanized steel and be manufactured by Steel City, Unistrut, Power-Strut, T. J. Cope, Chalfant or approved equal.

- G. Provide supports to meet the required Seismic rating as indicated under "Part One" of this Specification.
- H. Provide beam clamps with set screws (C-clamp type).
- I. Work under this Section shall be held in place by Seismic rated methods.
- J. Supporting from the roof decking will not be acceptable.
- K. Provide expansion anchors on masonry units or brick work. Power actuated supports will not be accepted.
- L. Provide stainless steel or corrosion resistant supports in corrosive areas on wet or damp areas.
- M. Support work from the building structure, independent of suspended ceilings, roof deck or other trades work. Where duct work, pipes, pipe racks, type of building construction materials or structural framing members provide obstruction or difficult support means, hanger rods shall be used in association with horizontal sections of steel support channels, in an approved manner.
- N. All work shall be installed in a rigid and satisfactory manner and shall be supported by bar hangers in frame construction or shall be fastened directly with wood screws on wood, bolts with expansion shields on concrete or brick toggle bolts on hollow masonry units, and machine screws or welded threaded studs on metal. Threaded studs of the proper type and holding capacity driven in by a power charge and provided with lock washers and nuts are acceptable for mounting of equipment on solid concrete walls or slabs.
- O. Obtain written permission from the General Contractor allowing use of power activated charges. Use only properly trained and licensed operators.
- P. Do not use power charge driven supports for any work that is to be hung from a horizontal surface without written permission from the Architect.
- Q. Preset inserts of the proper type and holding capacity shall be used in overhead slab construction wherever possible.
- R. Provide lateral supports for work to prevent excessive movement during a seismic event using rods, braces or galvanized or stainless steel cables.
- S. Pendants, supports or hanging rods longer than 12 inches (300mm) shall be laterally braced.
- T. Where installed in damp, wet and areas requiring wash down, all surface mounted panels, boxes, junction boxes, conduit, etc., shall be supported by spacers to provide a clearance between wall and equipment.

# 3.22 TELECOMMUNICATIONS CABLE SUPPORTS

- A. Provide strain relief hardware for backbone cables at each floor level as they pass from one floor to the next.
- B. Provide hook and loop (Velcro) cable wraps at all panels, equipment racks and cabinets. Cable ties are specifically prohibited.
- C. Cable ties for horizontal cables shall be secured with minimum required compression in order to secure the cables properly without impeding the signal transmission rating (geometry) of the cable. Hook and loop (Velcro) cable wraps may be used in lieu of cable ties for copper cables only. Cable-ties are specifically prohibited for fiber optic cables.
- D. When pathways are not provided or specified, provide J-Hook supports from the building structure as required for cable runs to the cable drop location. Maximum distance between supports shall be five feet (1 500mm) depending on the structural elements of the building. Maximum number of cables per support shall be thirty. Provide additional supports as required when cable quantities exceeds thirty and to maintain required bending radius of cables. Cables installed exposed or in areas subject to abuse (below 10 feet (3m) above finished floor) or in accessible areas shall be installed in conduit.
- E. All cables shall be supported directly from building structure. Under no circumstance shall cable be installed using cross bracing, plumbing/sprinkler pipes, ceiling systems or any other system that is not a specifically approved method to independently support cables. Cables shall not be allowed to rest on ceiling tiles, duct work, piping, etc. Supports shall be provided as required in order for cables to avoid contact with any other building system. Bundle cables in groups by Room.

#### 3.23 TELECOMMUNICATIONS CABLE PROTECTION

- A. Provide bushings in all metal studs and the like where cables will pass through. Bushings shall be of two (2) piece construction with one piece inserted through the opening and the second piece locking it into place. Single piece bushings with locking tabs or friction fit are specifically prohibited.
- B. Cables to be installed in existing enclosed open bays or furred spaces where conduit stubs are not provided, shall be protected from chafing or any damage. The Installer shall verify that the warranty shall not be violated before installing any cabling in these locations.
- C. Provide cutting, coring, sleeves and bushings and seal as required at all penetrations.
- D. Fiber optic backbone cables shall be installed in inner duct.
- E. Cables damaged during installation shall not be repaired. They shall be completely replaced with new cable.

## 3.24 TELECOMMUNICATIONS CABLE INSTALLATION

- A. All cabling shall be installed in conduit where indicated on plans, or shall be installed open using other methods, approved by architect, such as J-Hooks, cable tray & snake tray.
  - 1. Install wiring, per manufacturers recommendations.
  - 2. All wiring shall be new, concealed in pipe where exposed.
  - 3. Install wiring for detection and signal circuit as specified. Make wiring connections to new or existing door hardware devices as required
- B. All conduits, raceways, inner duct, etc. shall have pull strings remaining after cable is pulled.
- C. Impedance and Level Matching: Carefully match input and output impedances and signal levels at signal interfaces. Provide matching networks where required.
- D. Control Circuit Wiring:
  - 1. Install control circuits in accordance with NFPA 70 and as indicated. Provide number of conductors as recommended by system manufacturer to provide control functions indicated or specified.
  - 2. All housings are to be located as specified and shown on drawings.
  - 3. Make installation in strict accordance with approved manufacturer's drawings and instructions.
  - 4. The Installer shall provide necessary transient protection on the AC power feed, all station lines leaving or entering the building, and all central office trunks. All protection shall be as recommended by the equipment supplier and referenced to earth ground.
- E. Splices, Taps, and Terminations:
  - 1. Make splices, taps and terminations on numbered terminal punch blocks in junction, pull, and outlet boxes, terminal cabinets and equipment enclosures.
  - 2. Identification of Conductors and Cables: Use color coding of conductors and apply wire and cable marking tape to designate wires and cables so all media are identified in coordination with system wiring diagrams.
- F. Weatherproofing: Provide weatherproof enclosures for items to be mounted outdoors or exposed to weather.
- G. Typical Layouts and requirements of the specified systems:

- 1. Typical layout:
  - a. Equipment racks and cabinets
  - b. Backbone cabling
  - c. Headend equipment
- 2. Typical layout of telecommunications equipment racks and cabinets
  - a. Each equipment rack and cabinet shall contain the following equipment:
    - 1) Fiber optic patch panel:
      - a) Fiber optic cable management
      - b) Surge protector power strip
      - c) Patch panels Horizontal distribution
      - d) Horizontal distribution cable management
      - e) Vertical cable management
      - f) Patch cords
  - b. Provide space for the installation of network electronics equipment in the equipment racks.
  - c. Furnish and install horizontal cable management between each patch panel (fiber optics, Hub distribution, Horizontal distribution, and telephone distribution).
  - d. Furnish and install horizontal distribution patch panels in each wire center with sufficient ports to terminate all modular jacks shown on the Contract Drawings plus twenty percent spares. The exact number of modular jacks and horizontal distribution patch panels shall be obtained from the Contract Drawings.
  - e. Furnish and install all equipment racks and cabinets required to support the aforementioned equipment.
  - f. The MDF room shall contain fiber optic patch panel quantities which correspond to the total number of fiber optic patch panels located in the IDF rooms.
  - g. Grounding bars shall be installed under SECTION 16000. Furnish and install the required grounding to ensure that all of the aforementioned equipment is grounded and bonded.
- 3. Headend:
  - a. The headend consists of connecting hardware for the following:
    - 1) Data System
    - 2) Voice System
    - 3) Video System
    - 4) Sound System
  - b. Furnish and install all IDC cross connect block panels and hardware for terminating telephone, video all-call, administration console system and satellite dish cabling at the headend. Terminations of these systems onto the IDC cross connect block panels at the headend shall be provided under this Section.
  - c. IDC cross connect block panels and hardware for terminating Clocks, Speakers and all control wiring shall be furnished and installed under SECTION 16740. Terminations of these systems onto the IDC cross connect block panels at the headend shall be provided under SECTION 16740.
  - d. Furnish and install the specified UTP cables from Telephone Company demarcation to headend. Terminate both ends of each cable onto IDC cross connect block panels.

- e. Final terminations from the IDC cross connect block panels to the headend equipment shall be provided by the headend equipment installer.
- f. Coordinate with the headend equipment installer and the Electrical Subcontractor for:
  - 1) The installation of all the IDC cross connect block panels at the headend equipment. Installation shall be neat in appearance.
  - 2) The final terminations at the headend.

# 3.25 TELECOMMUNICATIONS SYSTEM GROUNDING

- A. General:
  - 1. The Telecommunications systems comprising of cable tray, snake tray, equipment cabinets, racks and non-current carrying metallic parts shall be grounded according to the Electrical Code.
  - 2. In general, the grounding shall be as specified, as indicated on the Contract Drawings and as required by the Electrical Code and Local Authorities.
- B. Methods:
  - 1. Provide equipment grounding connections for integrated sound, voice and video systems as indicated. Tighten connections to comply with tightening torques specified in UL Standard 486A to assure permanent and effective grounds.
  - 2. Ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.
  - 3. The installer shall provide all necessary transient protection on the AC power feed and on all station lines leaving or entering the building.
  - 4. The installer shall note in his system drawings, the type and location of these protection devices as well as all wiring information.
  - 5. The installer shall furnish and install a dedicated, isolated earth ground from the central equipment rack and bond to the incoming electrical service ground buss bar.
- C. Telecommunications Grounding:
  - Raceways including wireways, conduits, cable trays, snake tray, etc. installed for low voltage or fiber optic cabling shall be made electrically continuous for grounding purposes. Provide hollow braided copper jumpers between sections equal to Belden No. 8669 (60A Ampacity). Provide equal impedance conductor for aluminum raceway.

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a. Bond raceways to the ground bus located in the equipment cabinet. Bond raceways in each room they terminate in.

## D. Telecommunications Equipment Bonding & Grounding:

- 1. Provide grounding and bonding as required by EIA/TIA-607 standards, codes and the equipment manufacturers.
- 2. Make final grounding conductor connection to cabinet around bus.
- 3. Each individual piece of equipment shall have an individual grounding conductor to the ground bus within the cabinet.
- 4. All equipment shall have bonding jumpers between them (i.e. between cable tray, snake tray and equipment rack, etc.).
- 5. Equipment integral to an equipment rack (i.e. shelves, panels, cable management, etc.) shall be considered bonded.
- 6. Equipment that is not integral to an equipment rack (i.e. shelf mounted electronic equipment, cable tray, snake tray, etc.) require individual bonding jumpers between the equipment and the rack.
- 7. Properly clean and prepare all surfaces for a complete bonding and grounding termination.
- 8. Install grounding bus in all equipment racks and cabinets.

#### 3.26 UTP CABLING SYSTEMS

- A. The general topology shall be a "hierarchal star" configuration. All segments shall originate in NRTL listed patch panels located in the telecommunication equipment racks/cabinets and end at the Work Area Outlet.
- B. Backbone cables shall be installed in EMT between the headend (MDF) and the telecommunications closets (IDF).
- C. Routing:
  - 1. All cabling shall be installed in conduit where indicated on plans or shall be installed open using "J" hooks or Snake Tray.
  - 2. Cables shall be routed, in large groups, down main cable pathways, until a direct path to the point of access to the work station outlet can be taken. At that point, cables shall be routed, above all building systems, to the outlet location in accordance with standard installation practices, as described herein.
  - 3. Multiple cables to individual rooms shall be pulled as a bundle and terminated at each end in sequential order so that labeling within a room location is in sequence.

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- 4. When not in conduit or tray, cables shall be supported to the deck and/or beams, every five feet throughout the length of their installed run. Hangers, clips, and other methods of grouping the cables and keeping them away from other systems installed in the building are to be provided and installed. Ensure that hangers and other methods of securing cable do not compress cable or damage insulation.
- 5. Route cables (minimum of 12 inches (305mm) away) to avoid light ballasts, transformers, power wiring and other electrical devices so that there is no EMI or RFI interference with data transmission.
- 6. Cables shall be attached to beams with minimal disruption of the fire proofing. Care should be taken to assure that fire proofing removal is not excessive. The contractor shall be responsible of restoring the fire proofing to appropriate levels. Restoration will be verified by the general contractor.
- 7. Cable routes shall be with 90 degree angles whenever possible. Cables shall not be installed randomly or diagonally through the building.
- 8. Cables installed partially or fully within the Communications Room shall be routed through and secured in the cable tray wherever possible. No cables are to be routed across the rooms at angles, or are the cables to be run from one portion of the room or tray to another. Cables placed in the cable tray are to be laced frequently to keep them neatly bundled and not permitted to shift from one side of the tray to the other as they are routed in the tray.
- 9. Station cables shall be routed to fixed wall locations through EMT to back box. Secure and store four feet of slack cable above ceiling at cable entrance to EMT.
- D. All horizontal cables shall be terminated at their respective equipment racks/cabinets.
- E. All cables shall have both ends completely terminated at their respective patch panel and Work Area Outlet. Individual conductors shall be trimmed flush with IDC block. Cables indicated to be "spare" shall have one end terminated at their respective patch panel or cross-connect block and the other end shall be hermetically sealed with a polyolefin heat-shrinkable cap. Provide RayChem Co. or approved equivalent after testing. Tape shall not be approved.
- F. The total length of permanently installed cable for any complete segment shall not exceed 295 feet (90m). Do not splice or otherwise re-terminate any cable used, terminate only at the patch panels, cross connect blocks and Work Area Outlets. Route cables (minimum of 12 inches (305mm) away) to avoid light ballasts, transformers, power wiring and other electrical devices so that there is no EMI or RFI interference with data transmission. Permanently label all cables six inches from the connector at each end, according to the numbering convention outlined in the section on labeling. All cables shall be terminated at outlets, patch panels or cross connect blocks Only.
- G. Maximum pulling tension shall not exceed 25 lbs/ft. when installing cables.

H. Modular Jacks: Each Category 6 jack shall have a Category 6 home cable run back to its associated patch panel or cross connect block.

### 3.27 PATCH PANELS, PATCH CORDS AND LINE CORDS

- A. Provide sufficient quantities of Category 6 patch panels in each wire center (MDF, IDF) to allow for twenty percent (20%) growth.
- B. Provide Patch Cables as Follows:
  - 1. Provide one UTP patch cable for each horizontal cable terminated within the patch panel.
    - a. 50% of patch cables shall be 9 feet.
    - b. 50% of patch cables shall be 5 feet.
  - 2. Provide 12 duplex SC Fiber optic patch cables for each 12-strands of fiber optic cable in the project for use at each Fiber optic patch panel.
  - 3. Patch cable lengths shall be field measured before ordering.
- C. Provide Line Cords as Follows:
  - 1. Provide one 10 foot (3 m) category 6 line cord cable for each data connector installed in Data Work Area Outlet.
  - 2. Provide one coax line cord cable for each video connector installed in Work Area Outlets.
  - 3. All line cord cable lengths shall be field measured before ordering.

# 3.28 TELECOMMUNICATIONS CABLING LABELING

- A. Labeling procedure shall meet EIA/TIA 568B Series standard and 606 and BICSI Standards and shall be pre-approved by the Architect. Hand-written and embossed type labels are specifically prohibited.
- B. Permanently label, using pre-printed labels, all cables and terminations exactly as defined herein:
  - 1. Label each equipment rack and cabinet.
  - 2. Label patch panels and cross connect blocks numerically, top-to-bottom
  - 3. Label patch panel and cross connect blocks ports numerically.
  - 4. Label the cable segments as indicated on Drawing Schedules. Each outlet will be designated by the incoming cable, and will be labeled accordingly.
  - 5. Label each equipment rack, panel and cross connect block uniquely.

- 6. Refer to Administration section for specific labeling requirements.
- C. Use industry standard EIA/TIA and BICSI color codes as specified herein and maintain consistent color coding throughout the building.

# 3.29 SLEEVING AND BUSHINGS

- A. Raceways and openings shall be laid out in advance to permit their provision in the work. Sleeves and raceway shall be set before new masonry is constructed. Any extra work required where sleeves or raceways have been omitted or improperly placed shall be performed at the expense of the Installer which made the error or omission, including coring.
  - 1. Existing Construction: Where raceways and cable pathways must pass vertically through existing construction, coring shall be located as per the guidelines shown on the Contract Drawings.
- B. Provide sleeves for raceways, busways, snake trays and cable trays penetrating floors, fire walls, or smoke partitions. Install approved material to provide for fire stop.
- C. Provide waterproof seals inside and outside raceway when penetrating from the exterior or underground.
- D. Except where specified otherwise sleeves shall be made of galvanized metal to finish flush with building finish lines.
- E. Provide acoustic sealer in sleeves between occupied spaces.
- F. Sleeves installed in floors shall extend two inches (50mm) above the finished floor unless specifically indicated otherwise. Sleeves for busways shall extend four inches (100mm) above the floor.
- G. Provide sleeves in masonry construction and in full height (slab to slab) walls.
- H. Provide sleeves for any openings requiring fireproofing.
- I. Bushings in all conduits shall be provided by the Electrical Subcontractor in all metal studs and other openings where cables will pass through. Bushings shall be of two piece construction with one piece inserted through the opening and the second piece locking it into place. Single piece bushings with locking tabs or friction fit are specifically prohibited.

### 3.30 TELECOMMUNICATIONS SYSTEMS TESTING

- A. Cabling systems shall meet or exceed the electrical and transmission characteristics of the systems specified.
- B. Cable segments and links shall be tested from both ends of the cable for each of the construction phases. (Verify that cable labeling matches at both ends).
- C. Test Reports: Upon completion and testing of the installed system for each of the construction phases, test reports shall be submitted in booklet form showing all factory and field tests performed. Organize test reports by each telecommunication closet. Test reports shall be typewritten. Provide documentation and a copy of the standards being tested to. Indicate where test is in compliance, and acceptable limits for the test, measured value of the test and application involved. Submit test report formats for approval during shop drawing review.
- D. The system shall not be considered certified until the tester has acknowledged, in writing, that the performance of the physical layer of the system has been fully tested and is operational at the completion of the installation phase.
- E. Equipment Manufacturer's Factory Test:
  - 1. Each cable and equipment manufacturer shall factory test their respective products being installed on this project and provide test reports at time of delivery. Provide separate respective test reports indicating that they meet or exceed the latest applicable TIA/EIA Standards and technical bulletins.
  - 2. All other products relative to this specification shall be tested to its respective industry strictest standards.
  - 3. Each manufacturer shall factory test their respective cable or equipment provided to this project at several lower frequency levels, including the minimum and maximum frequency level indicated herein. The test reports shall indicate test results for at least five equal incremental frequency levels including the maximum required.
- F. Field Testing Equipment: Submit during shop drawing review on the testing equipment to be utilized on this project. The installer shall test all cables installed under this Section. Provide a hard copy of all field-testing.
  - 1. Unshielded and Shielded twisted pair Testing Equipment:
    - a. The cable tester shall have a wide variety of preprogrammed cable types as an integral part of its testing system and have the ability to test cables less than 6 feet (6ft.) from the test point.
      - 1) Cable tester shall be NRTL certified for EIA/TIA TSB95, Level 2E.
  - 2. Fiber Optic Test Equipment: Cable testers shall be Optical Power Meter and High Resolution Optical Time Domain Reflectometer (OTDR) The cable tester shall be NRTL certified for compliance to latest EIA/TIA 568B Series standard and TSB72 performance requirements, at 850, 1300 and 1550 nm.
- G. UTP Cabling Systems:
  - 1. Test each UTP cable and passive components. Provide certification that entire installation of UTP cabling, equipment and jacks are NRTL certified meeting or

exceeding a minimum of category performance specified on all four pairs of conductors. Tests shall indicate each cable segment performance as well as each cable overall channel performance (includes patch cables at both ends of cable segments).

- 2. Tests shall be based on each pair of conductors and not the aggregate multiple pair results.
- 3. UTP Cable: Test all installed cable segments end-to-end, from the telecommunications closet horizontal patch panel/cross connect block panel to each Work Area Outlet and from each [telecommunications closet backbone patch panel/cross-connect block panel] to respective main cross connect, and from the Work Area Outlet to the main cross-connect (through patch cables or cross- connect wiring) with a Signal Injector, Graphical Link Testing Meter and Time Domain Reflectometer (TDR) for compliance to latest EIA/TIA performance requirements, as well as NEXT, ELFEXT, structural return loss, alternating power sum, opens, shorts, continuity, cable length, and Characteristic Impedance.
- 4. Test results shall include:
  - a. Wire Map
  - b. Length
  - c. Attenuation
  - d. Near-end Crosstalk (NEXT) Loss
  - e. NEXT (Near End Cross Talk)
  - f. PS-NEXT (Power Sum Near End Cross Talk)
  - g. ELFEXT (Equal Level Far End Cross Talk)
  - h. PS-ELFEXT (Power Sum Equal Level Far End Cross Talk)
  - i. Propagation Delay
  - j. Delay Skew
  - k. Impedance
  - 1. Return loss
  - m. Wire map will determine the following:
    - 1) Continuity to the remote end
    - 2) Shorts between any two or more conductors
    - 3) Crossed pairs
    - 4) Reversed pairs
    - 5) Split pairs
    - 6) Any other miss wiring
  - n. Below are the current testing requirements in addition to the basic wire-map and length tests for Category 5E cables and the respected limits for each test parameter.
    - 1) Attenuation: 21.6dB Link 24.0dB Channel
    - 2) NEXT: 32.3dB Link 30.1dB Channel
    - 3) PS-NEXT: 29.3dB Link 27.1dB Channel
    - 4) ELFEXT: 20.0db Link 17.4dB Channel
    - 5) PS-ELFEXT: 17.0db Link 14.4dB Channel
    - 6) Return Loss: 12.1dB Link 10.0dB Channel

- 7) Prop. Delay: 510ns Link 548ns Channel
- 8) Delay Skew: 45ns Link 50ns Channel
- o. Length is determined by the propagation of delay of signals and depends on the twist helix and dielectric materials. Note: Calibration of nominal velocity of Propagation (NVP) is critical to the accuracy of the length measurements when estimating from either frequency or time domain methods.
- p. The maximum physical lengths for:
  - 1) Basic link = 94 meters including test equipment cords.
  - 2) Channel = 100 meters including equipment cords and patch cords.
  - 3) Test results shall be reported in feet.
- q. Attenuation: Link attenuation shall include all connection hardware.
- r. Near end Cross Talk (NEXT) Loss: Next and PS-NEXT shall be measured form both ends of the cable or link under test. For accurate measurements, at least 380 linearly spaced sample points in a 100 MHZ sweep are required.
- 5. When a test result is closer to the test limit than the accuracy of the field tester, the result shall be marked with an asterisk (\*). Provide documentation to interpret results marked by an asterisk.
- 6. The specified accuracy of the tester shall be indicated on the testing results. Limits of accuracy for the tester shall not exceed:
  - a. Random Noise Floor: 50-15 log (f/100 dB)
  - b. Residual NEXT: 40-15 log (f/100 dB)
  - c. Output Signal Balance: 27-15 log (f/100 dB)
  - d. Dynamic Accuracy:  $\pm 1 \text{ dB}$
  - e. Length Accuracy:  $\pm$  meter  $\pm$  4%
  - f. Return Loss: 15 dB
- 7. The Link test shall include all patch cables and line cords.
- 8. Any reconfiguration of link components after testing may change the performance of the link and thus invalidate the previous test result. These links shall be retested.
- 9. In general, provide certification that all cabling and equipment installed has been tested for wire mapping, cable length, NEXT, PS-NEXT, attenuation, ELFEXT, PS-ELFEXT, Return Loss, Prop. Delay and Delay Skew, shorts, opens, polarity, split pairs and that the pin configuration is consistent throughout the entire systems. (Category 5E backbone testing shall include testing for Powersum.)
- H. Test for Continuity and Short Circuits.

