



# **PROJECT MANUAL**

**MONETT ADDITION & RENOVATIONS**

**MONETT MO WARD**

**601 South Lincoln Avenue**

**Monett, MO 65708**

**Corporation of the Presiding Bishop of The Church of  
Jesus Christ of Latter-Day Saints**

**50 E North Temple**

**Salt Lake City, UT 84150**



A/E Project No. 14-524.00

# **PROJECT MANUAL**

April 25, 2016

FOR

## **MONETT ADDITION AND RENOVATIONS MONETT MISSOURI STAKE**

FOR

## **THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS**

50 EAST NORTH TEMPLE  
Salt Lake City, UT 84150

### **GHN**

Architects-Engineers  
300 S. Jefferson, Ste 301  
Springfield, Missouri 65806  
417/869-0719  
Fax: 417/869-3044

Missouri Certificate of Authority for Architecture 000354  
Missouri Certificate of Authority for Engineering 000657

BLANK PAGE

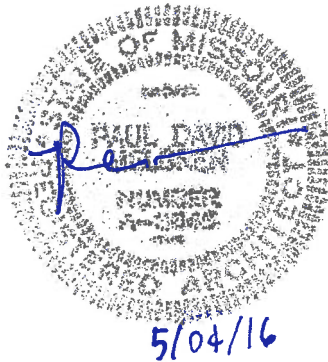
# SEALS PAGE

## GASKIN HILL NORCROSS OF MISSOURI, INC.

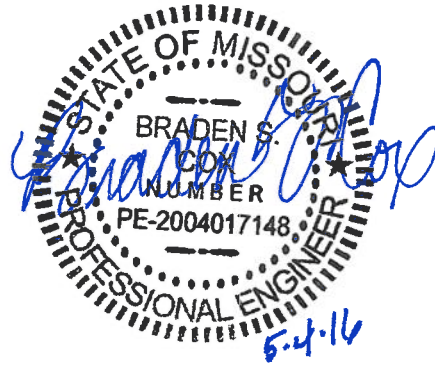
Architect - Engineers  
300 South Jefferson Ste. 301  
Springfield, MO 65806  
417-869-0719  
Fax: 417-869-3044

The following Design Professionals have provided services for this project and have assisted in the in the preparation of the technical specifications related to their work.

### ARCHITECT OF RECORD:



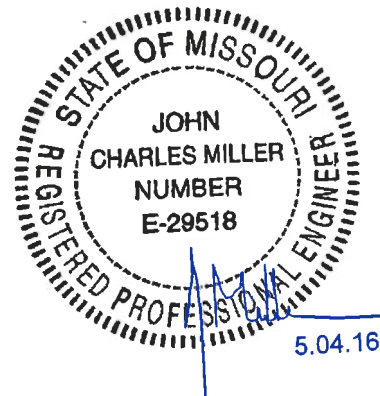
### MECHANICAL ENGINEER OF RECORD



### ELECTRICAL ENGINEER OF RECORD



### STRUCTURAL ENGINEER OF RECORD



BLANK PAGE

# **INTRODUCTORY INFORMATION**

BLANK PAGE



# TABLE of CONTENTS

## PROCUREMENT AND CONTRACTING REQUIREMENTS GROUP

### INTRODUCTORY INFORMATION

PROJECT TITLE PAGE  
SEALS PAGE  
TABLE OF CONTENTS

### DIVISION 00: PROCUREMENT AND CONTRACTING REQUIREMENTS

#### PROCUREMENT REQUIREMENTS SUBGROUP

##### 00 1000 SOLICITATION

INVITATION TO BID

##### 00 2000 INSTRUCTIONS FOR PROCUREMENT

INSTRUCTIONS TO BIDDERS

##### 00 3000 AVAILABLE INFORMATION

INFORMATION AVAILABLE TO BIDDERS  
GEOTECHNICAL DATA

##### 00 4000 PROCUREMENT FORMS AND SUPPLEMENTS

SUBCONTRACTORS AND MAJOR MATERIALS SUPPLIERS LIST  
EQUAL PRODUCT APPROVAL REQUEST FORM  
BID FORM  
CONSTRUCTION MATERIAL ASBESTOS STATEMENT