# 3.31 TELECOMMUNICATIONS SYSTEMS DOCUMENTATION

A. Label all equipment as herein specified.

- B. Provide:
  - 1. Provide Building Telecommunications Cabling Systems Administration Report indicating EIA/TIA-606 required information.
  - 2. Hard copy documentation of test results for every cable segment and link in 3-ring binder. Documents shall include measured values as well as whether or not the test passed.
  - 3. "Record" drawings indicating location of all equipment including but not limited to Work Area Outlets, patch panels, cross connect blocks, on each segment and cable routing. Indicate labeling for each piece of equipment.
  - 4. Record drawings indicating actual cable routes and outlet identifiers. Provide respective copies mounted in each telecommunications closet, and the main cross connect.
- C. Provide "as-built" Drawings on AutoCAD Version 12 or higher to the Owner. Obtain copy of original Drawings from the Architect.
- D. Submit NRTL certification that the voice, data and video cabling systems meets the transmission requirements of EIA/TIA 568B Series standard and TSB72.
- E. Submit NRTL certification that the fiber optic cabling system meets the transmission requirements of TIA/EIA 455, 492AAAA, EIA/TIA 568B Series standard and TSB72.
- F. Provide installer/tester certificate indicating compliance with transmission and reliability requirements for all components of the systems installed.

## 3.32 TELECOMMUNICATIONS SYSTEM PROJECT OWNER COORDINATION

- A. Prior to Substantial Completion of the project and in ample time to address and resolve any coordination issues, request and arrange meetings between the Owner, Owner's Vendors and Consultants, Architect and General Contractor to discuss the Scope of Work for each system being provided and the interface required for a fully functional and operational system upon project completion. Initial meetings shall be scheduled three months prior to the scheduled Substantial Completion date or as soon as Submittals are submitted and reviewed for projects with shorter schedules.
- B. At these meetings the required interface with the Owner shall be reviewed, requests for information required to complete programming or for coordination shall be presented and system operation and philosophy shall be discussed.
- C. Additional meetings shall be held as requested by any party so that all issues are resolved and with the goal and intent being that all systems are fully operational and functional upon project Substantial Completion and that the responsibility for all components required is clearly established.

## 3.33 CLEANING UP

- A. Upon completion of all work, and testing, thoroughly inspect all exposed portions of the installation and completely remove all exposed labels, markings, and foreign material.
- B. The interior of all boxes and cabinets shall be left clean; exposed surfaces shall be cleaned and plated surfaces polished.
- C. Repair damage to finish surfaces resulting from work under this Section.
- D. Remove material and equipment from areas of work and storage areas.
- E. All equipment shall be clean from dirt, dust, and fingerprints prior to final acceptance.
- F. Touch up all damaged pre-finished equipment using materials and methods recommended by the Manufacturer.

## END OF SECTION 26 00 00

### SECTION 31 20 00 - EARTH MOVING

#### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

- A. This Section includes the following:
  - a. Site excavating, grading, filling, backfilling, compacting, and preparing sub-grades to the lines and grades shown to the lines and grades herein or as indicated on the Drawings for the entire project (whichever is deeper) including but not limited to: foundations, footings, retaining walls, slab-on-grade components, site utility lines and structures, walks, pavements, lawns, athletic fields and plantings.
  - b. Processed aggregate for pavements and other improvements.
  - c. Reclaimed pulverized pavements (reclaimed pavement borrow) for road sub base.
  - d. Stone screenings for mow strips and other site improvements.
  - e. Crushed Stone and porous fill for pavements, under building slabs and footings.
  - f. General fill for establishing project sub-grades under paved areas and where shown on the Drawings.
  - g. Excavation of rock and/or boulders, including replacement with suitable earthwork materials.
  - h. Rehandling, hauling and placing of stockpiled materials for use in refilling, filling, backfilling, grading and such other operations. Stockpiling shall include protection to maintain materials in a workable condition.
  - i. Removal of encountered unsatisfactory soils, including lawful on-site disposal and replacement with suitable earthwork fill material.
  - j. Utility bedding material for site utilities.
  - k. Securing trenching permit
  - 1. Protecting existing, utilities, roads, pavements, lawns, plantings and other improvements from damage due to construction;
- B. Related Sections include the following:
  - a. Section 012200 Unit Prices
  - b. Section 014104 Special Inspections and Structural Testing
  - c. Section 024113 Selective Site Demolition
  - d. Section 210000 Fire Protection
  - e. Section 220000 Plumbing
  - f. Section 260000 Electrical
  - g. Section 312314 Structural Fill Placement
  - h. Section 312324 Structural Fill
  - i. Section 312500 Erosion Control
  - j. Section 315004 Earthwork Protection
  - k. Section 321216 Hot Mix Asphalt Pavement

- 1. Section 321313 Cement Concrete Pavement
- m. Section 321613 Precast Concrete Curb
- n. Section 329300 Trees, Plants & Groundcovers
- o. Section 330000 Site Utilities
- C. This project is Unclassified
  - a. Unclassified excavation shall comprise and include the satisfactory removal and disposal of all materials encountered within the lines and grades shown in the drawings and in the specifications regardless of the nature of the materials, and shall be understood to include but not limited to, earth, topsoil, subsoil, hardpan, fill, foundations, pavements, curbs, piping, footings, bricks, concrete, abandoned drainage and utility structures, debris, and materials classified as unsuitable materials. All excavations and associated backfill within the lines and grades shown in the drawings and in the specifications, except in rock as defined below, shall be included in the base bid.
  - b. The Contractor will be paid for excavations beyond the lines and grades shown in the drawings and specifications using the Unit Prices found under Section 012200 and following the method of measurement and verification of quantities as defined in this specification.

## 1.3 **DEFINITIONS**

- A. Backfill: Soil materials used to fill an excavation.
  - a. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
  - b. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Layer placed between the subbase course and proposed improvements.
- C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow: Satisfactory soil or earthwork products imported from off-site for use as fill or backfill.
- E. Excavation: Removal of material encountered above subgrade elevations.
  - a. Additional Excavation: Excavation below subgrade elevations as directed by Architect. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
  - b. Mass Excavation: Excavations more than 8 feet in width and pits more than 30 feet in either length or width.
  - c. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- F. Fill: Soil materials used to raise existing grades.
- G. Mass Rock or Earth: Excavated material that is greater than 8' in both length and width.

- H. Rock: Excavated rock material in beds, ledges, unstratified masses, and conglomerate deposits that cannot be removed by rock excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
  - a. Excavation of Footings, Trenches, and Pits: Late-model, track-mounted hydraulic excavator; Caterpillar 325D or equal, equipped with a 42-inch wide, short-tip-radius rock bucket.
  - b. Mass Excavation: Late-model, track-mounted loader; Caterpillar 963C or equal; or Late-model, track-mounted hydraulic excavator; Caterpillar 325D or equal, equipped with a 42-inch wide, short-tip-radius rock bucket.
- I. Boulder: An excavated, individual rock fragment or natural stone with a volume of less than 1 c.y in trenches and less than 3 c.y. in mass earth excavations. All boulders exceeding these definitions shall be classified as "rock" and shall fall within "mass" or "trench" subcategory based on definitions in this section. Material classified as "Rock" and excavated and paid for shall not be eligible to be classified as "boulder" for additional payment purposes.
- J. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- K. Subbase Course: Layer placed between the subgrade and base course for pavement or other site improvements.
- L. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.
- M. Trench Rock or Earth: An excavation of any length where the width is less than twice the depth and where the shortest distance between the excavation sides does not exceed eight (8') feet. All other excavations shall be defined as open excavations.
- N. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.
- O. SSHB: "Standard Specifications for Highways and Bridges", Commonwealth of Massachusetts, Massachusetts Highway Department, 1988 edition, including all supplements to date.
- P. Unsatisfactory/Unsuitable Soils: Any material generated, excavated and/or collected by earth moving activities or other contract work that does not meet any of the product specifications contained in contract documents.

### 1.4 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specifications Sections.
- B. Product Data: For the following:
  - a. Each type of plastic warning tape.
  - b. Drainage fabric.

- c. Separation fabric.
- C. Samples: For the following:
  - a. 50-lb samples, sealed in airtight containers, of each proposed soil material from onsite or borrow sources, for Owner's independent laboratory testing agency. Samples shall be delivered to the site seven (7) calendar days in advance or time planned on incorporating them into the work. Owner's testing lab will confirm submitted test results and compaction curve data. Submit the name of each material supplier and specific type and source of each material. Any change in source throughout the job requires approval of the Architect and the Geotechnical Engineer
  - b. 5-lb sample to Architect's office for visual conformance confirmation.
  - c. 12-by-12-inch sample of drainage fabric.
  - d. 12-by-12-inch sample of separation fabric.
  - e. 4-foot strip of each type of warning tape.
- D. Material Test Reports: From an approved qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
  - a. Complete mechanical/sieve analysis classification according to SSHB and ASTM D 2487 for every 200 cubic yards of on-site or borrow soil material proposed for fill and backfill. Washed sieve shall be performed for 200 sieve on all materials.
  - b. Laboratory compaction curve according to ASTM D 1557 for each on-site or borrow soil material proposed for fill and backfill.
  - c. Report of actual unconfined compressive strength and/or results of bearing tests of each stratum tested.
  - d. Test sampling shall conform to the requirements of ASTM D-75, and ASTM D-3665.
- E. All installation of materials prior to testing and/or review and response by Architect is at Contractor's risk.
- F. Submit a dewatering plan for review by the Geotechnical Engineer at least two weeks before the start of construction.
- G. Submit a temporary earth support system layout and design at least two weeks before the start of construction.

### 1.5 QUALITY ASSURANCE

- A. Comply with applicable requirements of NFPA 495, "Explosive Materials Code" and SSHB, Section 120 and State Fire Codes.
- B. The Owner may retain the services of a Geotechnical Engineer to periodically observe the earthwork operations including observing the subgrade of footings, slabs, parking lots, and roadways.
- C. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and rock-definition testing, as documented according to ASTM D 3740 and ASTM E 548.

- D. Pre-excavation Conference: Conduct conference at Project site to comply with requirements in Division 1, Section "Project Coordination".
  - a. Before commencing earthwork, meet with representatives of the governing authorities, Owner, Architect, Engineer, consultants, independent testing agency, and other concerned entities. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least 3 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.
- E. Testing: Compaction tests will be required by the Owner and will be paid for by the Owner. No specific testing schedule has been established at this time. If tests indicate that density requirements have not been achieved, the Contractor shall continue compacting.

All retesting in these areas shall be paid for by the Contractor. See Division 1, Section "Quality Control Services". Contractor is required to compensate testing laboratory, directly, for all material test reports.

- F. Density and Compaction Testing: The Contractor is responsible to schedule compaction tests and to allow adequate time for the proper execution of said tests.
- G. Protect all benchmarks, monuments, and property boundary pins. Replace if destroyed by Contractor's operations.
- H. The presence of the independent testing and inspection firm and/or the Geotechnical Engineer does not include supervision or direction of the actual work of the Contractor, his employees or agents. Neither the presence of the independent testing and inspection firm and/or the Geotechnical Engineer, nor any observations and testing performed by them, nor failure to give notice of defects shall excuse the Contractor from defects discovered in his work.
- I. Costs related to retesting due to unacceptable quality of work and failures discovered by testing shall be paid for by the Contractor at no additional expense to Owner.

### 1.6 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated. Note that operations of other facilities must be maintained throughout construction.
  - a. Notify Architect not less than two days in advance of proposed utility interruptions.
  - b. Do not proceed with utility interruptions without Architect's written permission.
  - c. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active. Contact Digsafe (811) and the Carver Operations and Maintenance Department prior to any earthwork or demolition operations.
- C. Contractor is responsible to properly obtain a trenching permit per 520 CMR 14.00 from appropriate local or state agency.

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### 1.7 UNIT PRICES

- A. Rock Measurement: Volume of rock actually removed, measured in original position, but not to exceed the following:
  - a. 12 inches outside of concrete forms at footings.
  - b. 6 inches outside of minimum required dimensions of concrete cast against grade.
  - c. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
  - d. 12 inches outside width and bottom of drainage structures, including catch basins and manholes.
  - e. Pavements: bottom elevation of the specified subbase course.
  - f. 6 inches beneath pipe in trenches, and 24 inches wider than inside diameter of the pipe.
  - g. Planting Areas: 48" below proposed finish elevations area as specified for typical planting installation.
  - h. Lawn Areas: 18" below indicated finish grades.
- B. Boulder Measurement: Volume of all boulders excavated and slated for removal from site. Individual boulders to be measured by method mutually agreed upon by the Contractor and Owner.
- C. Limits and measurements do not represent dimensions of excavation requirements mandated by safety and other regulatory agencies. Rock required to be removed to conform to safety regulations will not be measured for payment.

### 1.8 COORDINATION

- A. Prior to start of earthwork, the Contractor shall arrange an onsite meeting with the Architect, Engineer, the Geotechnical Engineer, and the independent testing firm for the purpose of establishing the Contractor's schedule of operations, and scheduling observation and testing procedures and requirements
- B. As construction proceeds, the Contractor shall be responsible for notifying the Geotechnical Engineer and the independent testing firm prior to the start of earthwork operations requiring observation and/or testing.
- C. The work of this Section shall be coordinated with that of other trades affecting, or affected by, this work, as necessary to ensure the steady progress of all work of the Contract.

### 1.9 SUBSURFACE SOIL DATA

A. Subsurface explorations have been performed at the site by the Geotechnical Engineer. The results of the explorations are included in the geotechnical report prepared by Briggs Engineering & Testing dated August 5, 2019.

- B. The subsurface explorations and geotechnical report were performed primarily for use in preparing the foundation design and are included for the convenience of the contractor. Use and interpretation of these data for purposes of the work shall be the responsibility of the Contractor. Subsurface conditions and groundwater levels are not considered as accurate for any times or locations other than the specific time and location of each of the explorations.
- C. Contractor may, at his own expense, conduct additional subsurface testing as required for his own information after approval by the Owner.

### PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Obtain off-site material as herein specified consisting of clean granular material from off-site Borrow Pits as approved by the Soils Laboratory prior to trucking to the site.
  - a. Maintain borrow source material in a clean condition, uncontaminated by organic soils or other deleterious materials. If borrow material from the cut sectors is stockpiled, such stockpiles shall be suitable protected, drained, and maintained to insure full availability of the materials.
  - b. Material weighing less than 100 lbs. per cubic foot (maximum laboratory dry weight) is not acceptable as fill material. Placed material shall be free of all objectionable material such as leaves, grass, and roots.

#### 2.2 PROCESSED GRAVEL FOR SUB-BASE

A. Processed gravel for sub-base, where called for on the Drawings and Specifications shall be from off-site sources and shall conform to the following gradation requirements of MHD Standard M1.03.0 Type 'C':

<u>Sieve Size</u>	% finer of weight		
2"	100		
1/2"	50-85		
No. 4	40-75		
No. 50	8-28		
No. 200	0-10		

## 2.3 GENERAL FILL (ORDINARY FILL)

A. Ordinary Fill should have a plasticity index of less than 6, and should meet the gradation requirements shown below. Ordinary Fill should be compacted in maximum 9-inch loose lifts to at least 95 percent of the Modified Proctor maximum dry density (ASTM D1557), with moisture contents within  $\pm 2$  percentage points of optimum moisture content and conform to the following gradation:

Sieve Size	<u>% finer by weight</u>		
6 Inch	100		
1 Inch	50-100		
No. 4	20-100		
No. 20	10-70		
No. 60	5-45		
No. 200	0-20		

### 2.4 GRANULAR FILL

A. Wherever granular fill is called for in the Drawings or Specifications, the material shall be brought from off-site sources and shall be free of ice, snow, sod, rubbish, or other deleterious material and conform to the following gradation:

<u>Sieve Size</u>	% finer by weight		
3 Inch	100		
1 Inch	60-100		
No. 4	25-90		
No. 200	0-25		

### 2.5 GRAVEL BORROW

A. Gravel borrow fill where called for on the Drawings and Specifications shall be from off-site sources and shall conform to the following gradation requirements of MHD Standard M1.03.0 Type 'B'.

<u>Sieve Size</u>	% finer of weight		
3"	100		
1/2"	50-85		
No. 4	40-75		
No. 50	8-28		
No. 200	0-10		

#### 2.6 DENSE-GRADED CRUSHED STONE FOR SUB-BASE

A. Base course under walks and roads or wherever "Mass Specs" or "Town of Carver Specs" appear shall be hard, durable particles from sources approved by the Architect, free from organic matter and clay, and conforming to the following gradation requirements of MHD Standard M2.01.7.

<u>Sieve Size</u>	<u>% by weight passing</u>
2"	100
1-1/2"	70-100
3/4"	50-85
No. 4	30-55
No. 50	8-24
No. 200	3-10

## 2.7 CRUSHED STONE

A. Where designated on the Drawings and Specifications as crushed stone, the material shall consist of processed stone and shall conform to MHD, Section M2.01.0 through M2.01.6, size as indicated on the drawings.

### 2.8 WASHED STONE

A. Crushed stone not to exceed 3".

### 2.9 SAND BORROW

A. Where designated on the Drawings and Specifications as sand borrow, the material shall consist of clean inert, durable grains of quartz or other hard durable rock, free from loam or clay, surface coatings and deleterious materials and shall conform to the following gradation requirements of MHD Standard M1.04.0 Type a.

### 2.10 RIP RAP

A. Where designated on the Drawings and Specifications as RIP RAP, the material shall be hard, durable, angular in shape, resistant to wreathing and shall meet the gradation requirements of MHD Standard M2.02.2.

### 2.11 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:

- a. Red: Electric.
- b. Yellow: Gas, oil, steam, and dangerous materials.
- c. Orange: Telephone and other communications.
- d. Blue: Water systems.
- e. Green: Sewer systems.
- B. Drainage Fabric: Non-woven geotextile, specifically manufactured as a drainage geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
  - a. Grab Tensile Strength: 110 lb/f; ASTM D 4632.
  - b. Tear Strength: 40 lb/f; ASTM D 4533.
  - c. Puncture Resistance: 50 lb/f; ASTM D 4833.
  - d. Water Flow Rate: 150 gpm per sq. ft.; ASTM D 4491.
  - e. Apparent Opening Size: No. 50; ASTM D 4751.
- C. Separation Fabric: Woven geotextile, specifically manufactured for use as a separation geotextile; made from polyolefins, polyesters, or polyamides; and with the following minimum properties determined according to ASTM D 4759 and referenced standard test methods:
  - a. Grab Tensile Strength: 200 lbf; ASTM D 4632.
  - b. Tear Strength: 75 lbf; ASTM D 4533.
  - c. Puncture Resistance: 90 lbf; ASTM D 4833.
  - d. Water Flow Rate: 4 gpm per sq. ft.; ASTM D 4491.
  - e. Apparent Opening Size: No. 30; ASTM D 4751.

### PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways. Refer to Sheet L-1.5, Erosion and Sedimentation Control Plan.
- D. Provide protective safety barrier around all trees in the work area that are to remain.

#### 3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area. Coordinate with project sediment and erosion control requirements.

- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
  - a. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
  - b. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.
  - c. Maintain groundwater level at least one foot beneath the bottom of excavations.

### 3.3 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavation to subgrade elevations regardless of the character of the surface and subsurface conditions encountered, including boulders, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
  - a. If excavated materials intended for fill and backfill include unsatisfactory materials and rock, replace with satisfactory soil materials.
  - b. Contractor will not be entitled to additional time to complete the project or additional compensation, when rock removal is required.
- B. Rock Excavation Procedures:
  - a. When, during the process of excavation, rock is encountered as specified herein, the Contractor shall strictly adhere to the following procedures.
  - b. Such material shall be uncovered and exposed.
  - c. The Architect and the Owner shall be notified by the Contractor before proceeding further.
  - d. The Contractor shall not proceed with the excavation of any material claimed as rock until the material has been classified by the Owner's Representative and cross sectioned as specified below.
  - e. The Contractor shall retain a land surveyor acceptable to both the Owner and the Contractor or agree to an alternate system of measurement, to take cross sections of rock before removal of same, and to provide computations of cross sections within payline limits.
  - f. All quantities and classifications must be verified and documented with Owner's Representative or Architect.
  - g. Should the Contractor proceed with the excavation without surveyed quantification and classification of the rock, the Contractor shall forfeit the right to payment as rock for the subject material.
  - h. Rock excavation materials may be used for fill, only as specifically allowed and approved by the Architect, in accordance with the following paragraph "D".
- C. All areas where rock is removed must be marked on the as-built Drawings. Obtain approval of the Architect before starting work.
- D. If the Contractor intends to utilize excavated rock for site earthwork operations, the Contractor must modify any such material to comply with the specification for the designated specific material, at no cost to the Owner. Boulders may also be modified for use. No material may be used, unless approved by the Architect, prior to placement.

- E. Boulder disposal:
  - a. Limited on-site, below grade boulder disposal is permitted. See plans for locations. Contractor shall not deviate from following procedure for on-site, below grade disposal.
  - b. Boulders to be buried in areas of fill under lawn and landscape areas only. Contractor to ensure that there are no conflicts with proposed or existing utilities.
  - c. Top of Boulders shall have a minimum 4'-0" cover to finish grade
  - d. There shall be a minimum distance of 4'-0" between boulders.
  - e. Approved fill materials shall be placed between boulders and installed and compacted in compliance with project specifications. Approved fill materials shall be placed above buried boulders in compliance with project specifications.
- F. Rock and boulder disposal:
  - a. All excess rock and boulders remain the property of the Contractor and may be disposed of on site in a legal manner.

### 3.4 STABILITY OF EXCAVATIONS

A. Comply with local codes, ordinances and requirements of authorities having jurisdiction to maintain stable excavations.

#### 3.5 TEMPORARY SHEETING, SHORING & BRACING

- A. The Contractor shall provide shoring systems adequately anchored and braced to resist earth and hydrostatic pressures at locations as needed to support excavations during construction. The sheeting/shoring systems shall be designed by a Massachusetts Professional Engineer.
- B. Shop drawings and calculations shall be submitted for review and approval prior to start of any work for temporary excavation support. All shop drawings, details & calculations submitted shall bear the Professional Engineer stamp of the Engineer responsible for the design.
- C. The General Contractor shall install, maintain and monitor (1 day before and each day excavation is open) 3 (minimum) settlement monitoring points on the building footing or foundation wall. Location of monitoring points to be determined by shoring design engineer.
- D. The Contractor shall locate required bracing to clear all permanent Work.
- E. Bracing which must be relocated shall be installed prior to the removal of original bracing.
- F. The Contractor shall remove shoring and bracing in stages to avoid disturbances to adjacent and underlying soils and damage to structures, pavements, facilities and utilities. The contractor shall repair or replace adjacent work damaged or displayed through the installation or removal of sharing and bracing work.

#### 3.6 SUBGRADE PREPARATION FOR PAVED AREAS

- A. Fill placed in the top 12" beneath sidewalks should consist of Structural fill with less than 5% fines.
- B. The subbase of new paved areas shall consist of Processed Gravel for Sub-base SSHB M1.03.1 and Dense Graded Crushed Stone for Sub-Base SSHB M2.01.7.

### 3.7 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus [1 inch]. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
  - a. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
  - b. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended for bearing surface.

## 3.8 EXCAVATION FOR WALKS AND PAVEMENTS AND SLABS ON GRADE

A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

### 3.9 APPROVAL OF SUBGRADE

- A. Notify Architect and Owner's Representative when excavations have reached required subgrade.
- B. If unsatisfactory soil is present at sub-grade elevation, continue excavation and replace with compacted backfill or fill material as directed.
  - a. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the work.
- C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades. Conform to SSHB, Section 170. Subgrade must be approved prior to application of any borrow or fill materials.
- D. If it is determined that unsatisfactory soil or excess moisture content is present, continue excavation and replace with compacted free draining backfill or fill material as directed.
- E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect.

#### 3.10 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Architect.
  - a. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.

#### 3.11 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow materials and satisfactory excavated/manufactured soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover with tarps to prevent windblown dust or temporarily seed as per the erosion control specifications. Surround stockpile with silt barrier and straw wattles.
  - a. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.
  - b. Contamination/intermixing of soil materials is just cause for rejection of material.

### 3.12 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
  - a. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation and drainage.
  - b. Surveying locations of underground utilities for record documents.
  - c. Inspecting, testing, and approving of underground utilities.
  - d. Removing concrete formwork.
  - e. Removing trash and debris from excavation.
  - f. Removing temporary shoring and bracing, and sheeting.
  - g. Installing permanent or temporary horizontal bracing on horizontally supported walls.

#### 3.13 PLACEMENT OF FILL

- A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills.
- B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- C. When subgrade or existing ground surface to receive fill has a density less than that required for fill, break up ground surface to depth required, pulverize, moisture-condition or aerate soil and recompact to required density.
- D. Place and compact fill material in maximum 6" lifts. After placement, thoroughly knead all general fill with sheep's foot rollers to break down any remaining chunks of soil prior to vibratory compaction.

- E. Do not deposit fill in areas of standing water. Any pockets of sediment and foreign material are to be removed before filling continues.
- F. Compaction: Each lift shall be compacted. Maintain optimum and proper moisture content to achieve required compaction. Coordinate with Owner on testing schedule throughout earthwork operations.
- G. Fill under lawn areas shall be compacted between 92% and 96% modified AASHTO laboratory density (ASTM D-1557, Method C).
- H. All fill materials shall be compacted to a minimum 95% of modified laboratory compaction test (ASTM D-1557, Method C). General Fill under pavement 5 or more feet below grade shall be compacted minimum 92% of modified laboratory compaction testy (ASTM D-1557, Method C). Under bituminous pavements, compact subbase material to minimum 98% modified laboratory compaction test (ASTM D-1557, Method C).
- I. Special Requirements
  - a. Remove all accumulated silts and organic material from temporary sedimentation, siltation, and detention basins prior to proceeding with earthwork.
  - b. Phase all earthwork operations in all key identified slopes so that each slope and bench/terrace is completed, including compaction and stabilization prior to proceeding with next higher slope/bench. Notify Architect, Engineer, and Geotechnical Consultant for inspection of each slope/bench as it is formed and stabilized. Do not proceed with additional embankment/earthwork operation until approved by Owner's Representative and Engineer.
  - c. Structural fill will be subject to excavation for underfloor utilities prior to the concreting of the floor slab on grade. The excavation, and the subsequent re-filling with structural fill, including compaction, is included in this Contract.

### 3.14 LOCATION OF POROUS FILL (CRUSHED STONE)

- A. At the slab on ground level a 6" minimum layer between the structural fill and the vapor retarder which is located directly under the interior slabs on grade as indicated on the Structural Drawings.
- B. At bottom of footing in cut locations -a 6" minimum layer beneath the bottom of footing elevation.

#### 3.15 MOISTURE CONTROL (All Soils)

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
- B. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
- C. Remove and replace, or scarify and air-dry, all soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.
  - a. Stockpile or spread and dry removed wet satisfactory soil material.

D. The Contractor is alerted that the nature of native materials at this site is such that they are sensitive to moisture. On-site materials are difficult to handle and compact and are easily disturbed when wet. The Contractor shall plan and conduct his excavation and filling operations considering the nature of the on-site materials.

### 3.16 FILL AND COMPACTION OF MATERIALS

- A. Place materials in layers not more than 6 inches in loose depth for material compacted by heavy compaction equipment (minimum 10 tons static weight, 20 tons dynamic force) and not more than 4 inches in loose depth for material compacted by hand-operated tampers. Otherwise, conform to requirements of paragraph 3.12.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compaction of the Porous Fill or Crushed Stone which is not suited for field density testing shall be accomplished with two to three passes of a vibratory compactor.
- D. Compaction equipment shall not be of the nature as to cause unstable conditions in the underlying natural soil. Compacting equipment shall be approved for use by the inspector of the Owner's testing laboratory.
- E. Placement of structural fill shall be in layers not exceeding thicknesses as noted below before compaction. In addition to the stated degree of compaction, all fill and backfill shall receive at least the compactive effort given in the following table. Application of the minimum compactive effort does not relieve the Contractor from his requirement to achieve the specified degree of compaction.

Compaction Method	Maximum Loose Lift Thickness	Minimum <u>No. Of Passes</u>	
Hand operated vibratory plate or light roller in confined areas	6"	4	
Hand operated vibratory drum rollers weighing at least 1000# in confined areas	8"	4	
Light vibratory drum roller, min. 3000# dynamic force per foot of drum width	10"	4	
Medium vibratory drum roller, min. 5000# dynamic force per foot of drum width	12"	4	

F. Structural fill will be subject to excavation for underfloor utilities prior to the concreting of the floor slab on grade. The excavation, and the subsequent re-filling with structural fill, including compaction, is included in this Contract.

### 3.17 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated. Shape pavement base course with required cross sections and elevations.
  - a. Provide a smooth transition between adjacent existing grades and new grades.
  - b. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
  - c. In all cases, maintain positive drainage.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
  - a. Lawn or Unpaved Areas: Plus or minus 1 inch.
  - b. Walks: Plus or minus 1 inch.
  - c. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10 foot straightedge.
- D. Pavement Shoulders: Place shoulders along edges of subbase and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of acceptable soil materials and compact simultaneously with each subbase and base layer.
- E. Grade final surface of porous fill below building slabs on grade smooth and even, free of voids, depressions or mounds and compact to required elevation. Final grades within tolerance of <sup>1</sup>/<sub>2</sub>" (1/4" above and <sup>1</sup>/<sub>4</sub>" below required elevation), when tested with a 10 foot straight edge.

#### 3.18 STONE SCREENINGS

- A. Install stone screenings at mow strips as detailed on the Drawings.
- B. Mix salvaged and screened stone screenings from Site Clearing operations, with new stone screenings to achieve a homogeneous mixture.
- C. Install stone screenings surface over prepared base, rake smooth and compact.

### 3.19 DRAINAGE FABRIC

- A. Install drainage fabric as shown on Structural, civil and landscape drawings and details. Fabric shall be placed all around the crushed stone that surrounds any perforated drains. The crushed stone surrounding the perforated drain pipe shall be completely wrapped in geotextile drainage fabric. The fabric shall be lapped at all ends, edges, and joints with adjacent sections of fabric. Care shall be exercised to avoid puncturing or tearing the fabric. Any fabric punctured or torn shall be patched with another piece of fabric extending at least two feet beyond the puncture or tear.
- B. A geotextile shall be installed to separate crushed stone from surrounding soil.

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### 3.20 FIELD QUALITY CONTROL

- A. Testing Agency: Allow the Owner's testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
  - a. Perform field in-place density tests according to ASTM D 1556 (sand cone method).
  - b. Field in-place density tests may also be performed by the nuclear method according to ASTM D 2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM C 1556. With each density calibration check, check the calibration curves furnished with the moisture gages according to ASTM D 3017.
  - c. When field in-place density tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the Engineer.
  - d. Trench Backfill: In each compacted initial and final backfill layer, perform at least one field in-place density test for each 150 feet or less of trench, but no fewer than two tests.
  - e. Field testing of structural fill will consist of grain size analysis of gravel fill, Modified Optimum Density (AASHTO T-180) and field density tests at the rate of one (1) per 200 cubic yards of fill or at the discretion of the inspector.
- B. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or allow drying, or removing and replacing soil to the depth required, re-compacting and retesting until required density is obtained. All retesting costs are the responsibility of the Contractor.
- C. Testing Laboratory's presence does not include supervision or direction of the actual work by the Contractor, his employees, subcontractors or agents. Neither the presence of the Testing Laboratory, nor any observations and testing performed by him shall excuse the Contractor from defects discovered in his work.
- D. Testing equipment will be provided by and testing performed by the Testing Laboratory, except as otherwise provided by Contract. Upon request by Architect, the Contractor shall provide such auxiliary personnel and services as needed to accomplish testing work and to repair damage caused thereby to permanent work.
- E. All fill materials delivered to the project site shall be tested for gradation before use. Additional test shall be performed when in the Geotechnical Engineer's opinion, the material being delivered to the site has changed in gradation.

### 3.21 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
  - a. Scarify or remove and replace soil material to depth as directed by the Architect; reshape and re-compact at optimum moisture content to the required density.

- C. Settling: Where settling occurs during the Project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.
  - a. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

### 3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove waste material, including trash, and debris, and legally dispose of it off Owner's property. Surplus satisfactory soil and unsatisfactory soil may be legally disposed of on the owner's property, in a location to be determined by the owner.
- B. Refer to Division 32 for requirements of disposal of topsoil.

END OF SECTION 31 20 00

## SECTION 31 23 14 - STRUCTURAL EXCAVATION

### PART 1 - GENERAL

### 1.1 <u>RELATED DOCUMENTS</u>

- A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.
- B. The General Provisions of the Contract, including the General and Supplementary Conditions, apply to the work specified in this Section.

### 1.2 SCOPE OF WORK

- A. The work under this Section includes all labor, supervision, materials and equipment necessary for the completion of all building structure excavation within the building and excavation five (5') feet outside the building for structures and utility lines, as shown on the Drawings and as specified.
- B. Work shall include, but not be limited to, the following:
  - 1. Building excavation, including pits and trenches for utilities within the building
  - 2. Protection of utilities
  - 3. Stockpiling of reusable materials
  - 4. Removal of unsuitable materials
  - 5. Rock excavation

### 1.3 <u>RELATED WORK</u>

- A. Section 31 50 04 Earthwork Protection
- B. Section 31 23 24 Structural Fill

## 1.4 <u>TEST BORINGS</u>

- A. Subsurface investigations have been made at the site. This data was obtained for use in designing foundations, and is made available to all bidders solely for their information. Interpretation of subsurface data for purposes of construction is the responsibility of the Contractor.
- B. There is no guarantee of the accuracy of this information, and the Owner or the Architect or the Structural Engineer shall not be responsible for any differences between the data given and the actual subsurface conditions or subsurface materials.

## PART 2 - PRODUCTS - Not applicable

## PART 3 - EXECUTION

## 3.1 EXCAVATION

- A. Excavate all areas as required to perform work shown on Drawings and to conform to new finish grades. Excavations shall be to proper depth and width to allow for slabs, gravel bases and other subsequent construction.
- B. Excavate to depth and lineal dimensions required to permit subsequent formwork and concrete operations to proceed without hindrance. Excavation for footings, walls, piers, grade beams, etc., must be sufficiently wide to compact all fill by mechanical means. In general, excavation shall be cut to a line eighteen (18") inches outside of the face of footings, with no undercutting permitted.
- C. Surfaces of excavations shall be suitably dressed to grade noted to receive subsequent construction. Bottoms shall be substantially level, with no large projections, and free of loose material. Material at bottoms of excavation shall be undisturbed. The Engineer shall be immediately notified if material unsatisfactory for foundation bearing is encountered, for further instructions, before proceeding with work.
- D. Trenches and excavations shall be of sufficient width and depth at all points to allow all pipes to be laid, joints to be formed, and structures and appurtenant construction to be built in most thorough and workmanlike manner, and to allow for sheeting and shoring, pumping and draining. Trenches and excavations shall be at least eighteen (18") inches wider than outside dimension of structures they are to contain. Trenches for pipes must not be unnecessarily wide so as to materially increase load on pipe resulting from backfill. Bottoms of trenches and other excavations shall be carried to lines and shapes satisfactory to Engineer.
- E. Completely remove all abandoned subsurface utilities, structures and existing foundations within the lines of the new building construction. Plug abandoned utility lines at least five (5') feet outside of new construction.
- F. If footing bottoms are disturbed, allowed to freeze, or if excavations for footings are carried below indicated elevations shown on the Drawings, the Contractor shall notify the Engineer for instructions prior to proceeding.

## 3.2 **PROTECTION OF UTILITIES**

- A. Protect existing utilities and relocate only as shown on Plans or in Specifications.
- B. Notify utility companies to shut off services when required.
- C. Any damage to existing drainage and utility structures to be retained shall be repaired at the Contractor's expense.

D. Maintain drainage of site and adjacent areas to prevent damage and erosion. When necessary to interrupt drainage of existing facilities, provide temporary facilities until permanent installations have been completed.

## 3.3 <u>REMOVAL OF UNSUITABLE MATERIALS</u>

- A. Remove all debris subject to termite attack, rot or corrosion and all other deleterious materials from areas to be filled.
- B. Remove from the interior of the building all unsuitable materials such as topsoil, loam or other organic materials.
- C. Remove from site, all excavated materials not required for fill.

### 3.4 STOCKPILES

A. Approved excavated material suitable for fill or structural fill (i.e., clean granular material) shall be stockpiled.

### 3.5 <u>ROCK EXCAVATION</u>

- A. Definition: Rock is defined as ledge, stone or hard shale, concrete, or masonry structures which require drilling or blasting for removal, and boulders larger than one (1 cy) cubic yard in volume within the building excavation and one-half (1/2 cy) cubic yard in volume encountered in trench excavations.
- B. Measurement: Rock shall be stripped for measurement before proceeding, and no rock excavated or loosened before measurement will be allowed or paid for as rock. Measurement and payment therefore shall be by the number of cubic yards required to bring the excavation to the required surface or grade shown on the Drawings. In making rock excavation, eighteen (18") inches will be allowed outside the footing lines, in vertical planes; twenty-four (24") inches will be allowed outside walls without footings and outside footings where drains are required. Submit cross-sections and certification of quantities by a Massachusetts Registered Land Surveyor or Professional Engineer.
- C. Blasting: When explosives are used, work shall be executed by experienced powdermen or persons who are licensed or otherwise authorized to use explosives. Explosives shall be stored, handled and used in accordance with local regulations and the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America, Incorporated. Structural Engineer shall be notified of scheduled blasting. Any damage to existing or new construction caused by the use of explosives shall be corrected at the Contractor's expense.
- D. Shelving: If rock surfaces supporting footings should be encountered, such surfaces shall be leveled off to a slope not exceeding one inch per foot (1"/ft) unless otherwise indicated on the plans.

E. Payment: It is anticipated that no rock, as above defined, will be encountered in the construction. However, if it should be encountered, payment will be made in accordance with the Unit Prices agreed upon before rock excavation commences.

END OF SECTION 31 23 14

## SECTION 31 23 24 - STRUCTURAL FILL

### PART 1 - GENERAL

### 1.1 <u>RELATED DOCUMENTS</u>

- A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.
- B. The General Provisions of the Contract, including the General and Supplementary Conditions, apply to the work specified in this Section.

### 1.2 SCOPE OF WORK

- A. The work under this Section includes all labor, supervision, materials and equipment necessary for the completion of all structural fill.
- B. Work shall include, but not be limited to the following:
  - 1. Structural Fill
  - 2. Compaction
  - 3. Testing

### 1.3 RELATED WORK

- A. Section 31 23 14 Structural Excavation
- B. Section 31 50 04 Earthwork Protection

### 1.4 SUBMITTALS

- A. The Contractor shall submit for approval to the Engineer prior to commencing operations a sieve analysis, a modified proctor density test of proposed structural fill material, and drainage filter material. The tests shall be prepared by an approved testing laboratory at the Contractor's expense.
- B. A sample of each approved material shall be kept at the Construction Site Field Office for comparison purposes during this phase of work.
- C. Any material which does not reasonably conform to the approved sieve analysis shall be subject to removal.

### 1.5 FIELD INSPECTION AND TESTING

A. The Owner shall retain and pay for an independent soils laboratory to perform inspection and/or testing of structural backfill. The laboratory will have an inspector on the site

during backfilling operations and will make tests required for fill and backfill placed.

- B. The following field tests shall be performed:
  - 1. One modified Proctor Density Test for each source of fill material performed in accordance with ASTM D1557.
  - 2. Standard field density tests, each of an accuracy of plus or minus one (1%) percent.
- C. Field density tests shall be at the rate of one (1) per two hundred (200 cy) cubic yards of fill, or at the discretion of the inspector. The tests shall be made at a maximum height differential of sixteen (16") inches throughout the fill.
- D. It shall be the Contractor's responsibility to notify the Engineer and Testing Laboratory when each layer of fill is to be in place and ready for testing. The Contractor shall allow ample time for testing. If any fill is placed in excess of sixteen (16") inches without testing, it shall be subject to removal.
- E. All required compaction and retesting due to unsatisfactory compaction shall be at the Contractor's expense.

## PART 2 - PRODUCTS

## 2.1 MATERIALS

A. Structural fill shall be clean gravel, free from foreign substances, lumps of clay, silt, loam or vegetable matter. The gravel shall be sound, tough, durable and free from thin elongated pieces. The material shall meet the following gradation requirements:

1.	Sieve Size	3 1/2"	1/4"	No. 10	No. 40	No. 100
2.	Percent Passing	100	30-65	20-55	5-30	0-5

## 2.2 LOCATION OF MATERIALS

A. Structural fill shall be used for all backfill under all slabs on grade, under all footings required to achieve footing base elevations for all backfill against exterior basement and retaining walls, to extend a distance of five (5') feet beyond the face, including that backfill required for structural or utility excavation and trenches within the limits of the outermost foundation walls of the building.

## PART 3 - EXECUTION

## 3.1 CONSTRUCTION METHODS

A. Structural fill shall be deposited in eight (8") inch layers and compacted to the following percent optimum density (ASTM D1557):

- 1. Ninety-five (95%) percent under footings and under all slabs on grade, trenches, sidewalks, driveways and paved areas, against interior face of foundation walls and retaining walls.
- 2. Ninety (90%) percent against exterior face of foundation walls and retaining walls.
- B. No material shall be compacted when its moisture content is greater than optimum.
- C. The excavation must be sufficiently dry to permit complete inspection of the excavation and to permit use of compaction machinery on the initial layers of fill. The excavation must be kept sufficiently dry to carry out placement of fill and compaction thereof as specified below.
- D. It shall be the responsibility of the General Contractor to notify the laboratory when excavation is complete so that inspection of conditions before filling may be made.
- E. Compacting equipment shall not be of a nature so as to cause unstable conditions in the underlying natural soil.
- F. No backfilling will be permitted against foundation walls until floor slabs at both top and bottom of walls have been placed and cured, or unless walls have been adequately braced. Where backfill occurs on both sides of a wall, levels of backfill on each side shall be kept approximately equal at all times.
- G. Do not place structural fill or backfill on frozen material. Do not place frozen fill material.
- H. If grade freezes or excavation bottom freezes, remove frozen material to extent of freezing prior to placing new structural fill or backfill material.