#### CONTRACTING REQUIREMENTS SUBGROUP

##### 00 7000 CONDITIONS OF THE CONTRACT

GENERAL CONDITIONS FOR A FIXED SUM (US)  
SUPPLEMENTARY CONDITIONS FIXED SUM (US)

## SPECIFICATIONS GROUP

#### GENERAL REQUIREMENTS SUBGROUP

### DIVISION 01: GENERAL REQUIREMENTS

##### 01 1000 SUMMARY

01 1100 SUMMARY OF WORK

01 1200 MULTIPLE CONTRACT SUMMARY  
01 1400 WORK RESTRICTIONS

**01 2000 PRICE AND PAYMENT PROCEDURES**

01 2200 UNIT PRICES  
01 2600 CONTRACT MODIFICATION PROCEDURES  
01 2900 PAYMENT PROCEDURES

**01 3000 ADMINISTRATIVE REQUIREMENTS**

01 3100 PROJECT MANAGEMENT AND COORDINATION  
01 3200 CONSTRUCTION PROGRESS DOCUMENTATION  
01 3300 SUBMITTAL PROCEDURES  
01 3500 SPECIAL PROCEDURES

**01 4000 QUALITY REQUIREMENTS**

01 4100 REGULATORY REQUIREMENTS  
01 4200 REFERENCES  
01 4301 QUALITY ASSURANCE - QUALIFICATIONS  
01 4523 TESTING AND INSPECTION SERVICES  
01 4546 DUCT TESTING, ADJUSTING, AND BALANCING

**01 5000 TEMPORARY FACILITIES AND CONTROLS**

01 5100 TEMPORARY UTILITIES  
01 5200 CONSTRUCTION FACILITIES  
01 5400 CONSTRUCTION AIDS  
01 5600 TEMPORARY BARRIERS AND ENCLOSURES  
01 5700 TEMPORARY CONTROLS  
01 5800 PROJECT IDENTIFICATION

**01 6000 PRODUCT REQUIREMENTS**

01 6100 COMMON PRODUCT REQUIREMENTS  
01 6200 PRODUCT OPTIONS  
01 6400 OWNER-FURNISHED PRODUCTS  
01 6600 PRODUCT DELIVERY, STORAGE, AND HANDLING REQUIREMENTS

**01 7000 EXECUTION AND CLOSEOUT REQUIREMENTS**

01 7300 EXECUTION  
01 7400 CLEANING AND WASTE MANAGEMENT  
01 7700 CLOSEOUT PROCEDURES  
01 7800 CLOSEOUT SUBMITTALS

**FACILITY CONSTRUCTION SUBGROUP****DIVISION 02: EXISTING CONDITIONS****02 4000 DEMOLITION AND STRUCTURE MOVING**

02 4113 SELECTIVE SITE DEMOLITION

02 4119 SELECTIVE STRUCTURE DEMOLITION

**DIVISION 03: CONCRETE****03 1000 CONCRETE FORMING AND ACCESSORIES**

03 1113 STRUCTURAL CAST-IN-PLACE CONCRETE FORMING  
03 1511 CONCRETE ANCHORS AND INSERTS

03 2000 CONCRETE REINFORCING

03 2100 REINFORCEMENT BARS

03 3000 CAST-IN-PLACE CONCRETE

03 3111 CAST-IN-PLACE STRUCTURAL CONCRETE  
03 3923 MEMBRANE CONCRETE CURING

03 6000 GROUTING

03 6213 NON-METALLIC NON-SHRINK GROUT

**DIVISION 04: MASONRY**

04 0100 MAINTENANCE OF MASONRY

04 0500 COMMON WORK RESULTS FOR MASONRY

04 0513 CEMENT AND LIME MASONRY MORTARING  
04 0516 MASONRY GROUTING  
04 0519 MASONRY ANCHORS AND INSERTS  
04 0520 MASONRY REINFORCING  
04 0521 MASONRY VENEER TIES  
04 0523 MASONRY ACCESSORIES