END OF SECTION 31 23 24

## 31 25 00 – EROSION CONTROLS

### <u>PART 1 - GENERAL</u>

## 1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

### 1.2 SUMMARY

- A. Provide and maintain erosion control devices in locations shown on the plans, as noted and as detailed to control runoff of stormwater and silt until final surface finishes have been installed and lawns have been established.
- B. Provide all facilities, labor, materials, equipment, transportation, supervision, and related work necessary to complete the work in this Specification, and as shown on the Drawings.
- C. All work shall be performed in accordance with applicable codes, permits and regulations, and the requirements of all local, state, and federal agencies having jurisdiction over the work.

### 1.3 <u>RELATED SECTIONS</u>

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:
  - 1. Division 02, Section 02 41 13 Selective Site Demolition.
  - 2. Division 31, Section 31 20 00 Site Earthwork.
  - 3. Division 32, Section 32 91 13 Topsoil & Planting Soil.
  - 4. Division 32, Section 32 92 00 Seeded Lawns.

### 1.4 <u>REFERENCES AND DEFINITIONS</u>

A. Refer to Division 01, Section 01 42 16 Standard Sitework References & Definitions for definition of specific referenced standards as may be abbreviated in this section.

## 1.5 <u>QUALITY ASSURANCE</u>

- A. Refer to Division 01, Section 01 43 00 Quality Assurance for testing and quality standards for site work defined elsewhere in this specification.
- B. Erosion controls shall additionally be in accordance with MASSDEP Guidelines.
- C. Erosion controls shall additionally be in accordance with local approvals as may be required and so noted.
- D. Contractor shall maintain written logs / reports of erosion control inspection, repair and maintenance as required by MASSDEP Guidelines and local authorities having jurisdiction. These shall be on-site at all times and available for review.

## 1.6 <u>SUBMITTALS</u>

- A. Erosion Control Fence: Product data for fence fabric.
- B. Sediment Retention Fiber Roll (SFSR).
- C. Construction Entrance: Sieve analysis for stone aggregate and geotextile fabric.
- D. Stone Barriers: Sieve analysis for stone aggregate.

## PART 2- PRODUCTS

## 2.1 EROSION CONTROL FENCE

- A. Fabric shall be Mirafi-140N as manufactured by Tencate Geosynthetics North America, Pendergrass, GA or approved equal.
- B. Stakes shall be 2 inch by 2 inch by 5 feet long, hardwood, pointed at one end.

## 2.2 <u>HAYBALES</u>

- A. Standard size bales of hay or straw with no loose or decomposed baling twine.
- B. Stakes shall be 2 inch by 2 inch by 3 feet long, hardwood, pointed at one end.

## 2.3 SEDIMENT RETENTION FIBER ROLL (SRFR)

- A. Sediment Retention Fiber Roll shall be SediMax-SW9 as manufactured by North American Green, Poseyville, IN or approved equal.
- B. Stakes shall be 2 inch by 2 inch by 3 feet long, hardwood, pointed at one end.

## 2.4 <u>CONSTRUCTION ENTRANCE</u>

- A. Geotextile fabric shall be Mirafi-600X as manufactured by Tencate Geosynthetics North America, Pendergrass, GA or approved equal.
- B. Stone shall be 2 ½ 3 inch trap rock conforming to Section M.02 of CTDOT Form 816.

## 2.5 <u>STONE BARRIER</u>

A. Stone shall comply with MASSDOT, M2.01.03, crushed stone.

### PART 3 - EXECUTION

### 3.1 EROSION CONTROL FENCE

A. Install fencing in accordance with manufacturer's instructions and as detailed.

### 3.2 SEDIMENT RETENTION FIBER ROLLS (SRFR)

A. Install in accordance with manufacturer's instructions and as detailed.

### 3.3 <u>HAYBALES</u>

A. Install as shown on detail, tightly butted together and held in place with two stakes minimum for each bale.

## 3.4 <u>CONSTRUCTION ENTRANCE</u>

- A. Box-out and grade area(s) for construction entrance to dimensions shown on plan.
- B. Place geotextile fabric on compacted Subgrade. Extend fabric up all edges to contain stone.
- C. Place stone on fabric to depth indicated on detail.

## 3.6 STOCKPILED MATERIAL NOT USED WITHIN 30 DAYS

- A. Surround stockpile with erosion control fence and/or haybales as designated on plan.
- B. Provide temporary seeding based on time of year and construction schedule. Follow MASSDEP Guidelines for requirements.

### 3.7 <u>MAINTENANCE</u>

- A. Maintain erosion controls throughout the entire project until final surface treatments are in place and lawn areas have been established.
- B. Repair, replace or adjust erosion controls as necessary during construction to maintain silt and erosion control as required.
- C. Remove built-up silt when it reaches a maximum of ½ the height of any erosion control device. Dispose of silt in accordance with regulations.
- D. Remove built-up silt, soils and materials from construction entrance as necessary to ensure no material is tracked off-site or onto adjacent finished surfaces.
  - 1. Contractor shall be required to clean any material that is tracked offsite within 24-hours of notice by the Architect or local authorities.
- E. When final surfaces and lawns are completed and stabilized, remove erosion control devices and repair the area(s) to conform to finishes shown on plans.
  - 1. Maintain these areas until satisfactory cover / finish is approved by the Architect.

END OF SECTION 31 25 00

## **SECTION 31 50 04 - EARTHWORK PROTECTION**

#### PART 1 - GENERAL

#### 1.1 <u>RELATED DOCUMENTS</u>

- A. Instructions to Bidders, AIA Document A201-2007, "The General Conditions of the Contract for Construction,", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and/or Subcontractor who performs this work. Note also all Addenda.
- B. The General Provisions of the Contract, including the General and Supplementary Conditions, apply to the work specified in this Section.

### 1.2 SCOPE OF WORK

- A. The work under this Section includes all labor, supervision, materials and equipment necessary for the completion of earthwork protection as specified.
- B. Work shall include, but not be limited to, the following:
  - 1. Protection of work and property
  - 2. Stability of sides
  - 3. Shoring and bracing
  - 4. Drainage and pumping

### 1.3 <u>RELATED WORK</u>

- A. Section 31 23 14 Structural Excavation
- B. Section 31 23 24 Structural Fill

### PART 2 - PRODUCTS - Not applicable

### PART 3 - EXECUTION

### 3.1 PROTECTION OF WORK AND PROPERTY

- A. Protect structures, utilities, sidewalks, pavements and other facilities immediately adjacent to structure excavation from damage caused by settlement, lateral movement, undermining, washout and other hazards.
- B. Take precautions and provide necessary bracing and shoring to guard against movement or settlement of existing improvements or new construction. The Contractor is solely responsible for the strength and adequacy of bracing and shoring; and for the safety and support of construction from damage or injury caused by the lack thereof, of movement and/or settlement.
- C. Protect excavation, trenches and all items of subsurface construction from damage by rain, water from melted snow, surface water and subsurface water. Provide all pumps, equipment, and enclosures necessary to ensure such protection.
D. Protect exposed earth and foundations in excavation areas when the atmospheric temperature is less than 35 degrees F by covering with dry insulating materials of sufficient depth to prevent frost penetration of soil.

# 3.2 STABILITY OF SLOPES

- A. Slope the sides of excavations over five (5') feet to the angle of repose of the material excavated; otherwise, shore and brace where sloping is not possible either because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in a safe condition until completion of backfilling by benching, shelving or bracing.
- B. Take precautions to prevent slides or cave-ins when excavations are made in locations adjacent to backfilled excavations, and when sides of excavations are subjected to vibrations from vehicular traffic or the operation of machinery or any other source.

### 3.3 SHORING, SHEETING AND BRACING

- A. Contractor shall furnish, install in place, and maintain such sheeting, shoring, and bracing as may be required to support sides of excavations and to prevent any movement which could in anyway injure work, diminish necessary width of trench or other excavations, or otherwise delay work or endanger adjacent structures. Sheeting shall be driven and excavation work conducted in such a manner as to prevent material in back of sheeting from running under sheeting and into trench.
- B. Provide steel or timber materials for sheeting, shoring and bracing, such as sheet piling, uprights, stringers, rangers and cross-braces, in good serviceable condition. Use timbers that are sound and free of large or loose knots. Maintain shoring and bracing in excavations, regardless of the time period excavations will be open. Carry down shoring and bracing as the excavation progresses.
- C. Provide trench shoring and bracing to comply with the provisions of ANSI A10.2 "Safety Code for Building Construction", and with requirements of the local codes and authorities having jurisdiction.
- D. The Contractor shall, prior to driving sheeting, determine the presence and extent of underground structures as may affect the driving of sheeting.
- E. Care shall be taken to prevent voids outside of sheeting; but if voids are formed, they shall be immediately filled and well rammed. Sheeting shall not be carried to such depth at manholes that it will bear upon pipe. Special precautions, by using sheeting, shoring and bracing shall be taken to guard against any damage to or settlement of buildings, walls or other structures which are adjacent to work.
- F. Sheeting shall not unnecessarily be driven below structures and thereby necessitate its being left permanently in place.

G. Bracing, rangers and sheeting shall be securely fastened in place so that they cannot loosen up and fall from position. Sheeting, shoring, bracing, etc., or parts thereof, shall be removed after completion of work.

# 3.4 DRAINAGE AND PUMPING

- A. Perform excavation in a manner to prevent surface water from flowing into the excavations, and to prevent water from flooding the project site and surrounding area. Do not allow water to accumulate in excavations. Remove water from excavations using dewatering methods which will prevent softening of foundation bottoms, undercutting of footings, and soil changes detrimental to the stability of subgrades and foundations.
- B. Provide and maintain pumps, sumps, suction and discharge lines and other dewatering system components necessary to convey the water away from excavations. Convey water removed from excavations and rain water to runoff areas. Provide and maintain temporary drainage ditches and other diversions outside the excavation limits for each structure. Do not use trench excavations for site utilities as temporary drainage ditches.

END OF SECTION 31 50 04

# <u> 31 01 90 – TREE PROTECTION</u>

### <u>PART 1 - GENERAL</u>

### 1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

### 1.2 SUMMARY

- A. This Section includes the protection and trimming of existing trees that interfere with, or are affected by, execution of the Work, whether temporary or permanent construction.
- B. Provide all facilities, labor, materials, equipment, transportation, supervision, and related work necessary to complete the work in this Specification, and as shown on the Drawings.
- C. All work shall be performed in accordance with applicable codes, permits and regulations, and the requirements of all local, state, and federal agencies having jurisdiction over the work.

# 1.3 <u>RELATED SECTIONS</u>

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specifications Sections that directly relate to Work of this Section include, but are not limited to:
  - 1. Division 02, Section 02 41 13 Selective Site Demolition.
  - 2. Division 31, Section 31 20 00 Site Earthwork.
  - 3. Division 31, Section 31 25 00 Erosion Controls.
  - 4. Division 32, Section 32 91 13 Topsoil & Planting Soil.
  - 5. Division 32, Section 32 92 00 Seeded Lawns.
  - 6. Division 32, Section 32 93 00 Trees, Plants and Groundcovers.

### 1.4 <u>REFERENCES AND DEFINITIONS</u>

A. Refer to Division 01, Section 01 42 16 Standard Sitework References
& Definitions for definition of specific referenced standards as may be abbreviated in this section.

B. Tree Protection Zone: Area surrounding individual trees or groups of trees to remain during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

# 1.5 QUALITY ASSURANCE

- A. Refer to Division 01, Section 01 43 00 Quality Assurance for testing and quality standards for site work defined elsewhere in this specification.
- B. As directed by the Architect, provided a licensed arborist to examine, report on and/or correct any damage to plant materials noted to remain that may be adversely affected by Contractor's operations.

# 1.6 <u>SUBMITTALS</u>

- A. Product Data: For each type of product indicated.
- B. Tree Pruning Schedule: Written schedule from arborist detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.
- C. Qualification Data: For tree service firm and licensed arborist.
- D. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.
- E. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

# PART 2- PRODUCTS

# 2.1 <u>MATERIALS</u>

- A. Topsoil: Refer to Section 32 91 13 Topsoil & Planting Soil.
- B. Snow Fence: Medium duty, orange, plastic, 4-foot-high fencing mounted on wood or metal posts capable of supporting fence throughout the period of construction.
- C. Boxing: Wooden fence, 4-foot-high, consisting of minimum 2" square posts and three horizontal 1" x 6" stringers throughout the period of construction.

# PART 3- EXECUTION

# 3.1 <u>PREPARATION</u>

- A. Install and maintain Snow Fencing or Boxing around tree protection zones to protect remaining trees and vegetation from construction damage. Remove only when construction is complete.
  - 1. Posts driven 3 feet into ground and no more than 8 feet apart.
  - 2. Minimum distance from trees or vegetation being protected shall be 8 feet unless shown greater on the plans.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations. Do not allow fires within tree protection zones.
- C. Do not store construction materials, debris, or excavated material inside tree protection zones. Do not permit vehicles or foot traffic within tree protection zones; prevent soil compaction over root systems.
- D. Maintain tree protection zones free of weeds and trash.

# 3.2 <u>EXCAVATION</u>

- A. Install shoring or other protective support systems to minimize sloping or benching of excavations.
- B. Do not excavate within tree protection zones, unless otherwise indicated.
- C. Where excavation for new construction is required within tree protection zones, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks and comb soil to expose roots.
  - 1. Redirect roots in backfill areas where possible. If encountering large, main lateral roots, expose roots beyond excavation limits as required to bend and redirect them without breaking. If encountered immediately adjacent to location of new construction and redirection is not practical, cut roots approximately 3 inches back from new construction.
  - Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.

- D. Where utility trenches are required within tree protection zones, tunnel under or around roots by drilling, auger boring, pipe jacking, or digging by hand.
  - 1. Root Pruning: Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots with sharp pruning instruments; do not break or chop.

### 3.3 <u>REGRADING</u>

- A. Grade Lowering: Where new finish grade is indicated below existing grade around trees, slope grade away from trees as recommended by arborist, unless otherwise indicated.
- B. Root Pruning: Prune tree roots exposed during grade lowering. Do not cut main lateral roots or taproots; cut only smaller roots. Cut roots with sharp pruning instruments; do not break or chop.
- C. Minor Fill: Where existing grade is 6 inches or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

# 3.4 TREE PRUNING

- A. Prune trees to remain that are affected by temporary and permanent construction.
- B. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period as recommended by arborist.
- C. Pruning Standards: Prune trees according to ANSI A300 (Part 1)
- D. Cut branches with sharp pruning instruments; do not break or chop.
- E. Chip removed tree branches and dispose of off-site.

# 3.5 TREE REPAIR AND REPLACEMENT

- A. Promptly repair trees damaged by construction operations within 24 hours. Treat damaged trunks, limbs, and roots according to arborist's written instructions.
- B. Remove and replace trees indicated to remain that die or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.
  - 1. Provide new trees of same size as damaged or dead tree, up to 6 inch caliper, and of the same species unless substitution is approved by Architect.

- 1. For damaged or dead trees 6 12 inches in caliper, provide one new 6 inch caliper tree of a species selected by the Architect.
- 3. For damaged or dead trees greater than 12 inches caliper, provide one additional 6 inch caliper replacement for every 6 inches caliper of the tree being replaced. I.e., if a 30" existing tree was damaged or killed, 5 replacement trees are required.
- 3. Plant and maintain replacement trees per Section 32 93 00.
- C. Aerate surface soil, compacted during construction, 10 feet beyond drip line and no closer than 36 inches to tree trunk. Drill 2-inchdiameter holes a minimum of 12 inches deep at 24 inches o.c. Backfill holes with an equal mix of augered soil and sand.
  - 1. Use of a surface aeration machine may be substituted in lieu of manual aeration upon review of machinery to be used, and written approval by the Landscape Architect.

# 3.6 DISPOSAL OF WASTE MATERIALS

- A. Burning on site is not permitted.
- B. Burial of debris on site is not permitted.
- C. Remove excess excavated material and displaced trees from Owner's property and dispose of in a legal manner.

END OF SECTION 32 01 90

# 32 11 00 – PAVEMENT BASE COURSES

### <u> PART 1 - GENERAL</u>

### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

### 1.2 SUMMARY

- A. This Section includes the work of supplying the materials for and installation of stone and aggregate subbase and base course materials for site pavements and other sitework.
- B. Provide all facilities, labor, materials, equipment, transportation, supervision, and related work necessary to complete the work in this Specification, and as shown on the Drawings.
- C. All work shall be performed in accordance with applicable codes, permits and regulations, and the requirements of all local, state, and federal agencies having jurisdiction over the work.

# 1.3 <u>RELATED SECTIONS</u>

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specifications Sections that directly relate to Work of this Section include, but are not limited to:
  - 1. Division 31, Section 31 20 00 Site Earthwork.
  - 2. Division 32, Section 32 12 16 Hot Mix Asphalt Pavement.
  - 3. Division 32, Section 32 13 13 Cement Concrete Pavement.

#### 1.4 <u>REFERENCES</u>

A. Refer to Division 01, Section 01 42 16 Standard Sitework References & Definitions for definition of specific referenced standards as may be abbreviated in this section.

### 1.5 QUALITY ASSURANCE

A. Refer to Division 01, Section 01 43 00 Quality Assurance for testing and quality standards for site work defined elsewhere in this specification.

### 1.6 <u>DELIVERY, STORAGE, AND HANDLING</u>

A. Materials shall be dry and in suitable condition to support paving and imposed loads at the time of installation.

### 1.7 PROJECT CONDITIONS

A. Where any in-place material has been contaminated, softened, frozen, saturated or otherwise disturbed, it shall be removed and replaced with suitable material at no additional cost to the Contract prior to the placement of any additional material.

#### 1.8 <u>SUBMITTALS</u>

- A. Material Certificates for each type of material used, including sieve analysis and proctor, signed by manufacturers, and certified to meet the requirements of this Specification.
- B. Materials:
  - 1. Processed Gravel For Subbase.
  - 2. Dense Graded Crushed Stone For Subbase.
  - 3. Crushed Stone (3/4").
  - 4. Peastone. (Provide 5 gallon sample.)

# PART 2- PRODUCTS

# 2.1 <u>MATERIALS</u>

- A. Processed Gravel For Subbase shall conform to MASSDOT Section M1, M1.03.1.
- B. Dense Graded Crushed Stone For Subbase shall conform to MASSDOT Section M2, M2.01.07.
- C. Crushed Stone (3/4") shall conform to MASSDOT Section M2, M2.01.04.
- D. Peastone shall generally conform to MASSDOT Section M2, M2.01.06 for approximate aggregate of 1/4-inch size.

# PART 3- EXECUTION

# 3.1 <u>EXAMINATION</u>

- A. Contractor shall verify that all subgrade excavations / fills have been installed and tested per Division 31, Section 31 20 00 Site Earthwork prior to placement of any materials of this Section.
- B. The Contractor is responsible for coordinating with the Architect to obtain final approval of subgrade prior to installation of any pavement base course materials. All materials installed without prior approval of the Architect is subject to removal at the Contractor's expense.

### 3.2 INSTALLATION

- A. Place materials of this section on prepared subgrades.
- B. The methods employed in performing the work and all equipment, tools, machinery and other plant used in handling materials and executing any part of the work shall conform to all the requirements of MASSDOT Standard Specification, Section 400, excluding "Compensation."
  - 1. Section 403, Reclaimed Base Course is NOT allowed.

# 3.3 PLACEMENT AND COMPACTION

- A. Material Placement:
  - 1. Place and compact each type of subbase and base course material to the depths shown on the drawings and details for the type of final surface finish or improvement to be installed.
  - Gravel shall be spread and compacted in layers not exceeding eight (8) inches in depth, compacted measurement, except the last layer of gravel sub-base course (conforming to M1.03.0 type b) will be four (4) inches in depth, compacted measurement.
  - 3. Any stone with a dimension greater than that permitted for the type of gravel specified shall be removed from the sub-base before gravel is compacted.
  - 4. Slope and compact surfaces at the end of each day to provide for free surface drainage. Protect drainage structures from sedimentation.
  - 5. Do not place material containing frozen materials, snow or ice. Do not place material over frozen ground. Do not place material if at risk of freezing.
- 6. Protect adjacent improvements during installation. Repair damage at no additional cost to the Owner.

32 11 00-4

- 7. Compaction shall be performed using approved vibratory compaction equipment. Compaction by puddling or jetting is prohibited.
- 8. Control groundwater and surface run-off to minimize disturbance of material being placed. Dewater all subgrades prior to installation. Place all material in-the-dry on stable, undisturbed subgrades.
- B. Compaction Equipment
  - 1. Compaction equipment used to compact materials in open areas where space permits shall consist of vibratory rollers weighing at least 10,000 pounds, pneumatic compactors or other similar approved equipment sufficient to provide a firm, stable subgrade and achieve the required compaction.
  - 2. Compaction equipment used in tight access areas shall consist of a walk-behind vibratory drum roller or other equivalent equipment sufficient to provide a firm, stable subgrade and achieve the required compaction.
- C. Compaction Requirements
  - 1. All material placed as subbase and base courses under pavements and other surface finishes defined in this Section shall be compacted to not less than 95 percent of the maximum dry density of the material as determined by AASHTO T99 compaction test Method C at optimum moisture content.
- D. Tolerances
  - 1. Compaction shall continue until the surface is even and true to the proposed lines and grades within a tolerance of 3/8-inch above or below the required cross sectional elevations to a maximum irregularity not exceeding 3/8-inch under a 10-foot line longitudinally.
  - 2. Any specific are of gravel sub-base which after being rolled, does not form a satisfactory, solid, stable foundation shall be removed, replaced and recompacted by the Contractor without extra compensation.
  - 3. Gravel foundation for cement concrete surfacing shall be conditioned in accordance with the provisions of Subsection 476.61.
- E. Moisture Control
  - 1. The material being placed should generally be within 2 percent of its optimum moisture content to facilitate compaction.
  - Material too wet for proper compaction shall be harrowed or otherwise treated to achieve compaction to the required density. Material that cannot be dried shall be removed and replaced with drier material.

- 3. Material too dry for proper compaction shall be watered uniformly over the surface of the top loose layer. Sufficient water shall be added to allow compaction to the required density.
- F. Protection of Materials
  - 1. In the event of and prior to heavy rains, the Contractor shall suspend operations immediately and shall take steps to keep the site as well drained as possible. Operations shall not be resumed until the moisture content meets the requirements of the Specifications.
  - All excavated or filled areas disturbed during construction, all loose or saturated soil, and other areas that do not meet compaction requirements as specified herein shall be removed and replaced with suitable materials to obtain the specified compaction requirements. Costs of removal of disturbed material and replacement shall be borne by the Contractor

# 3.4 CLEANUP & PROTECTION

- A. Remove any excess material from the site and dispose of in a legal manner.
- B. Protect all properly installed material from vehicular or pedestrian traffic prior to the installation of the final surface treatment. Any material disturbed shall be corrected immediately prior to final installation of finishes and retested as may be necessary at no additional cost to the Owner.
- C. Provide street sweeping on roadways used by construction vehicles in order to reduce dust, siltation and nuisance problems.

END OF SECTION 32 11 00

### <u>32 12 16 – HOT MIX ASPHALT PAVEMENT</u>

### <u> PART 1 - GENERAL</u>

### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes the work to provide Hot Mix Asphalt Pavements for roads and drives, including patching as may be required, in the locations shown on the drawings, as detailed and in these Specifications.
- B. Provide all facilities, labor, materials, equipment, transportation, supervision, and related work necessary to complete the work in this Specification, and as shown on the Drawings.
- C. All work shall be performed in accordance with applicable codes, permits and regulations, and the requirements of all local, state, and federal agencies having jurisdiction over the work.

# 1.3 <u>RELATED SECTIONS</u>

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specifications Sections that directly relate to Work of this Section include, but are not limited to:
  - 1. Division 01, Section 01 71 23 Field Engineering.
  - 2. Division 32, Section 32 11 00 Pavement Base Courses.

#### 1.4 <u>REFERENCES AND DEFINITIONS</u>

A. Refer to Division 01, Section 01 42 16 Standard Sitework References & Definitions for definition of specific referenced standards as may be abbreviated in this section.

#### 1.5 <u>SYSTEM DESCRIPTION</u>

- A. Provide bituminous concrete pavement according to materials, workmanship and other applicable requirements of MASSDOT, unless more stringent requirements are noted herein.
  - 1. Measurement and payment provisions and safety program submittals included in MASSDOT do not apply to this Section.

# 1.6 QUALITY ASSURANCE

- A. Manufacturer shall be a paving-mix manufacturer registered with the Connecticut Department of Transportation.
- B. Testing Agency Qualifications: Qualified according to ASTM D 3666 for testing indicated, as documented according to ASTM E 548.
- C. Regulatory Requirements: Comply with MASSDOT for hot mix asphalt paving work.
- D. Asphalt-Paving Publication: Comply with AI MS-22, "Construction of Hot Mix Asphalt Pavements," unless more stringent requirements are indicated.
- E. Pre-installation Conference: Conduct conference at Project site prior to the start of paving operations. Review methods and procedures related to bituminous concrete pavement including, but not limited to, the following:
  - 1. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
  - 2. Review condition of subgrade and preparatory work.
  - 3. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
  - 4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment and facilities needed to make progress and avoid delays.

# 1.7 <u>SUBMITTALS</u>

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
- B. Job-Mix Designs: Certification, by authorities having jurisdiction, and signed by each manufacturer, of approval of each job mix proposed for the Work.
- C. Material Test Reports: For each "Class" of material used.
- D. Product data for Pavement Marking Paint.

# PART 2- PRODUCTS

# 2.1 <u>MATERIALS</u>

A. Bituminous Mix and Materials: The materials for bituminous concrete mix, source of supply, job mix formula, job mix tolerance, approval of job

mix, and control of mixture shall conform to the requirements of MASSDOT, Section M.3. Dense, hot-laid, bituminous concrete plant mixes complying with the following requirements:

- 1. Top Course.
- 2. Binder Course.
- 3. Bituminous Concrete Materials.
- 4. Auxiliary Materials.
- 5. Painted Pavement Markings.

# PART 3- EXECUTION

# 3.1 <u>EXAMINATION</u>

- A. The Contractor is responsible for coordinating with the Architect to obtain final approval of installed base materials prior to installation of any Asphalt pavements. All paving installed without prior approval of the Architect is subject to removal at the Contractor's expense.
- B. Base material shall be dry and in suitable condition to support paving and imposed loads at the time of installation.
- C. Proof-roll Base using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- D. Proceed with paving only after unsatisfactory conditions have been corrected.
- E. The methods employed in performing the work and all equipment, tools, machinery and other plant used in handling materials and executing any part of the work shall conform to all the requirements of MASSDOT SectionM3.
  - 1. "Compensation" section does not apply.

# 3.2 PROJECT CONDITIONS

- A. Environmental Limitations: Do not apply bituminous materials if subgrade is wet or excessively damp or if the following conditions are not met:
  - 1. Prime and Tack Coats: Minimum surface temperature of 60 F (15.5 C).
  - 2. Slurry Coat: Comply with weather limitations of ASTM D 3910.
  - Bituminous Base Course: Minimum surface temperature of 40 F (4 C) and rising at time of placement.
  - 4. Bituminous Surface Course: Minimum surface temperature of 60 F (15.5 C) at time of placement.

- 5. Base material: Do not place pavement or base materials until compaction testing has been reviewed and approved by the architect.
- 6. See notes on the drawings for additional time requirements for the use of prime and tack coat between successive placement of courses.
- B. Pavement Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 40 F(4 C) for oil-based materials, 50 F(10 C) for water-based materials, and not exceeding 95 F(35 C).

# 3.3 INSTALLATION TOLERANCES

- A. Thickness: Compact each course to produce the thickness indicated within the following tolerances:
  - 1. Binder Course: Plus 1/2 inch, minus 1/4 inch.
  - 2. Top Course: Plus 1/4 inch, no minus.
- B. Surface Smoothness: Compact the finish course to produce a surface smoothness within the following tolerances as determined by using a 10foot (3-m) straightedge applied transversely or longitudinally to paved areas:
  - 1. Surface Course: 1/4 inch.

# 3.4 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
  - 1. Sweep loose granular particles from surface of unbound-aggregate base course. Do not dislodge or disturb aggregate embedded in compacted surface of base course.
- B. Prime Coat: Apply uniformly over surface of compacted unboundaggregate base course at a rate of 0.15 to 0.50 gal. / sq. yd. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure for 72 hours minimum.
  - 1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
  - 2. Protect primed substrate from damage until ready to receive paving.

- 1. Allow tack coat to cure undisturbed before applying bituminous concrete pavement.
- 2. Avoid smearing or staining adjoining surfaces, appurtenances and surroundings. Remove spillages and clean affected surfaces.
- 3. Where new or existing bituminous pavement has been in place more than 5 days, tack coat is required in all instances.

# 3.5 BITUMINOUS CONCRETE PLACEMENT

- A. Machine place bituminous concrete mix on prepared surface, spread uniformly and strike off. Place mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section and thickness when compacted.
  - 1. Place each bituminous concrete course in single lift.
  - 2. Spread mix at minimum temperature of 250 F.
  - 3. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes, unless otherwise indicated.
  - 4. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide for roads and parking areas, and 6' for walkways, unless infill edge strips of a lesser width are required.
  - 1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Complete a section of asphalt base course before placing asphalt surface course.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with bituminous concrete to prevent segregation of mix; use suitable hand tools to smooth surface.

# 3.6 <u>PATCHING</u>

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- A. Bituminous Concrete Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Re-compact existing unbound-aggregate base course to form new subgrade.
- B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, bituminous concrete pavement at a rate of 0.05 to 0.15 gal./sq. yd.

- 1. Allow tack coat to cure undisturbed before applying bituminous concrete pavement.
- 2. Avoid smearing or staining adjoining surfaces, appurtenances and surroundings. Remove spillages and clean affected surfaces.
- C. Patching: Partially fill excavated pavements with bituminous concrete base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

# 3.7 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions with same texture and smoothness as other sections of bituminous concrete course.
  - 1. Clean contact surfaces and apply tack coat to joints.
  - 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
  - 3. Offset transverse joints, in successive courses, a minimum of 24 inches .
  - 4. Construct transverse joints as described in AI MS-22, "Construction of Hot Mix Asphalt Pavements."
  - 5. Compact joints as soon as bituminous concrete will bear roller weight without excessive displacement.
  - 6. Compact asphalt at joints to a density within 2 percent of specified course density.

# 3.8 <u>COMPACTION</u>

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers.
  - 1. Complete compaction before mix temperature cools to 185 F.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while bituminous concrete is still hot enough to achieve specified density. Continue rolling until bituminous concrete course has been uniformly compacted to the following density:

- 1. Average Density: 96 percent of reference laboratory density according to AASHTO T 245, but not less than 94 percent nor greater than 100 percent.
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while bituminous concrete is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.
- F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.
- G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

# 3.9 PAVEMENT MARKINGS

- A. Allow paving to cure for 30 days before applying final pavement markings.
- B. Do not apply pavement-marking paint until layout, colors, and placement have been verified with the Architect.
- C. Sweep and clean surface to eliminate loose material and dust.
- D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.

# 3.10 <u>DISPOSAL</u>

A. Remove all excess material from the site and dispose of in a legal manner.

END OF SECTION 32 12 16

# <u>32 13 13 – CEMENT CONCRETE PAVEMENT</u>

### <u>PART 1 - GENERAL</u>

### 1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes exterior concrete for the following:
  - 1. Concrete walk pavement.
  - 2. Integral, Monolithic Concrete Curbs.
- B. Provide all facilities, labor, materials, equipment, transportation, supervision, and related work necessary to complete the work in this Specification, and as shown on the Drawings.
- C. All work shall be performed in accordance with applicable codes, permits and regulations, and the requirements of all local, state, and federal agencies having jurisdiction over the work.

# 1.3 <u>RELATED SECTIONS</u>

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specifications Sections that directly relate to Work of this Section include, but are not limited to:
  - 1. Division 01, Section 01 71 23 Field Engineering.
  - 2. Division 32, Section 32 11 00 Pavement Base Courses.

#### 1.4 <u>REFERENCES AND DEFINITIONS</u>

A. Refer to Division 01, Section 01 42 16 Standard Sitework References & Definitions for definition of specific referenced standards as may be abbreviated in this section.

### 1.5 QUALITY ASSURANCE

A. Refer to Division 01, Section 01 43 00 Quality Assurance for testing and quality standards and for site work defined elsewhere in this specification.

# 1.6 <u>SUBMITTALS</u>

- A. Concrete Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- B. Qualification Data: For installer(s) and/or manufacturer(s).
- C. Expansion Joints: Product data for expansion joint materials.
- D. Joint Sealant: Product data for joint sealant(s).
- E. Detectable Warning Tiles: Product data for detectable warning tiles, including certification that product meets Federal ADA requirements.

# PART 2 - PRODUCTS

# 2.1 <u>CONCRETE MIXTURES</u>

- A. Concrete shall comply with MASSDOT Section M4, 5,000 psi Portland cement concrete (@ 28 days), except that air content shall be 6% (+/-1.0%).
  - 1. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement.
  - 2. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
  - 3. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
  - 4. Use water-reducing admixture in concrete, as required, for placement and workability.
  - 5. Use retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

# 2.2 STEEL REINFORCEMENT

- A. Reinforcement, where noted, shall conform to MASSDOT for uncoated bar and welded steel wire fabric, unless otherwise noted on plan.
- B. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.

# 2.3 <u>FORMS</u>

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
- B. Use flexible or curved forms for radii.
- C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

# 2.5 EXPANSION & CONTROL JOINTS

- A. Expansion joint material shall be 3/8-inch pre-molded asphaltic expansion joint filler where noted on plans.
  - 1. Expansion joint material is required where new concrete pavement abuts any new or existing concrete walls, foundations, steps, curbs and between successive pours.
  - 2. Trim joint filler at least 1/4 inch below finished surface.
- B. Control joints shall consist of tooled joints to the depth shown on the details and where noted on the plans.
  - 1. Control joints shall be evenly spaced between expansion joints.
  - C. All tool marks at expansion and control joints on horizontal planes shall be removed by brushing.

# 2.6 JOINT SEALANTS

- A. General: Pavement sealants shall be a polyurethane based complying with ASTM C-920, Type S (single component),or Type M (multi-component),Use group T (traffic) or NT (non-traffic), Class 35 (minimum) and the following. Any sealants used shall be recommended for the specific use by the manufacturer. Sealant and backer-rod materials shall be compatible as noted by the manufacturers submitted.
  - 1. Horizontal joints in areas of vehicular traffic shall comply with: ASTM C-920,

Grade P (pourable or self-leveling) Use T.

- Horizontal joints in areas of pedestrian, or light vehicular traffic shall comply with ASTM C-920, Grade NS (non-sag), use T or NT.
- 3. Vertical Joints: Shall comply with ASTM C-920, Grade NS (non-sag), use T or NT.
- 4. Color shall be from the manufacturer's standard color chart / samples.

B. Round backer rods of diameter and density required for the application and compatible with sealant type(s) and joint substrate to control sealant depth and prevent bottom adhesion of sealant.

# 2.7 DETECTABLE WARNING TILES

A. Detectable Warning Tiles shall be "Cast-In-Place Replaceable Tactile (Wet-Set)" Composite Detectable Warning Tiles as manufactured by ADA Solution, Inc., 1 Survey Circle 2<sup>nd</sup> Floor, North Billerica, MA, or approved equal. Color to be selected by Architect from manufacturer's standard color chart.

# PART 3 - EXECUTION

# 3.1 <u>EXAMINATION</u>

- A. Examine exposed pavement base course surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared base course below concrete pavements and slabs with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
  - 1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
  - Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch require correction according to requirements in Division 31 Section "Earthwork."
- C. Proceed with concrete placement operations only after nonconforming conditions have been corrected and base course is ready to receive pavement.
- D. Remove loose material from compacted base course surface immediately before placing concrete.

# 3.2 <u>CONSTRUCTION</u>

- A. Place concrete pavement to the grade, width and depth as shown on plan.
- B. General: Construct forms and place reinforcement and concrete in conformance with MASSDOT, Section 476.

# 3.3 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

# 3.4 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- D. Do not add water to fresh concrete after testing.
- E. Deposit and spread concrete in a continuous operation between joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- F. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
  - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- G. Screed pavement surfaces with a straightedge and strike off.
- H. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- I. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When air temperature has fallen to or is expected to fall below 40° F, uniformly heat water and aggregates before mixing to obtain a

concrete mixture temperature of not less than 50° F and not more than 80° F at point of placement.

- 2. Do not use frozen materials or materials containing ice or snow.
- 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.
- J. Hot-Weather Placement: Comply with ACI 301 and as follows when hotweather conditions exist:
  - Cool ingredients before mixing to maintain concrete temperature below 90° F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
  - 2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
  - 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

# 3.5 DETECTABLE WARNING TILES

A. Install detectable warning tiles per manufacturer's instructions. Protect tile surface during concrete finishing. Clean spills / splatter immediately.

# 3.6 JOINTS

- A. Install expansion and contraction joints in locations shown and as noted on drawings.
- B. Install backer rods at expansion joints in accordance with manufacturer's instructions.
  - 1. Do not leave gaps between ends of backer rod material.
  - 2. Do not stretch, twist, puncture or tear backer rod material.
  - 3. Remove any backer rod material that has become wet before sealant application and replace with dry material.
- C. Install joint sealant at expansion joints in accordance with manufacturer's instructions.
  - 1. Place sealant so it directly contacts concrete surfaces and backer rod materials.
  - 2. Sealant shall completely fill all recesses for each joint configuration.

- 3. Produce uniform cross-sectional shapes and depths relative to the joint and according to manufacturer's instructions.
- D. Immediately clean any excess sealant or smears on adjacent surfaces as the work progresses by methods and with materials approved by the sealant manufacturer.
- E. Protect joint sealant during placement and throughout curing period from contaminants and/or damage. Remove and replace any contaminated or damaged sections.

# 3.7 FINISHING CONCRETE

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- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Finish: Begin the second floating operation when bleed-water sheen has disappeared, and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
  - 1. Medium-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic. Edges of panels shall have a tooled radius, but the <u>flat surface</u> shall have the tooled marks removed by brooming.

# 3.8 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
  - 1. Comply with ACI 306.1 for cold-weather protection.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb./sq. ft. x h(1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retainingcover, curing compound or a combination of these as follows:
  - 1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately

repair any holes or tears during curing period using cover material and waterproof tape.

2. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

# 3.9 PAVEMENT TOLERANCES

- A. Comply with tolerances of ACI 117 and as follows:
  - 1. Elevation: 1/4 inch.
  - 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
  - 3. Surface: Gap below 10-foot long, unleveled straightedge not to exceed 1/4 inch.
  - 4. Contraction Joint Depth: Plus 1/4 inch, no minus.
  - 5. Joint Width: Plus 1/8 inch, no minus.

# 3.10 REPAIRS AND PROTECTION

- A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.
- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 32 13 13

# <u>32 6 13 – PRECAST CONCRETE CURB</u>

### <u>PART 1 - GENERAL</u>

### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. Contractor shall provide and install precast concrete curb as detailed and in location shown on the drawings.
- B. Provide all facilities, labor, materials, equipment, transportation, supervision, and related work necessary to complete the work in this Specification, and as shown on the Drawings.
- C. All work shall be performed in accordance with applicable codes, permits and regulations, and the requirements of all local, state, and federal agencies having jurisdiction over the work.

### 1.3 <u>RELATED SECTIONS</u>

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specifications Sections that directly relate to Work of this Section include, but are not limited to:
  - 1. Division 01, Section 01 71 23 Field Engineering.
  - 2. Division 31, Section 31 20 00 Site Earthwork.
  - 3. Division 32, Section 32 11 00 Pavement Base Courses.
  - 4. Division 32, Section 32 12 16 Bituminous Concrete Pavement.

# 1.4 <u>REFERENCES AND DEFINITIONS</u>

A. Refer to Division 01, Section 01 42 16 Standard Sitework References & Definitions for definition of specific referenced standards as may be abbreviated in this section.

# 1.5 QUALITY ASSURANCE

A. Refer to Division 01, Section 01 43 00 Quality Assurance for testing and quality standards and for site work defined elsewhere in this specification.

### 1.6 <u>SUBMITTALS</u>

- A. Product data for precast concrete curb units, including dowels.
- B. Product data for joint sealant.
- C. Concrete mix at joints.

# PART 2- PRODUCTS

# 2.1 MATERIALS

- A. Precast concrete curb shall be as manufactured by United Concrete Products, Inc., Yalesville, CT, or approved equal.
- B. Joint Sealant: Shall comply with ASTM C-920, Grade NS (non-sag), use T or NT. Submitted product shall be available in a minimum of 7 standard colors. Any sealants used shall be as recommended for the specific use by the manufacturer. Backer-rods, if required, shall be compatible as noted by the manufacturers submitted.
- C. Concrete Mix: Concrete for backfill at curb joints shall meet CTDOT Form 816, Class C.

# PART 3- EXECUTION

# 3.1 INSTALLATION

- A. Install curb as per manufacturer's instructions and as detailed.
  - 1. Install standard "Transition End" sections for sloped curbs (i.e. at handicap ramps) where noted on drawings and as detailed.
  - 2. Install standard "90 degree "Inside / Outside Corner" sections at all 90-degree corners.
  - 3. Where Catch Basins are located in corners, Catch Basin frame shall be located so that standard Precast Curb "Inside / Outside Corner" forms the 90-degree corner.
- B. All curb sections shall be joined with standard steel dowel pin.
- C. Install 1 cubic foot of concrete mix behind each joint as detailed.
- D. Chipped sections shall be removed and replaced or repaired with manufacturer's specified material as directed by the Architect prior to paving.
- E. Install joint sealant and backer rod as per manufacturer's instructions.

END OF SECTION 32 16 13

# 32 39 05 – WOOD POST & BEAM GUIDE RAIL

### PART 1 - GENERAL

### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

#### 1.1 <u>SUMMARY</u>

- A. Contractor shall provide and install Wood Post & Beam Guide Rail in location shown on the drawings and as detailed.
- B. Provide all facilities, labor, materials, equipment, transportation, supervision, and related work necessary to complete the work in this Specification, and as shown on the Drawings.
- C. All work shall be performed in accordance with applicable codes, permits and regulations, and the requirements of all local, state, and federal agencies having jurisdiction over the work.

#### 1.2 <u>RELATED SECTIONS</u>

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specifications Sections that directly relate to Work of this Section include, but are not limited to:
  - 1. Division 31, Section 31 20 00 Site Earthwork.

#### 1.3 <u>REFERENCE STANDARDS</u>

A. Refer to Division 01, Section 01 42 16 Standard Sitework References & Definitions for definition of specific referenced standards as may be abbreviated in this section.

#### 1.4 QUALITY ASSURANCE

A. Refer to Division 01, Section 01 43 00 Quality Assurance for testing and quality standards and for site work defined elsewhere in this specification.

#### 1.5 <u>SUBMITTALS</u>

A. Shop Drawings: Provide shop drawings of guide rail showing dimensions, materials, finishes and field verified layout.

# 1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver products and materials in original unopened packages, containers, or bundles with manufacturer's label intact and legible.
- B. Remove items delivered in broken, damaged, rusted, or unlabeled condition from project site immediately.
- C. Handle and store so as to avoid damage.