04 2000 UNIT MASONRY

04 2113 BRICK VENEER MASONRY

**DIVISION 05: METALS**

05 0500 COMMON WORK RESULTS OF METALS

05 0503 SHOP-APPLIED METAL COATINGS  
05 0523 METAL FASTENINGS

05 1000 STRUCTURAL METAL FRAMING

05 1223 STRUCTURAL STEEL FOR BUILDINGS

05 5000 METAL FABRICATIONS

05 5214 GALVANIZED STEEL PIPE AND TUBE RAILINGS

**DIVISION 06: WOOD, PLASTICS, AND COMPOSITES**

06 0100 MAINTENANCE OF WOOD, PLASTICS, AND COMPOSITES

06 0500 COMMON WORK RESULTS OF WOOD, PLASTICS, AND COMPOSITES

06 0573 PRESERVATIVE WOOD TREATMENT

06 1000 ROUGH CARPENTRY

06 1011 WOOD FASTENINGS  
06 1100 WOOD FRAMING  
06 1636 WOOD PANEL PRODUCT SHEATHING  
  
06 1712 STRUCTURAL COMPOSITE LUMBER: SCL  
06 1753 SHOP-FABRICATED WOOD TRUSSES: TRUSSED RAFTERS

#### 06 2000 FINISH CARPENTRY

06 2001 COMMON FINISH CARPENTRY REQUIREMENTS  
06 2024 DOOR, FRAME, AND FINISH HARDWARE INSTALLATION  
06 2210 MISCELLANEOUS WOOD TRIM

#### 06 4000 ARCHITECTURAL WOODWORK

06 4001 COMMON ARCHITECTURAL WOODWORK REQUIREMENTS  
06 4005 PLASTIC LAMINATE  
06 4114 WOOD-VENEER-FACED ARCHITECTURAL CABINETS  
06 4512 ARCHITECTURAL WOODWORK WOOD TRIM

#### 06 6000 PLASTIC FABRICATIONS

06 6001 MISCELLANEOUS PLASTIC FABRICATIONS

### **DIVISION 07: THERMAL AND MOISTURE PROTECTION**

#### 07 1000 DAMPPROOFING AND WATERPROOFING

07 1113 BITUMINOUS DAMPPROOFING

#### 07 2000 THERMAL PROTECTION

07 2113 BOARD INSULATION  
07 2116 BLANKET INSULATION  
07 2616 BELOW-GRADE VAPOR RETARDERS  
07 2719 PLASTIC SHEET AIR BARRIERS

#### 07 3000 STEEP SLOPE ROOFING

07 3113 ASPHALT SHINGLES

#### 07 6000 FLASHING AND SHEET METAL

07 6210 GALVANIZED STEEL FLASHING AND TRIM  
07 6310 STEEP SLOPE ROOF FLASHING: ASPHALT TILE  
07 6312 PERFORATED METAL SOFFIT  
07 6322 STEEL FASCIA