# PART 2 - PRODUCTS

- 2.1 <u>MATERIALS</u>:
  - A. Posts and Rails: Pressure treated Southern Yellow Pine or Douglas Fir in accordance with the rules of the West Coast Bureau of Lumber Grade and Inspection of Southern Pine in accordance with the rules of Southern Pine Inspection Bureau. Wood to be .40 CCT pressure treated; sound; well-seasoned; straight grained; free from checks, knots or any other defects.

# PART 3- EXECUTION

# 3.1 INSTALLATION

- A. Install as indicated on drawings and details.
- B. Install posts level, plumb, true, and securely anchored as indicated on drawings.
- C. Install beam sections following finished grade of ground surface.

END OF SECTION 32 31 05

# 31 31 13 – CHAIN LINK FENCE

### <u>PART 1 - GENERAL</u>

### 1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

#### 1.1 <u>SUMMARY</u>

- A. Contractor shall provide all facilities, labor, materials, equipment, transportation, supervision, and related work necessary to install chain link fencing in location(s) shown on the drawings and as detailed.
- B. Provide all facilities, labor, materials, equipment, transportation, supervision, and related work necessary to complete the work in this Specification, and as shown on the Drawings.
- C. All work shall be performed in accordance with applicable codes, permits and regulations, and the requirements of all local, state, and federal agencies having jurisdiction over the work.

# 1.2 RELATED SECTIONS

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specifications Sections that directly relate to Work of this Section include, but are not limited to:
  - 1. Division 31, Section 31 20 00 Site Earthwork.

#### 1.3 <u>REFERENCES AND DEFINITIONS</u>

A. Refer to Division 01, Section 01 42 16 Standard Sitework References & Definitions for definition of specific referenced standards as may be abbreviated in this section.

# 1.4 QUALITY ASSURANCE

A. Refer to Division 01, Section 01 43 00 Quality Assurance for testing and quality standards and for site work defined elsewhere in this specification.

- B. Additional Fencing Requirements:
  - 1. Railing assembly, wall rails, and attachments to resist force in any direction of 300 pounds at any point without damage or permanent set.
  - 2. Gates shall be equipped with latching mechanism that meets current ADA requirements, including "*operable parts* shall be operable with one hand and shall not require tight grasping, pinching or twisting of the wrist. The force required to activate *operable parts* shall be 5 pounds (22.2 N) maximum."

# 1.5 <u>SUBMITTALS</u>

- A. Shop Drawings: Provide shop drawings of fencing and gates showing dimensions, materials, finishes and field verified layout.
- B. Manufacturer shall verify strength and sizing of terminal / corner and gate posts.
- C. Concrete Footings: Provide job mix for concrete used for fence post footings.

# PART 2- PRODUCTS

# 2.1 <u>MATERIALS</u>

- A. Fabric: Chain link fence fabric shall be 9-gauge, 2-inch mesh, aluminum coated steel conforming to ASTM A 491-11.
  - Vinyl Coated Fabric: Chain link fence fabric shall be 9-gauge, 2-inch mesh aluminum coated steel conforming to ASTM A 491 with 7 mil PVC coating conforming to ASTM F668-11 applied by the fusion method over a thermoset plastic bonding agent.
- B. Terminal / Corner Posts: Posts of size indicated on the drawings of galvanized steel with a minimum bending strength of 381 pounds on a six foot cantilever load.
- C. Gates: Gate posts shall be of size to properly support gate leaf(s) throughout full operation meeting these minimums:

Up to 6 foot width	2 7/8" O.D. 5.79 lbs/linear foot
Over 6 up to 13 feet	4" O.D. 9.11 lbs/linear foot
Over 13 up to 18 feet	6 5/8" O.D.18.79 lbs/linear foot
Over 18 feet	8 5/8" O.D.28.55 lbs/linear foot

1. Gate Frame: Tubular 1.90-inch O.D. steel with welded or steel fitted corners. Braces or trusses shall be furnished when necessary to hold frame true and square.
- 2. Gate Latch: Commercial fork-type, lockable gate latch.
- 3. Gate Keeper: Mechanical device capable of holding gate secure in the full open position.
- 4. Drop Rod: For double gates, provide drop rod, center gate stop pipe and provision for padlocking gates closed. Padlock provided by Owner.
- D. Line Posts: Standard weight 2.375-inch O.D. galvanized steel pipe with a minimum bending strength of 201 pounds under a 6 foot cantilever load.
- E. Horizontal Rails: Standard weight 1.66-inch O.D. galvanized steel pipe with a minimum bending strength of 202 pounds under a 10 foot cantilever load.
- F. Bottom Tension Wire: Aluminum coated, seven (7) gauge tension wire stretched and securely fastened between terminal posts and each intermediate post six (6) inches above finished grade with aluminum hog rings every 24 inches.
- G. Tie Wire: 9-gauge aluminum or 11 gauge galvanized steel, spaced every 12 inches.
- H. Galvanizing: All parts required to be galvanized shall be coated with two (2.0) ounces of hot-dipped zinc in accordance with ASTM A 120 requirements.
- I. Concrete: All posts shall be set in concrete footings as detailed. Concrete shall conform to CTDOT Class "C" concrete.

# PART 3- EXECUTION

## 3.01 INSTALLATION

- A. Fence shall be installed to lines and grades shown on the plans and as detailed. Top of fence shall follow finished grade in a uniform line.
- B. Install posts level, plumb and true in footings as indicated on the drawings.
  - 1. Posts shall be evenly spaced, no further than ten (10) feet apart or closer than five (5) feet.
  - 2. Concrete footings shall be sized as shown on the detail(s). Top of footing shall be below finished surface as shown on the detail(s).
- C. Fabric shall be stretched to the proper tension between terminal / corner posts and securely fastened. Bottom of fence fabric to finished grade shall not exceed two (2) inches.

END OF SECTION 32 31 13

# 31 31 13 - CHAIN LINK FENCE

## <u> PART 1 - GENERAL</u>

## 1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

## 1.2 <u>SUMMARY</u>

- A. Contractor shall provide and install plastic (PVC) fencing in location shown on the drawings and as detailed.
- B. Provide all facilities, labor, materials, equipment, transportation, supervision, and related work necessary to complete the work in this Specification, and as shown on the Drawings.
- C. All work shall be performed in accordance with applicable codes, permits and regulations, and the requirements of all local, state, and federal agencies having jurisdiction over the work.

### 1.3 <u>RELATED SECTIONS</u>

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specifications Sections that directly relate to Work of this Section include, but are not limited to:
  - 1. Division 31, Section 31 20 00 Site Earthwork.

## 1.4 <u>REFERENCE STANDARDS</u>

A. Refer to Division 01, Section 01 42 16 Standard Sitework References & Definitions for definition of specific referenced standards as may be abbreviated in this section.

## 1.5 QUALITY ASSURANCE

- A. Fencing Requirements
  - 1. Railing assembly, wall rails, and attachments to resist force in any direction of 300 pounds at any point without damage or permanent set.
  - 2. Gates shall be equipped with latching mechanism that meets current ADA requirements, including "*operable parts* shall be operable with one hand and shall not require tight grasping, pinching or twisting of

# PLASTIC (PVC) SCREEN FENCE

the wrist. The force required to activate *operable parts* shall be 5 pounds (22.2 N) maximum."

# 1.6 <u>SUBMITTALS</u>

- A. Shop Drawings: Provide shop drawings of fencing and gates showing dimensions, materials, finishes and field verified layout.
- B. "Or Equal" submission must provide a complete fencing system from one manufacturer and must include sufficient information to compare all aspects of the product with that specified herein.
- C. Concrete Footings: Provide job mix for concrete used for fence post footings.

# 1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver products and materials in original unopened packages, containers, or bundles with manufacturer's label intact and legible.
- B. Remove items delivered in broken, damaged, rusted, or unlabeled condition from project site immediately.
- C. Handle and store so as to avoid damage.

# PART 2 - PRODUCTS

- 2.1 <u>MATERIALS:</u>
  - A. Commercial grade, virgin rigid polyvinyl chloride (PVC) posts, panels, pickets rails, caps and accessories from a single manufacturer as a complete system.
    - 1. Materials shall meet ASTM D4216 06 Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) and Related PVC and Chlorinated Poly(Vinyl Chloride) (CPVC) Building Products Compounds.
    - Material shall meet ASTM F964 09 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Exterior Profiles Used for Fencing and Railing.
  - B. Concrete fence post footings: Concrete shall be MASSDOT 4,000 psi.

# 2.2 MANUFACTURER / STYLE

- A. Fencing system shall be the specified style as manufactured by Illusions Vinyl Fencing, or approved equal.
  - 1. Privacy Panel, Classic Series, V300-6, 6- foot height x 8-foot (nom.) panels, with standard post caps.
  - 2. Color to be selected from the manufacturer's standard available color chart.
  - 3. Posts: 5" x 5" H.D. option with 0.250" wall thickness.

4. Gate(s): Gate to match fence style, height and color. Provide manufacturer's hardware (hinges, latch, drop rod and accessories) to suit gate size. Post size to support gate leaf width.

# PART 3 - EXECUTION

# 3.1 INSTALLATION

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated.
- B. Install as indicated on drawings.
- C. Install posts level, plumb, true, and securely anchored as indicated on drawings.
- D. Install fence sections with horizontal rails following finished grade of ground surface.
- E. Post Setting: Set cast-in support posts in concrete footing with smooth top, shaped to shed water. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- F. Repairs: Field repair any damage with manufacturer's repair product(s).

# 3.2 <u>WARRANTY</u>

- A. All structural fence components (rails, pickets, posts) shall be warranted by the manufacturer for a period of 10 years from the date of original purchase. Warranty shall cover any defects in material finish, including cracking, peeling chipping, blistering or corroding.
- B. Contractor shall provide Owner with 10 manufacturer's repair kits.

END OF SECTION 32 31 23

## <u>32 39 13 – STEEL PIPE BOLLARDS</u>

## <u> PART 1 - GENERAL</u>

### 1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

### 1.2 SUMMARY

- A. This Section includes the work to provide and install Steel Pipe Bollards.
- B. Provide all facilities, labor, materials, equipment, transportation, supervision, and related work necessary to complete the work in this Specification, and as shown on the Drawings.
- C. All work shall be performed in accordance with applicable codes, permits and regulations, and the requirements of all local, state, and federal agencies having jurisdiction over the work.

### 1.3 <u>RELATED SECTIONS</u>

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specifications Sections that directly relate to Work of this Section include, but are not limited to:
  - 1. Division 31 Section 31 20 00 Site Earthwork.
  - 2. Division 32 Section 32 13 13 Concrete Pavement.

#### 1.4 <u>REFERENCES AND DEFINITIONS</u>

A. Refer to Division 01, Section 01 42 16 Standard Sitework References & Definitions for definition of specific referenced standards as may be abbreviated in this section.

#### 1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver products and materials in original unopened packages, containers, or bundles with manufacturer's label intact and legible.
- B. Remove items delivered in broken, damaged, rusted, or unlabeled condition from project site immediately.
- C. Handle and store so as to avoid damage.

### 1.6 <u>SUBMITTALS</u>

- A. Shop drawings for bollard including dimensions and materials.
- B. Concrete design mix.
- C. Product information for plastic bollard (HDPE) covers.

### PART 2- PRODUCTS

### 2.1 STEEL PIPE BOLLARDS

- A. Bollards shall be constructed of Schedule 40 steel pipe to dimensions shown on plan.
- B. Galvanizing: Bollard must be hot dip galvanized after fabrication in compliance with ASTM A-123, A-153 and/or A-386.
  - 1. To minimize surface imperfections (e.g. flux inclusions), material to be galvanized shall be dipped into a solution of Zinc Ammonium Chloride (ZAC) immediately prior to galvanizing.
  - 2. To minimize distortion and to thoroughly dry the ZAC, material which is less than 30 feet in length shall be placed into a suitable dryer/preheater with a heating capability of not less than 200 degrees F. Material which is longer than 30 feet shall be air dried until the ZAC is dry to touch, then placed into the galvanizer's kettle. The type of galvanizing process utilizing a flux blanket overlaying the molten zinc shall not be permitted.
  - 3. Following galvanizing, all items must be chromated by dipping in a chromic acid solution (minimum 0.15% by volume).
  - 4. Field welds must be repaired by applying two coats, each to a dry film thickness of 2.0 mils, of a one package, 95% organic zinc rich paint (equal to ZIRP as manufactured by Duncan Galvanizing) to all damaged areas. Grinding must be limited to the weld area. Excessive over-grinding causing removal of galvanizing will result in rejection.
- C. Fill bollards with concrete. Concrete shall meet MASSDOT, Section M4, 4,000 psi concrete.
- D. Bollard Covers: High Density Polyethylene (HDPE) covers, sized for steel pipe shown on details, as manufactured by BollardGard, Chagrin Falls OH or approved equal.
  - 1. Color to be selected from the standard manufacturer's color chart.
  - 2. If noted on plans, provide reflective tape.
  - 3. Provide adhesive "Gripper Tabs" to secure cover to post.

## PART 3- EXECUTION

# 3.1 INSTALLATION

- A. Place at locations and in accordance to details indicated on the Drawings.
- B. Excavate for concrete footings and set posts in concrete footing with smooth top, shaped to shed water. Top of concrete footing shall be below finished grade as detailed on the drawings. Protect portion of posts above footing from concrete splatter. Verify that posts are set plumb or at correct angle and are aligned and at correct height and spacing. Hold posts in position during placement and finishing operations until concrete is sufficiently cured.
- C. Clean surfaces and protect from damage. Touch up any damages to factory primer finish with manufacturer supplied zinc-rich primer.
- D. Apply two coats of final paint finish to thickness and dry time as recommended by paint manufacturer.
  - 1. If final paint finish does not provide complete cover, apply additional coat to ENTIRE assembly. Do not touch up thin areas.

END OF SECTION 32 39 13

### <u>31 91 13 – TOPSOIL & PLANTING SOIL</u>

#### <u>PART 1 - GENERAL</u>

#### 1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

#### 1.2 <u>SUMMARY</u>

- A. This Section includes preparation and placement of Topsoil for seedbeds and Planting Soil for planting pits and shrub beds on a prepared subgrade.
- B. Provide all facilities, labor, materials, equipment, transportation, supervision, and related work necessary to complete the work in this Specification, and as shown on the Drawings.
- C. All work shall be performed in accordance with applicable codes, permits and regulations, and the requirements of all local, state, and federal agencies having jurisdiction over the work.

## 1.3 <u>RELATED SECTIONS</u>

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specifications Sections that directly relate to Work of this Section include, but are not limited to:
  - 1. Division 31, Section 31 20 00 Site Earthwork.
  - 2. Division 32, Section 32 92 00 Seeded Lawns.
  - 3. Division 32, Section 32 93 00 Trees, Plants & Groundcovers.

#### 1.4 <u>REFERENCES AND DEFINITIONS</u>

- A. Refer to Division 01, Section 01 42 16 Standard Sitework References & Definitions for definition of specific referenced standards as may be abbreviated in this section.
- B. Topsoil: Existing or imported topsoil, or manufactured soil modified to become topsoil, intended for installation as a seed bed for lawns, sod or meadow, and as a basis for Planting Soil mixture, meeting the requirements of this Section.

C. Planting Soil: Topsoil that has been further modified with soil amendments intended for installation in tree pits and plant beds meeting the requirements of this Section.

# 1.5 QUALITY ASSURANCE

A. Refer to Division 01, Section 01 43 00 Quality Assurance for testing and quality standards for site work defined elsewhere in this specification.

# 1.6 <u>DELIVERY, STORAGE, AND HANDLING</u>

A. Do not deliver or place soils in frozen, wet, or muddy conditions.

# 1.7 <u>SUBMITTALS</u>

- A. Topsoil: Submit soil test analysis report for all on-site and borrow topsoil and planting soil from an approved soil testing laboratory for the type of crop to be installed, including at minimum:
  - 1. Soil pH.
  - 2. Percent organic content by weight.
  - 3. Levels of nitrogen, phosphorus and potassium.
  - 4. Soluble salt in parts per million (ppm).
  - 5. Mechanical Analysis including gradation of sand, silt, and clay content and determination of U.S.D.A. textural classification.
  - 6. Recommended quantities of fertilizer(s), organic and inorganic amendments to be added to produce topsoil or planting soil suitable for the intended use.
- B. Additives: Product data for organic and inorganic additives, fertilizers and amendments as required for use as noted in testing results, including at minimum:
  - 1. Lime.
  - 2. Fertilizer(s).
  - 3. Peat or Compost.

# PART 2- PRODUCTS

- 2.1 <u>TOPSOIL</u> (FOR LAWNS AND GRASSES)
  - A. Topsoil shall be loose and friable and free from refuse, stumps, roots, brush, weeds, rocks and stones. The topsoil shall also be free from any material that will prevent the formation of a suitable seedbed or prevent seed germination and plant growth, including the following:

- 1. USDA Textural class, as defined by testing, shall meet at least one of the following: Loamy Sand (incl. coarse, loamy fine and loamy very fine sand), Sandy Loam (incl. coarse, fine and very fine sandy loam), Loam, Silt Loam (w/ not more than 60% silt).
- 2. Organic matter content by weight shall be not less than 6% nor more than 20%.
- 3. Soil pH value shall be between 5.5 and 6.0.
- 4. Topsoil shall be screened of all debris and stones greater than 3/4 inch in any direction.
- 5. Nutrient levels shall be as recommended by testing.
- 6. Imported topsoil shall be from one source.
- 2.2 <u>PLANTING SOIL</u> (FOR TREE PITS & PLANTING BEDS)
  - A. Planting Soil mixture shall be Topsoil as specified in this section that is further amended to provide suitable backfill for plant materials, including the following:
    - USDA Textural class, as defined by testing, shall meet at least one of the following: Loamy Sand (w/ not more than 80% sand), Sandy Loam, Loam, Silt Loam (w/ not more than 60% silt), Clay Loam (w/ not more than 30% clay) or Sandy Clay Loam (w/ not more than 30% clay).
    - 2. Planting Soil shall be screened of all debris and stones greater than 1 1/2 inch in any direction.
    - 3. Soil pH for ericaceous plants and broad leaf evergreens requiring acid soil shall be between 4.5 and 5.5.
    - 4. Soil pH for general and non-acid loving plants shall be between 5.6 to 6.5.
    - 5. Nutrient levels shall be as recommended by testing.
    - 6. Amendments as required by testing by percentage of volume.

## 2.3 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:
  - 1. Minimum calcium carbonate equivalent shall be 90% by weight, plus 100% passing #10, 90% passing #20 and 40% passing #100 sieves.
  - 2. Provide lime in form of dolomitic limestone.
- B. Sulfur: Granular, biodegradable, containing a minimum of 90% sulfur, with a minimum 99% passing #6 sieve and a maximum 10% passing the #40 sieve.

- C. Perlite: Horticultural perlite, soil amendment grade.
- E. Sand: Clean, washed, natural or manufactured, free of toxic materials, sized to 1/4".

# 2.4 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings, and as follows:
  - 1. Organic Matter Content: 50 to 60 percent of dry weight.
  - 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
  - 3. Peat: Finely divided or granular texture, with a pH range of 6 to 7.5, containing partially decomposed moss peat, native peat, or reed-sedge peat and having a water-absorbing capacity of 1100 to 2000 percent.
  - 4. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture, free of chips, stones, sticks, soil, or toxic materials.
- B. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.
- C. Composted Leaf Mold: Leaf matter and yard waste composted sufficiently to break down all woody fibers, seeds and leaf structures. Screened and free of toxic and non-organic matter greater than 1/2 inch in any direction.

## 2.5 <u>FERTILIZER</u>

- A. Bonemeal: Commercial grade, finely ground providing a minimum of four
  (4) percent nitrogen and ten (10) percent phosphoric acid.
- B. Superphosphate: Commercial grade, soluble providing a minimum of twenty (20) percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, fifty (50) percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the amounts recommended by testing for the crop to be grown.

## PART 3- EXECUTION

- 3.1 <u>MIX DESIGN</u>
  - A. For each different topsoil or planting soil mix, prepare samples to determine the proper ratio of components to be added to the soil mix. Submit to the Architect for approval.
    - 1. The Architect may request testing of the prepared topsoil or planting soil to verify conformance with this Specification. Owner shall pay for such testing.

# 3.2 SOIL MIXING AND TESTING

- A. All soil mixing shall be performed using appropriate soil mixing and shredding equipment of sufficient capacity and capability to assure proper quality control.
  - 1. Any additional town or state agency permitting required for on-site processing of soils are the responsibility of the Contractor.
- B. Contractor shall mix sufficient material in advance of the time needed at the Project site to allow adequate time for testing as required by the progress of the work.
  - 1. Store separate soil mixes in piles not to exceed 400 cubic yards, and number & clearly identify each pile for identification and testing purposes.
  - 2. Contractor shall submit one particle size distribution analysis of each 400 cubic yards of topsoil (seedbed) mix prepared.
  - 3. In the event that the particle size distribution varies significantly from the approved sample, as determined by the Architect, make adjustments to the mixing ratios and procedures.
  - 4. Re-mix and re-test stockpiles of soil that fail to meet the correct analysis after the adjustment has been made.

## 3.3 <u>SITE PREPARATION</u>

- A. Confirm that the subgrade is at the proper elevation and compacted as required. Subgrade elevations shall slope parallel to the finished grade. Do not proceed with the installation of topsoil or planting soil until all work in the area has been installed.
- B. Protect adjacent walls, walks and utilities from damage or staining by the soil. Use plywood and or plastic sheeting as directed to cover existing masonry work and other items during the installation.
  - 1. Clean up any soil or dirt spilled on any paved surface, including at the end of each work day.

2. Damage to paving or architectural work caused by the soils installation shall be repaired by the Contractor at no additional expense.

# 3.4 <u>TILLING SUBGRADE AND MIXING OF SOILS INTO THE SUBGRADE</u>

- A. Loosen the subgrade to a depth of 2 to 3-inches with a roto tiller or other suitable device.
- B. Spread a layer of the specified topsoil or planting soil mix two inches (2") deep over the subgrade. Thoroughly till the soil mix and the subgrade together.
- C. Protect the tilled area from traffic. Do not allow the tilled subgrade to become compacted. In the event that the tilled subgrade becomes compacted, till the area again prior to installing the final soil mixture(s).

## 3.5 <u>TOPSOIL INSTALLATION</u>

- A. Install the topsoil to the depths shown on the drawing and as detailed. The depths and grades are the final grades after settlement and shrinkage of the organic material. The contractor shall install the soil at a higher level to anticipate this reduction of soil volume.
  - 1. Lightly compact topsoil sufficiently to reduce settling but not to prevent the movement of water through the soil.
  - 2. Maintain moisture conditions within the soils during installation to allow for satisfactory compaction. Suspend installation operations if the soil becomes wet. Do not place topsoil on wet or frozen subgrade.
  - 3. Provide adequate equipment to achieve consistent and uniform compaction of the soils. Do not use vibrator equipment to compact top soil.
  - 4. Reset grade, repair wash-outs as required after soil has settled.
  - Do not place topsoil unless final seeding is anticipated within three (3) weeks of final grading.

## 3.6 PLANTING SOIL INSTALLATION

A. Install planting soil mixture to the depths and grades shown on the drawing and details. The depths and grades shown on the drawings are the final grades after settlement and shrinkage of the soil material. The contractor shall install the soil at a higher level to anticipate this reduction of soil volume.

- 1. Lightly compact soil mix sufficiently to reduce settling and eliminate voids but not to prevent the movement of water and feeder roots through the soil.
- 2. Maintain moisture conditions within the soils during installation to allow for satisfactory compaction. Suspend installation operations if the soil becomes wet. Do not place soils on wet or frozen subgrade.
- 3. Provide adequate equipment to achieve consistent and uniform compaction of the soils. Do not use vibrator equipment to compact top soil or planting mix.
- 4. Thoroughly soak the soil after installation but prior to planting. Let soil stand for a minimum of 3 days after soaking to accommodate initial settling. Reset grades after soil has settled.

# 3.7 <u>FINE GRADING</u>

- A. Grade the finish surface of all areas to meet the grades shown on the drawings. Adjust the finish grades to meet field conditions as directed.
  - 1. Provide for positive drainage from all areas toward the existing inlets and drainage structures.
  - 2. Provide smooth transitions between slopes of different gradients and direction. Modify the grade so that the finished grade is flush with all adjacent surface finishes.
  - 3. Fill all dips and remove any bumps in the overall plane of the slope. Tolerance for dips and bumps in lawn areas shall be a 1/2 inch, in plant beds 1 inch deviation from the plane in 10 feet.
  - 4. Fine grading shall be inspected and approved by the Landscape Architect prior to planting, mulching, sodding, or seeding.

# 3.8 TOP DRESSING AND SOIL IMPROVEMENT UNDER EXISTING TREES

- A. Kill existing sod and other plants shown on the drawings as directed using "Round Up" or other approved herbicide. Apply the herbicide using equipment and techniques that do not allow drifting or spilling onto adjacent plants directed to remain. Herbicide application shall be made at a time of year when the plants are in an active growth period.
- B. Fourteen (14) days after the application of the herbicide, thoroughly soak the area and remove the tops and roots of the dead plants. Dead sod shall be stripped using steel rakes. Other plants, ground covers and vines shall be pulled by hand or loosened with hand tools.
- C. Scarify the top 1-inch of the soil surface. Spread 1-inch of composted leaf mold over the area to be top dressed as indicated on the drawings. Work into the top layer of soil using a steel rake, DO NOT ROTO TILL THE LEAF MOLD INTO THE EXISTING GRADE.

D. Proceed with planting, seeding or sodding as required immediately after completion of the top dressing work.

## 3.9 RESTORATION OF SETTLED GRADES

- A. Guarantee: One year after the date of substantial completion of the ENTIRE project, inspect the site and restore any areas where the grades have settled beyond the elevations shown on the drawings.
  - 1. Lawn areas: Where settlement is greater than two (2) inches deviation from the plane in 10 feet, creates areas of ponding deeper than one (1) inch for a 24-hour period or greater than 1/2 inch from adjacent finished surfaces (pavements or curbs), provide additional topsoil and repair lawn.
  - 2. Planting Areas: Where the settlement is 3-inches or less, remove the mulch, top dress the area with the specified topsoil or planting mix and re mulch. Where the settlement is greater than 3-inches remove the mulch and plants, add the specified planting mix, reinstall plants and re mulch.

# 3.10 <u>CLEAN UP</u>

- A. Upon completion of soil operations, clean areas within the contract limits.
  - 1. Remove all excess fill soils and soil stockpiles, and legally dispose of all waste materials, trash, and debris.
  - 2. Remove all tools and equipment and provide a clean, clear site.
  - 3. Wash all paving and other exposed surfaces of dirt and mud.

END OF SECTION 32 91 15

# <u> 32 92 00 – SEEDING</u>

### <u> PART 1 - GENERAL</u>

### 1.1 RELATED DOCUMENTS

A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

### 1.2 SUMMARY

- A. This Section includes installation of temporary and permanent seeding of lawn areas, wildflower areas and seeding of stockpiles and areas not ready for final finishes.
- B. Provide all facilities, labor, materials, equipment, transportation, supervision, and related work necessary to complete the work in this Specification, and as shown on the Drawings.
- C. All work shall be performed in accordance with applicable codes, permits and regulations, and the requirements of all local, state, and federal agencies having jurisdiction over the work.

## 1.3 <u>RELATED SECTIONS</u>

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specifications Sections that directly relate to Work of this Section include, but are not limited to:
  - 1. Division 31, Section 31 23 15 Site Earthwork.
  - 2. Division 32, Section 32 91 13 Topsoil & Planting Soil.
  - 3. Division 32, Section 32 93 00, Trees, Plants & Groundcovers.

#### 1.4 <u>REFERENCES AND DEFINITIONS</u>

A. Refer to Division 01, Section 01 42 16 Standard Sitework References & Definitions for definition of specific referenced standards as may be abbreviated in this section.

### 1.5 QUALITY ASSURANCE

A. Refer to Division 01, Section 01 43 00 Quality Assurance for testing and quality standards for site work defined elsewhere in this specification.

B. Pre-installation Inspection: Architect shall be given ample opportunity to inspect finished topsoil grades and conditions prior to any planting activities. All planting or seeding done without prior approval is subject to rejection and removal at the Contractor's expense.

# 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver seed in original sealed, labeled and undamaged containers.

# 1.7 <u>SCHEDULING</u>

- A. Planting Restrictions: Plant only during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
  - 1. Spring Planting: March 15 to June 1.
  - 2. Fall Planting: August 15 to October 15.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

# 1.8 <u>SUBMITTALS</u>

- A. Certification of Grass Seed: From seed vendor for each grass seed or mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
- B. Product Certificates: For soil amendments and fertilizers, signed by product manufacturer. Provide copy of actual product label(s) as delivered to site.
- C. Qualification Data: For Landscape Installer.
- D. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of lawns and seeded areas during a calendar year. Submit before expiration of required maintenance periods.

# PART 2- PRODUCTS

- 2.1 <u>SEED</u>
  - A. Lawns: Seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 1 percent weed seed, in the proportion by weight, 35 percent Kentucky bluegrass, 35 percent Creeping Red Fescue, 30 percent Perennial Ryegrass.

- B. Temporary Vegetative Cover: Seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 1 percent weed seed, in the proportion by weight as follows:
  - 1. 60 percent Annual Ryegrass
  - 2. 40 percent Perennial Ryegrass

# 2.2 <u>FERTILIZER</u>

- A. Commercial Fertilizer: Commercial-grade fertilizer uniform in composition, dry and free flowing bearing the manufacturer's guaranteed statement of analysis. Fertilizer shall be derived from natural organic sources of urea formaldehyde, phosphorous, and potassium.
  - 1. Original fertilization: Composition and rate of application shall be as indicated by soils testing.
  - 2. Refertilization: Composition shall be 10-6-4 by weight with 50% organic nitrogen applied at a rate of 20 pounds per 1,000 s.f.
- B. Slow-Release Fertilizer: Commercial grade granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium, uniform in composition, dry and free flowing bearing the manufacturer's guaranteed statement of analysis.
  - 1. Composition shall be 20-10-10 by weight with 50% organic nitrogen applied at the rate indicated by testing

# 2.3 <u>MULCHES</u>

- A. Fiber Mulch: Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic; free of plant-growth or germination inhibitors; with maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
- B. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

# PART 3- EXECUTION

# 3.1 <u>EXAMINATION</u>

A. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Any Hydroseeding must be approved by the Architect in writing prior to application. Hydroseeding will NOT be permitted for lawns areas indicated on plan as receiving 'Athletic Turf Mix'.

# 3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
- B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

# 3.3 <u>TOPSOIL PREPARATION</u>

- A. Verify that topsoil base has been prepared and installed in accordance with other specification section(s) and is ready to receive the work of this Section.
- B. Beginning of installation means Contractor acceptance of existing site conditions. All work prior to Architect review and approval of established grades is subject to removal and reworking at the Contractors expense.
- C. Harrow or rake the topsoil to a depth of three (3) inches. Remove all sticks, foreign material and stones 3/4 inches or greater in any dimension
  - 1. Apply lime to dry soil before mixing fertilizer.
  - 2. Apply fertilizer and rake into surface before spreading seed.
- D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation as measured with a 10' straight edge. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.
- E. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- F. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

# 3.5 <u>SEEDING</u>

- A. Permanent Seed: Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
  - 1. Do not use wet seed or seed that is moldy or otherwise damaged.

- 2. Sow seed at the rate of 6 lbs./1,000 sq. ft. unless noted otherwise.
- 3. Rake seed lightly into top 1/8 inch (3 mm) of topsoil, roll lightly, and water with fine spray.
- 4. Protect seeded areas with slopes exceeding 1: 4 with erosion control fabric matting installed and stapled according to manufacturer's written instructions.
  - a. See Division 31, Section 31 25 00 Erosion Controls.
- B. Temporary Seeding: Sow seed with spreader, seeding machine or hydroseed.
  - 1. Sow seed evenly at the rate of 10 lbs./1,000 sq. ft.

## 3.6 <u>HYDROSEEDING</u>

- A. Hydro seeding is only allowed upon written approval of installer, slurry mix and proposed application rates by the Landscape Architect.
- B. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
  - 1. Mix slurry with nonasphaltic tackifier.
  - Apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry application at a minimum rate of 500 lbs./acre (5.1-kg/92.9 sq. m) dry weight but not less than the rate required to obtain specified seed sowing rate. Apply slurry cover coat of fiber mulch at a rate of 1,000 lbs./acre(10.2 kg/92.9 sq. m).
  - 3. Protect seeded areas with slopes exceeding 1:3 with slope stabilization blankets installed and stapled according to manufacturer's written instructions.

See Division 31, Section 31 25 00

Erosion Controls.

a.

4. Hydroseeding is NOT acceptable for athletic field seeding.

## 3.7 LAWN MAINTENANCE – PERMANENTLY SEEDED AREAS

- A. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
  - 1. Sixty (60) days from date of Substantial Completion or a minimum of three (3) mowings , whichever is greater.

- 2. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.
- B. Maintain and establish seeded areas by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.
  - 1. In areas where mulch has been disturbed by wind or maintenance operations, restore topsoil grades and add new mulch. Anchor as required to prevent displacement.
- C. Watering: Provide and maintain temporary piping, hoses, and lawn watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 4 inches (100 mm).
  - 1. Schedule watering/control irrigation system to prevent wilting, puddling, erosion, and displacement of seed or mulch.
  - 2. Water lawn at a minimum rate of 1 inch per week.
- D. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 40 percent of grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
  - 1. Mow lawns 2 to 2-1/2 high.
- E. Refertilization: Apply fertilizer as required after initial mowing and when grass is dry to provide an acceptable stand of grass.

# 3.8 <u>SATISFACTORY LAWNS</u>

- A. Satisfactory Seeded Lawn: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 4 by 4 inches.
- B. Reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

# 3.9 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas. B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.

SEEDING

C. Remove erosion-control measures, repair areas disturbed by erosion control measures, fine grade and seed after grass establishment period.

END OF SECTION 32 92 00

# 32 93 00 – TREES, PLANTS & GROUNDCOVERS

## <u> PART 1 - GENERAL</u>

### 1.1 <u>RELATED DOCUMENTS</u>

A. Instructions to Bidders, AIA Document A201 - 2007, "General Conditions of the Contract for Construction", the Supplementary General Conditions and Division 1, General Requirements, are a part of this Section and shall be binding on the Contractor and or Subcontractor who performs this Work. Note also all Addenda.

### 1.2 <u>SUMMARY</u>

- A. This Section includes installation of trees, shrubs, groundcovers, perennials and plant beds and transplanting of existing plant materials.
- B. Provide all facilities, labor, materials, equipment, transportation, supervision, and related work necessary to complete the work in this Specification, and as shown on the Drawings.
- C. All work shall be performed in accordance with applicable codes, permits and regulations, and the requirements of all local, state, and federal agencies having jurisdiction over the work.

## 1.3 <u>RELATED SECTIONS</u>

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specifications Sections that directly relate to Work of this Section include, but are not limited to:
  - 1. Division 31, Section 31 20 00 Site Earthwork.
  - 2. Division 32, Section 32 91 13 Topsoil & Planting Soil.
  - 3. Division 32, Section 32 92 00 Seeded Lawns.

## 1.4 <u>REFERENCES AND DEFINITIONS</u>

- A. Refer to Division 01, Section 01 42 16 Standard Sitework References & Definitions for definition of specific referenced standards as may be abbreviated in this section and the additional definistions:
  - 1. Balled and Burlapped Stock: Exterior plants dug with firm, natural balls of earth in which they are grown, with ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of tree or shrub required; wrapped, tied, rigidly supported, and drum-laced as recommended by ANSI Z60.1.
  - 2. Balled and Potted Stock: Exterior plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a

<u>32 93 00-2</u>

container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of exterior plant required.

- 3. Container-Grown Stock: Healthy, vigorous, well-rooted exterior plants grown in a container with well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for kind, type, and size of exterior plant required.
- 4. Caliper: Caliper of trees shall be measured at six inches above ground. At least 50% of the materials supplied shall meet the larger of the sizes listed.
- 5. Height / Spread: Plants shall be measured from ground to height of major growth or from tip-to-tip of major growth. At least 50% of the materials supplied shall meet the larger of the sizes listed.
- 6. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.
- 7. Finish Grade: Elevation of finished surface of planting soil.
- 8. Topsoil and Plant Mix: As defined in Division 32 Section 'Topsoil and Planting Mix'.

# 1.5 QUALITY ASSURANCE

A. Refer to Division 01, Section 01 43 00 Quality Assurance for testing and quality standards for site work defined elsewhere in this specification.

# 1.6 <u>DELIVERY, STORAGE, AND HANDLING</u>

- A. Deliver plants freshly dug.
- B. Do not prune trees and shrubs before delivery, except as approved by Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of exterior plants during delivery. Do not drop exterior plants during delivery

# 1.7 <u>SCHEDULING</u>

- A. Plant only during specified time periods.
  - 1. Spring Season: March 15 to June 1.
  - 2. Fall Season: September 1 to November 1.

CARVER POLICE		
CARVER, MA	TREES, PLANTS & GROUNDCOVERS	32 93 00-3

- B. Do not plant in areas where other work of the contract has not been completed.
- C. Proceed with planting only when existing and forecasted weather conditions permit.

# 1.8 <u>SUBMITTALS</u>

- A. Supplier Information: Provide location(s) of wholesale supplier for all plant materials.
- B. Qualification Data: For Landscape Installer.
- C. Plant Materials: State and Federal Certificate stating all materials are free from disease and infestation.
- D. Product Certificates: For soil amendments and fertilizers, signed by product manufacturer.
- E. Mulch: Sample of shredded bark mulch in plastic bag labeled with source and date.
- H. Planting Schedule: Written plan of anticipated planting dates and F of work.
- G. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of lawns and meadows during a calendar year. Submit before expiration of required maintenance periods.

# PART 2 - PRODUCTS

# 2.1 PLANT MATERIALS

- Plants shall be supplied true to name as defined by the American Joint Committee on Horticulture Nomenclature, 1942 and as amended, "Standardized Plant Names."
- B. Plant size and grading standards shall be as defined by the American Association of Nurserymen.
- C. Substitutions shall not be permitted unless requested in writing and approved by the Architect.

## 2.2 <u>MULCH</u>

- A. Pine Bark: Horticultural grade milled pine bark, size 3/4 inch maximum.
  - 1. Pine Bark shall be aged at least 9 months and shall be screened from any individual pieces larger than two inches.
  - 2. Pine Bark shall be locally produced (within 100 miles) and certified free from disease and infestation.

## CARVER POLICE CARVER, MA

## 2.3 PLANTING ACCESSORIES

- A. Stakes for supporting trees shall be provided as detailed for the type of tree listed.
- B. Stakes shall be 2 inch x 2 inch x 10 feet (min. 3 feet in ground) hardwood. Minimum of three stakes per tree.
- C. Wire shall be 12 gauge galvanized with 2-ply reinforced hose where wire contacts tree.
- D. Tree wrap shall be krinklecraft paper wrapped from top of ball to lowest branches and secured at two foot intervals along the trunk. Paper to be removed at end of guarantee period.

# PART 3 - EXECUTION

# 3.1 <u>EXAMINATION</u>

A. Examine areas to receive plantings for compliance with specified requirements of other Sections and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected. Start of any landscape work constitutes acceptance of all condition.

## 3.2 PLANTING SEASON

A. Planting out of season will not be allowed unless requested in writing and approved by the Architect. Anticipated extended weather conditions will be the determining factor.

## 3.3 INSTALLATION

- A. Excavate all plant pits, shrub beds and perennial beds to the dimensions shown on the plans and as detailed.
- B. Install prepared Planting Soil as specified in Section 32 91 13 Topsoil and Planting Soil.
- C. Install individual plants in prepared bed in accordance with standard nursery practices and as detailed. Water at intervals during backfill to settle mix and prevent air pockets.
- D. Plants shall be plumb and at same level at which they have naturally grown, unless otherwise noted.
- E. Provide saucer around plant areas, at least as large as the hole they were planted in.
- F. Install stakes and guy wires.

- H. Install mulch in beds and at individual trees as shown on the plans and as detailed.
- I. Thoroughly water again at completion of initial installation.

# 3.4 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by planting work from paved areas.
- B. Erect barricades and warning signs as required protecting newly planted areas from traffic.

# 3.5 <u>MAINTENANCE</u>

- A. Begin maintenance immediately after each area is planted and continue for one full growing season or until final acceptance of *entire* project, whichever is greater.
  - 1. Contractor may request in writing, early acceptance and release from required maintenance if major planted areas are completed and established prior to the overall project's scheduled completion at the discretion of the Architect.
- B. Maintain planted areas by watering, fertilizing, weeding, trimming, replanting, and other operations necessary for successful plant survival.
- C. Watering: Contractor shall supply his own water source.

# 3.6 <u>ACCEPTANCE</u>

- A. Guarantee: All plant materials, and their subsequent replacements, shall be guaranteed for a minimum of one full year and shall be alive and in satisfactory growth condition, as determined by the Architect. Period of guarantee begins upon final acceptance of the *entire* project.
  - 1. Contractor may request in writing, early acceptance if required guarantee period has been achieved for major planted areas and prior to the overall project's scheduled completion at the discretion of the Architect.
- B. Planting shall be inspected by the Architect at the end of one full growing season. Any plant that is dead or not in satisfactory growth condition, as determined by the Architect, shall be removed and replaced with the same type and size as originally specified as soon as possible but within the specified planting season.
- C. Replacements shall be at the Contractor's expense. Retainage for plantings shall not be released until final inspection, any necessary replacements are completed and final acceptance is granted.

END OF SECTION 32 93 00

### SECTION 33 00 00 - SITE UTILITIES

#### PART 1 - GENERAL

#### 1.1 GENERAL

- A. General Conditions, Supplementary Conditions and applicable parts of Division 1 form a part of this Specification and the Contractor shall consult them in detail for instructions.
- B. The Drawings on which this Contract is based are listed in Division 1. Consult all Drawings, note all conditions that may affect the Work and care for same in executing the Contract.
- C. Refer to Section 012300, Alternates for alternates, which may affect the work of this Section.

### 1.2 SUMMARY

- A. This Section includes the following:
  - a. All labor, materials, and operations in connection with the installation of the Site Utilities Work.
  - b. The principal work of this Section includes, but is not necessarily limited to the following:
    - 1. Sanitary Sewers and Subsurface Disposal Systems
    - 2. Storm Drainage Systems including underground Infiltration Beds
    - 3. Domestic Water Service Piping to six inches above building slab & Valves
    - 4. Catch Basins, Drain Inlets and Manholes including Frames and Covers.
    - 5. Concrete Encasement for Electrical & Communications Duct Bank
    - 6. Transformer Pad constructed to conform to Utility Company Standards
    - 7. Concrete Light Pole Bases to conform to details on Electrical Drawings
    - 8. Installation of Manholes and Handholes provided by the Electrical Contractor
    - 9. Coordination of roadway closures and detours as well as furnishing of all police details, barriers, cones, etc. to safely complete work in roadway.
- B. The following related work is specified under the designated Sections:
  - a. Section 210000 Fire Protection
  - b. Section 220000 Plumbing
  - c. Section 260000 Electrical
  - d. Section 312000 Earth Moving
  - e. Section 312500 Erosion Control
  - f. Section 321216 Hot Mix Asphalt Pavement
  - g. Section 321313 Cement Concrete Pavement

### 1.3 REFERENCE STANDARDS, SPECIFICATIONS, AND CODES

- A. The following are hereby made a part of this SECTION by reference thereto:
  - a. All work installed under this SECTION shall comply with all Local, State, County and Federal Codes, Laws, Statutes, and Authorities having jurisdiction. Include any and all permit, connection, and/or inspection fees in the bid. Where the Contract Documents indicate more stringent requirements than the above Codes and Ordinances, the Contract Documents shall take precedence.
  - b. Give all requisite notices and file all requisite plans relating to this work with the proper Authorities, secure all permits for this work, and pay all fees for same.
  - c. All Site Utilities related materials and methods shall conform to the Commonwealth of Massachusetts Highway Department (MHD) Standard Specifications for Highways and Bridges, Latest Edition.
  - d. Title 5: State Sanitary Code and Carver Board of Health Regulations.

## 1.4 SUBMITTALS

- A. Submit for approval Shop Drawings for the following:
  - a. Precast Concrete Structures
  - b. Piping of all description including Valves and Hydrants
  - c. Frames and Covers

## 1.5 RECORD DRAWINGS

- A. Maintain on the site at all times one (1) set of black or blue line on white Drawings which shall at all times be accurate, clear and complete, showing the actual location of all piping and structures as installed in colored pencil.
- B. The Contractor shall, as part of the application for substantial completion, provide the Owner a set of "As-Built" drawings for the scope of work provided under this section. "As-Built" drawings shall be prepared and endorsed by a Massachusetts Registered Professional Engineer or Land Surveyor and shall bear the seal of such professional. Drawings shall depict, in relationship to the design plan, the "As-Built" condition of all the utility systems including but not limited to: Drainage, Sewer, Subsurface Sewage Disposal System, Electric, CATV, Telephone, Alarm, Data, Water and Underground Tanks. "As-Built" shall identify the location, elevations, pipe size, pipe material of all site utilities related to grade components.

C. At project close out provide the services of an outside firm who shall run an underground video camera, locating all sanitary and storm drainage system lines including depth, preparing a video, and identifying and correcting any problem areas. Turn over 4 copies of the video and written report to the Owner. Videos are required for the underground sanitary and storm drainage systems including subsurface infiltration trenches.

# 1.6 CONTRACT DOCUMENTS

- A. It is the intent of these Specifications and Drawings to call for finished work, tested, and ready for operation. Any apparatus, appliance, materials, or work not shown on the Drawings but mentioned in the Specifications, or vice-versa, or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished, and installed.
- B. The Drawings are generally diagrammatic and are intended to convey the scope of work and indicate general arrangements of equipment, conduits, and piping. The locations of all items shown on the Drawings or called for in the Specifications that are not definitely fixed by dimensions or invert elevations are approximate only. If directed by the Architect, make reasonable modifications in the layout as needed to prevent conflict with other work or for proper execution of work.

## PART 2 - PRODUCTS

## 2.1 GENERAL

- A. Material and equipment for installation under this Section of the Specifications shall be new, unused, free of defects, and the best quality of a manufacturer of established reputation. Any defective or damaged material shall be immediately removed from the Site.
- B. Each piece of pipe, fitting, valve, etc., delivered under this Section of the Specifications shall have indelibly cast or marked thereon the manufacturer's name, trademark, pressure rating, and the date of manufacture.
- C. Specifications for materials included herein are intended for the purpose of establishing minimum quality requirements, and all materials are subject to approval by the Architect.

## 2.2 PIPING

A. All piping installed for this job shall be marked with manufacturer's data indicating type, size, etc. Refer to Drawings for various pipe materials to be used on this project.

### 2.3 DETECTABLE UNDERGROUND WARNING TAPE

A. Detectable warning tape shall be installed 12" directly above all buried utilities. Detectable warning tape shall consist of a nominal 4.5 mil (0.0045") overall thickness and 6" wide, with a solid aluminum foil core. The imprinted warning message is "Buried, or Encased" to prevent rub-off, and is impervious to acids, alkalis and other destructive elements found in soil. The imprint is as such that it allows for total reflectivity. A tape must be visibly seen before it can be read. The tape shall meet the testing requirements of ASTM D-882, Method A.

### B. Legend/Color & Imprint:

- a. Tape shall read "CAUTION BURIED \_\_\_\_\_ LINE BELOW" with respective utility type indicated.
- b. Tape color coding:
  - 1. Electric Red
  - 2. Gas Yellow
  - 3. Water Blue
  - 4. Sewer Green
  - 5. Fiber Optic/Telephone Orange
  - 6. Storm Drain Green

## 2.4 MANHOLE AND PRECAST CONCRETE STRUCTURE

- A. Manholes and precast concrete structures shall be constructed as shown on Drawings. Conform accurately to indicated dimensions.
  - a. Precast concrete manhole barrel, base, and cone sections shall conform to ASTM C-478 and shall be furnished complete with integral cast aluminum polymer coated steel steps. Sections shall be assembled with Kentseal #2 gaskets, or equal.
  - b. Brick for constructing channels and adjustments to grade shall be waterstruck sewer brick, Grade 'A' concrete brick conforming to ASTM C-55, or precast concrete grade rings mortared in place.
  - c. Cement mortar for parging and for joining brick shall be made of one (1) part portland cement and two (2) parts sand mixed to the proper consistency. Add approximately twenty (20) pounds of hydrated lime for each sack of cement.
d. Precast concrete structures for pump chamber, acid neutralizer vault, grease trap, leaching pits, etc. shall be as manufactured by A. Rotondo & Sons, Inc. or equal by Scituate Concrete pipe or Shea precast. Structures shall conform to the form and dimensions shown, be reinforced with ASTM A-615-79 Grade 60 reinforcing steel having a minimum 1" cover, and constructed of 5,000 PSI concrete. All field joints shall be sealed with rubber gasket and shall be grouted with hydraulic cement for watertightness. Design loading for all structures shall meet H-20 wheel loading design criteria.

## 2.5 CONCRETE

A. Conform to the Concrete Section of the specification for 4,000 PSI 6% air entrained concrete for all concrete structures for the work of this section. Including reinforcing steel where detailed.

# 2.6 FRAMES, COVERS, AND STEPS

- A. Cast iron manholes, frames, and covers, shall be of the form, dimensions, and manufacture shown on the Contract Drawings. Manhole extensions shall be neatly and accurately brought to dimensions of the base of the frame. Casting shall be of tough gray iron, free from cracks, holes, and cold shuts. All castings shall be made accurately to dimensions and shall be machined to provide even bearing surfaces. Covers must fit the frames in any position and, if found to rattle under traffic, shall be replaced. Filling to obtain tight covers will not be permitted. No plugging, burning-in, or filling will be allowed. All castings shall be carefully coated inside and out with coal tar pitch varnish of approved quality.
- B. Castings shall be as detailed on drawings or castings that appear on the Massachusetts Highway Department approval list for manhole frame & cover castings. Castings shall be by LeBaron Foundry, Neenah Foundry, or Campbell Foundry.

## 2.7 SAND BORROW

A. Sand borrow meeting the gradation requirements of MassDOT M1.04.0 Type b shall be used as backfill around all water and natural gas piping.

## 2.8 FIRE HYDRANTS

A. Hydrants shall conform to the requirements of AWWA C502, and be designed for 150 psi working pressure tested to 300 psi hydrostatic. Hydrants shall be 6 inch mechanical joint show, 4-1/4 inch valve opening, open COUNTER CLOCKWISE with 2-1/2 inch hose nozzles and 4-1/2 inch pumper connection, National Standard Threads, operating nut and nozzle cap with non-kink safety chains. Bury length shall be 5'-0"

- B. Hydrant shall be the compression type, closing with the pressure. They shall be traffic model with safety flange and stem couplings.
- C. Hydrant shall be able to be rotated 360 degrees. They shall have a positive closing, self-cleaning drain valve and drainage area shall be completely bronze or brass lined.

### 2.9 MISCELLANEOUS WATER VALVES & FITTINGS

- A. Corporation stops shall be brass compression type with AWWA Taper (CC or CS) Thread. Corporations shall be supplied with pack-joint. Corporation stops shall be Ford, Cambridge Brass, Mueller or approved equal.
- B. Curb stops shall be of brass and shall be manufactured by Ford, Cambridge Brass, Mueller, or approved equal. The inlet and outlet shall have compression connections.
- C. Each curb stop shall be provided with a cast iron box. The box shall be the extension type with arch patter. Inside diameter of the upper section shall be at least 2-1/2 inches. The boxes shall be furnished with a cast iron lid and heavy brass pentagon plug. Boxes shall be completely thoroughly coated with bitumastic paint.
- D. Tubing for services and sample lines shall be 200 psi, copper tubing size polyethylene and shall comply with AWWA Specifications.
- E. Adapter couples may be required for fitting new services to existing service lines. Such fitting shall be compression connections and provide electrical continuity.
- F. Trace wire shall be 15 gauge and connected to the corporation valve, curb stop and valve above slab in building.

### 2.10 STONE

- A. Stone for this project shall be from approved sources and shall conform to the size and gradation requirements indicated on the drawings. Prior to shipping stone to the site designated stockpiles shall be established at the processing plant. At least three (3) samples shall be taken from each stockpile and submitted to the laboratory for sieve analysis. Stone shall be carefully handled to maintain in a clean acceptable condition.
- B. All stone shall be processed, hard, angular stone, triple washed as a minimum and free from iron, fines and dust, and containing less than 0.2% of fines when tested in accordance with AASHO T-11 procedures.
- C. Coarse stone to range from 3/4" to 1-1/2" in size, MA spec M2.01.1.
- D. Peastone to be 1/4" size, MA spec M2.01.6.

### 2.11 CONTROLLED DENSITY FILL

- A. Controlled Density Fill shall be installed in lieu of gravel in utility trench backfills with the public right-of-way as required by the Town of Carver.
- B. Controlled Density Fill (CDF) material is a flowable, self-consolidating, rigid setting, low density material that can substitute for compacted gravel in backfills, fills and structural fills.
- C. All materials shall comply with the following:
  - a. Portland Cement: AASHTO M 85
  - b. Fly Ash: AASHTO M 295 Class F
  - c. Sand: M4.02.02
  - d. Air Entraining Admixtures: M4.02.05
- D. Controlled Density Fill shall meet the material requirements of MassDOT M4.08.0 Type 2E (Flowable (Excavatable)) with the following requirements:
  - a. Compressive Strength at 28 Days: 30-80 pounds per square inch (psi)
  - b. Compressive Strength at 90 Days: 100 pounds per square inch (psi) maximum
  - c. Slump: 10-12 inches

### PART 3 - EXECUTION

### 3.1 GENERAL

- A. Furnish the services of a Registered Land Surveyor for layout of Site Utility Systems.
  - a. Infiltration beds, catch basins and manholes shall be established with offsets and grade. Establish line and grade for all piping. Provide additional control along the pipe runs by use of lasers. Grade stakes and batter boards are not acceptable except as may be used in conjunction with lasers.
- B. Verify inverts and locations of all existing utilities prior to installation of any work. Transmit above information to the Architect who shall make any alterations to the Contract Drawings as required by the existing conditions. Proceed with construction only after written permission from the Architect. If any work is installed without prior written notice of the Architect, and said work requires alteration due to existing conditions, said alterations shall be made by the Contractor at his expense.
- C. Protect all pipe lines, sewers, drains, poles, wiring and the like that interfere in any way with the work whether or not they are specifically shown on the Drawings. Notify the proper Authorities that items are protected, supported and/or relocated as necessary to adjust them to the new work.

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### 3.2 PROTECTION, SHORING AND PUMPING

- A. Protect open excavations with fencing, warning lights and/or other suitable safeguards and as may be additionally required by the Authorities having jurisdiction.
- B. Protect bottom of excavation from frost. Do not place new work on frozen ground. Shore and brace excavation and provide sheet piling, if necessary, to prevent cave-ins and to conform to Local, State, and Federal Safety Regulations. Remove shoring and piling before backfilling is completed, but not until permanent supports are in place.
- C. Provide all necessary pumps, well points and pumping facilities, including attendants, to keep all excavation free from water from whatever source at all times when work is in progress and when necessary for protection and integrity of the work in place. Trenches shall be kept water-free during jointing and for sufficient time thereafter to allow the jointing material to become fully set and completely resistant to water penetration. Pump discharge to be in such a manner that it does not flood, interfere or damage any other area of work and meets with approval of Conservation Commission.

#### 3.3 INSTALLATION OF PIPE

- A. Trenches shall be opened only to such extent as approved by the Architect and the total lengths of open trench shall be as short as practical at all times. Immediately upon opening of trench, pipe bedding shall be placed, compacted, and dressed as specified.
- B. Carefully examine each pipe length before laying, and do not lay defective or damaged pipe. Lay pipe lines to grades and alignment indicated. Provide proper facilities for lowering sections of pipe into trenches. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable.
- C. Pipe laying shall proceed upgrade with spigot ends of bell-and-spigot pipe, and tongue ends of tongue-and-groove pipe pointing in direction of flow.
- D. Execute installation of flexible joints by placing gaskets and jointing materials in accordance with recommendation of particular manufacturer in regard to use of lubricants, cements, adhesives and other special installation requirements. Surfaces to receive lubricants, cements or adhesives shall be clean and dry. Affix gaskets and jointing materials to pipe not more than twenty-four (24) hours prior to installation of pipe and protect from sun, blowing dust, and other deleterious agents at all times. Gaskets and jointing materials so damaged shall be removed and replaced. Pipe shall be aligned with previously installed pipe and joint pulled together. If, while making joint, gasket or jointing material becomes loose and can

be seen through exterior joint recess when joint is pulled up to within 1 inch of closure, pipe shall be removed and joint remade.

### 3.4 GRADE TOLERANCE – SEWER PIPING

- A. Grade tolerance of the flow line of sewer pipe shall not exceed  $\pm 0.05$  feet. In addition, in any twenty-five-foot (25') length, the total variation (plus or minus) from flow line grade shall no exceed the following:
  - a. One-quarter of an inch (0.25") in four inch (4") or smaller pipe.
  - b. Three-quarters of an inch (0.75") in six- through twelve-inch (6"-12") pipe.
  - c. One inch (1") in fifteen- through thirty-six-inch (15"-36") pipe.

### 3.5 GRADE TOLERANCE – STORM DRAIN

A. The elevation of the pipe invert for storm drain pipe shall not deviate from the design elevation by more than plus or minus two percent ( $\pm 2.0\%$ ) of the pipe size concern, or one inch (1"), whichever is greater. The rate of deviation from grade or returning to grade shall be limited to one-sixteenth of an inch (1/16") per foot (1') of pipe.

### 3.6 FLANGED JOINTS

A. Flanged joints shall be made with full faced one-piece gaskets of best quality cloth inserted sheet rubber at least 1/16 inch thick and all flanges shall be made up evenly and perfectly tight. Bolts and nuts shall be of best quality wrought iron or mild steel with hexagonal heads and nuts and of proper size and length.

## 3.7 ANCHORAGE AND THRUST BLOCKING

- A. All plugs, caps, tees, and bends on water and fire services deflecting 11-1/2 degrees or more and at other locations where there will be an unbalanced thrust in the line shall be provided with a concrete thrust block or anchorages to prevent movement. Concrete thrust blocks shall be in accordance with the details on the plans. The excavation shall be carried out by hand at such locations to provide a good bearing against undisturbed soil within a short distance from the fitting. The use of joint harnesses in place of anchorage and thrust blocks shall be subject to the approval of the Architect both as to location and to details of the harness. Harnesses shall utilize galvanized rods, nuts and bolts.
- B. Where bends turn down and the resulting thrust will be upward, provision to restrain the thrust shall be made either with concrete anchorages, joint harnesses, or a combination of both.

C. Insofar as possible, thrust blocking and anchorages shall be so placed that the pipe and fitting joints will be accessible for repair. Concrete from thrust blocks shall conform to the requirements of CONCRETE Section of the Specification for 4,000 PSI, 6% air entraned concrete.

### 3.8 VALVES & VALVE BOXES

A. Valves and valve boxes shall be set plumb with valve boxes directly over the valves.

#### 3.9 CATCH BASINS AND MANHOLES

- A. Catch basins and manholes shall be built accurately to dimensions. Brickwork shall be laid by skilled workmen. Inverts shall have a cross section of the sewers which are connected, and changes in size, grade or lines shall be made gradually and evenly.
- B. The top of the brickwork shall be brought to the dimensions of the flange of the manhole frame. Adequate precautions shall be taken in freezing weather to protect the masonry from damage by frost. Particular care shall be taken that no water rises on the masonry until the mortar is thoroughly set and any brick masonry damaged in this manner shall be removed upon the order of the Contractor.
- C. All pipes or casting to be embedded in brickwork shall be accurately set, and if so required, headers shall be laid around the casting so embedded.
- D. Cement plaster for plastering exterior of brick or block walls shall be 1:2 cement and sand mortar.
- E. The outside of brickwork on all manholes shall be plastered with 3/4" thick coat of Portland cement mortar mixed in the proportions of one (1) part cement to two (2) parts of sand. Plaster shall be troweled to a smooth hard finish, and no backfill shall be placed until mortar has thoroughly hardened.
- F. After the plaster has hardened, exterior walls of sanitary manholes shall be painted with two (2) coats of Bitumastic 300M, as manufactured by the Carboline Company, or approved equal. All work shall be in accordance with the manufacturer's instructions.
- G. Upon completion, all debris shall be removed from manholes.
- H. The entire work of constructing manholes shall be carried on in a manner to insure watertight work, and any leaks in manholes shall be caulked and repaired, or the entire work shall be removed and rebuilt. Attention is particularly called to the necessity of keeping the water below all parts of the brick or concrete foundation and walls until the cement has obtained adequate set.

### 3.10 TESTS

- A. Provide all labor, materials, and equipment for performing all test as herein specified or required by Local Authorities.
- B. Sanitary and storm sewers shall be tested as follows:
  - a. If any inspection of the completed sewer or any part thereof shown any manholes, pipes or joints which allow the infiltration of water in a noticeable stream or jet, the defective work shall be replaced or repaired as directed.
  - b. After the sewers have been laid and otherwise completed, infiltration or exfiltration test shall be made to demonstrate that the line will satisfactorily meet the conditions prevailing in place with leakage not in excess of 375 gallons/day per inch of diameter per mile of pipe.
  - c. Rate of infiltration shall be determined by means of V-notch weirs or pipe spigot in an approved manner and at such times and locations as may be directed by the Architect during the progress of the work. Provide and install weir plates or other materials required and at such time and locations as may be directed by the Architect.
  - d. Perform an air test as per manufacturer's recommendation and report result to Architect and Town of Carver.
  - e. All joints shall be inspected and inspection of line and grade shall be made with mirrors and lights. Alignment for both line and grade shall be true with full circles visible at manholes.
- C. Test Water Piping as follows:
  - a. When a section of pipe is ready for testing, the line shall be completely filled with water thoroughly checked for elimination of all air, and a leakage test made.
  - b. All pipe lines shall be tested under a hydrostatic pressure of 200 pounds per square inch on the highest part of the section under test.

#### 3.11 CHLORINATION OF PIPE LINES

- A. During the installation of the water main, install flushing, insertion, and test ports in the water main so that the entire main from the point of connection to the street main, up to the water meter and or the sprinkler shutoff, shall thoroughly be chlorinated, flushed, and tested in accordance with the requirements of AWWA B300, B301, B302, B303, and AWWA C.651 Standards for disinfecting water mains and the Local Water Department Standards.
- B. Prior to chlorinating, notify the Architect in writing that the water service main has been properly installed and pressure tested. Using the services of a qualified Testing Lab, extract and analyze the existing water supply to establish a water quality baseline of the existing Municipal Supply. After the disinfection procedures, submit test results of the mains installed hereunder which tests shall be performed by the same Lab.

- C. Sterilization All water lines shall be thoroughly flushed and chlorinated before being put into service.
- D. Methods Chlorine may be applied by the following methods subject to approval; liquid chlorine gas-water mixture, direct chlorine gas feed or calcium hypochlorite and water mixture.
- E. Point of Application The chlorinating agent shall be applied at the beginning of the reach, adjacent to the source of supply for filling. The chlorine shall be applied through a corporation cock or other approved connection to the newly laid pipe.
- F. Rate of Application The water from the source of supply shall be controlled to flow very slowly in the newly laid pipe during the application of the chlorine which shall be applied in amounts such as will produce a dosage of at least 40 to 50 parts per million. In the event that the pipe line is already filled, the dose shall be increased to such concentration and shall be applied for a sufficient period to produce a residual of not less than 25 parts per million at all of the outlets within the reach being chlorinated, including the terminus of the reach.
- G. Retention Period Treated water shall be retained in the pipe long enough to destroy all non-spore containing bacteria. The period shall be at least twenty-four (24) hours and preferably longer, as may be directed. After the chlorine-treated water has been retained for the time required, the chlorine residual at pipe extremities and other intermediate points shall be at least twenty-four parts per million.
- H. Back Pressure to be Prevented Back pressure causing a reversal of flow from the section being chlorinated to the supply shall be prevented.
- I. Chlorination Valves and Accessories In the process of chlorinating newly laid pipe, all valves and other pipe line accessories shall be operated while the pipe is filled with chlorinating agent.
- J. Final Flushing and Dose Following chlorination, and after the entire length of line is ready for operation, all treated water shall be flushed thoroughly from the newly laid pipe line, at its extremities, until the replacement water throughout its length will upon test, both chemical and bacteriological, be proved equal to the quality introduced at the permanent source of supply.
- K. Repetition of Procedures Should the initial treatment prove ineffective, the chlorination procedure shall be repeated as directed until conformed tests show that water from the newly laid pipe conforms to the requirements of the preceding Section.

L. Liquid Chlorination - Chlorine gas-water mixture shall be applied by the means of a solution-feed chlorinating device. Chlorine shall be fed directly from a chlorine cylinder equipped with suitable device for regulating the rate of flow and the effective diffusion of gas within the pipe. Calcium hypochlorite shall be comparable to commercial products known as "H.T.H.", "Perchloren" and "Maxochlor". A solution consisting of 5% of powder to 95% of water by weight should be prepared. The calcium hypochlorite and water mixture, first made into a paste and then thinned to a slurry shall be injected or pumped unto the newly laid line under the conditions specified hereinbefore.

END OF SECTION 33 00 00