#### 07 7000 ROOF AND WALL SPECIALTIES AND ACCESSORIES

07 7123 MANUFACTURED GUTTERS AND DOWNSPOUTS  
07 7126 REGLETS  
07 7226 RIDGE VENTS

#### 07 8000 SMOKE AND FIRE PROTECTION

07 8400 FIRESTOPPING

## 07 9000 JOINT PROTECTION

07 9213 ELASTOMERIC JOINT SEALANTS

07 9219 ACOUSTICAL JOINT SEALANTS

**DIVISION 08: OPENINGS**

## 08 0100 OPERATION AND MAINTENANCE OF OPENINGS

08 0601 HARDWARE GROUP AND KEYING SCHEDULES

## 08 1000 DOORS AND FRAMES

08 1213 HOLLOW METAL FRAMES

08 1313 HOLLOW METAL DOORS

08 1429 FLUSH WOOD DOORS: FACTORY-FINISHED, CLEAR

## 08 4000 ENTRANCES, STOREFRONTS, AND CURTAIN WALLS

08 4113 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

## 08 5000 WINDOWS

08 5113 ALUMINUM WINDOWS

## 08 7000 HARDWARE

08 7101 COMMON FINISH HARDWARE REQUIREMENTS

08 7102 HANGING DEVICES

08 7103 SECURING DEVICES

08 7106 CLOSING DEVICES

08 7107 PROTECTIVE PLATES AND TRIM

08 7108 STOPS AND HOLDERS

08 7109 ACCESSORIES

## 08 8000 GLAZING

08 8100 GLASS GLAZING

## 08 9000 LOUVERS AND VENTS

**DIVISION 09: FINISHES**

## 09 0100 MAINTENANCE OF FINISHES

## 09 0500 COMMON WORK RESULTS FOR FINISHES

09 0503 FLOORING SUBSTRATE PREPARATION

## 09 2000 PLASTER AND GYPSUM BOARD

09 2226 METAL SUSPENSION SYSTEM: GYPSUM BOARD

09 2900 GYPSUM BOARD

## 09 3000 TILING

09 3013 CERAMIC TILING

09 5000 CEILINGS

09 5116 ACOUSTIC TILE CEILINGS

09 6000 FLOORING

09 6513 RESILIENT BASE AND ACCESSORIES

09 6813 TILE CARPETING

09 6816 SHEET CARPET: BACK CUSHION, DIRECT GLUE

09 7000 WALL FINISHES

09 7226 SISAL WALL COVERINGS

09 9000 PAINTS AND COATINGS

09 9001 COMMON PAINTING AND COATING REQUIREMENTS

09 9123 INTERIOR PAINTED GYPSUM BOARD, PLASTER

09 9124 INTERIOR PAINTED METAL

09 9324 INTERIOR CLEAR-FINISHED HARDWOOD

09 9413 INTERIOR TEXTURED FINISHING

**DIVISION 10: SPECIALTIES**

10 1000 INFORMATION SPECIALTIES

10 1116 FIXED MARKERBOARDS

10 1123 FIXED TACKBOARDS

10 1495 MISCELLANEOUS INTERIOR SIGNAGE

10 2000 INTERIOR SPECIALTIES

10 2113 METAL TOILET COMPARTMENTS

10 2813 COMMERCIAL TOILET ACCESSORIES

10 2814 BABY-CHANGING STATION

10 4000 SAFETY SPECIALTIES

10 4400 FIRE PROTECTION SPECIALTIES

**DIVISION 11: NOT USED**

**DIVISION 12: FURNISHINGS**

12 2000 WINDOW TREATMENTS

12 2200 CURTAINS AND DRAPES

**DIVISIONS 13 - 14: NOT USED**

**DIVISIONS 15 THROUGH 19: NOT USED**

**FACILITY SERVICES SUBGROUP**

**DIVISION 20: NOT USED****DIVISION 21: NOT USED****DIVISION 22: PLUMBING****22 0500 COMMON WORK RESULTS FOR PLUMBING**

- 22 0501 COMMON PLUMBING REQUIREMENTS
- 22 0529 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
- 22 0553 IDENTIFICATION FOR PLUMBING PIPES AND EQUIPMENT
- 22 0719 PLUMBING PIPING INSULATION

**22 1000 PLUMBING PIPES AND PUMPS**

- 22 1116 DOMESTIC WATER PIPING
- 22 1119 DOMESTIC WATER PIPING SPECIALTIES
- 22 1313 FACILITY SEWERS
- 22 1319 FACILITY SANITARY SEWER SPECIALTIES

**22 4000 PLUMBING FIXTURES**

- 22 4213 COMMERCIAL WATER CLOSETS AND URINALS
- 22 4216 COMMERCIAL LAVATORIES AND SINKS

**DIVISION 23: HEATING, VENTILATING, AND AIR-CONDITIONING****23 0500 COMMON WORK RESULTS FOR HVAC**

- 23 0501 COMMON HVAC REQUIREMENTS
- 23 0513 COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
- 23 0529 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
- 23 0548 VIBRATION AND SEISMIC CONTROL FOR HVAC PIPING & EQUIPMENT
- 23 0553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
- 23 0713 DUCT INSULATION
- 23 0933 ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC

**23 1000 FACILITY FUEL SYSTEMS**

- 23 1123 FACILITY NATURAL GAS PIPING

**23 2000 HVAC PIPING AND PUMPS**

- 23 2300 REFRIGERANT PIPING
- 23 2600 CONDENSATE DRAIN PIPING

**23 3000 HVAC AIR DISTRIBUTION**

- 23 3001 COMMON DUCT REQUIREMENTS
- 23 3114 LOW-PRESSURE METAL DUCTS
- 23 3300 AIR DUCT ACCESSORIES
- 23 3713 DIFFUSERS, REGISTERS, AND GRILLES
- 23 3714 LOUVERS AND VENTS
- 23 3723 HVAC GRAVITY VENTILATORS

**23 4000 HVAC AIR CLEANING DEVICES**

- 23 4100 AIR FILTERS

**23 5000 CENTRAL HEATING EQUIPMENT**

23 5135 AIR PIPING  
23 5417 GAS-FIRED FURNACES

**23 6000 CENTRAL COOLING EQUIPMENT**

23 6213 PACKAGED AIR-COOLED REFRIGERANT COMPRESSOR AND CONDENSER UNITS: AIR CONDITIONING

**23 8000 DECENTRALIZED HVAC EQUIPMENT**

23 8216 AIR COILS: DX

**DIVISION 24 & 25: NOT USED****DIVISION 26: ELECTRICAL****26 0500 COMMON WORK RESULTS FOR ELECTRICAL**

26 0501 COMMON ELECTRICAL REQUIREMENTS  
26 0519 LINE-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES  
26 0523 CONTROL-VOLTAGE ELECTRICAL CABLES  
26 0526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS  
26 0533 RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS  
26 0613 ELECTRICAL EQUIPMENT MOUNTING HEIGHT SCHEDULE  
26 0924 LIGHTING CONTROL SYSTEM

**26 2000 LOW-VOLTAGE ELECTRICAL TRANSMISSION**

26 2726 WIRING DEVICES  
26 2816 ENCLOSED SWITCHES AND CIRCUIT BREAKERS

**26 5000 LIGHTING**

26 5100 INTERIOR LIGHTING  
26 5200 EMERGENCY LIGHTING  
26 5600 EXTERIOR LIGHTING

**DIVISIONS 27 - 28: NOT USED****DIVISION 29: NOT USED****SITE AND INFRASTRUCTURE SUBGROUP****DIVISION 30: NOT USED****DIVISION 31: EARTHWORK****31 0500 COMMON WORK RESULTS FOR EARTHWORK**

31 0501 COMMON EARTHWORK REQUIREMENTS

**31 1000 SITE CLEARING**

31 1100 CLEARING AND GRUBBING  
31 1123 AGGREGATE BASE



31 1413 TOPSOIL STRIPPING AND STOCKPILING

31 2000 EARTH MOVING

31 2213 ROUGH GRADING

31 2216 FINE GRADING

31 2316 EXCAVATION

31 2323 FILL

31 2324 FLOWABLE FILL

31 2500 EROSION AND SEDIMENTATION CONTROLS

31 3000 EARTHWORK METHODS

31 3116 TERMITE CONTROL

**DIVISION 32: EXTERIOR IMPROVEMENTS**

32 3000 SITE IMPROVEMENTS

32 3113 CHAIN LINK FENCES AND GATES

32 8000 IRRIGATION

32 8423 UNDERGROUND SPRINKLERS

32 9000 PLANTING

32 9001 COMMON PLANTING REQUIREMENTS

32 9120 TOPSOIL AND PLACEMENT

32 9122 TOPSOIL GRADING

32 9223 SODDING

32 9300 PLANTS

**DIVISION 33: NOT USED**

**DIVISIONS 36 THROUGH 39: NOT USED**

**PROCESS EQUIPMENT SUBGROUP**

**DIVISIONS 40 THROUGH 49: NOT USED**

END OF TABLE OF CONTENTS

**BLANK PAGE**

# **BIDDING REQUIREMENTS**

**SAMPLE FORMS, ETC**

**FIXED SUM PROJECT (U.S.)**

BLANK PAGE

# INVITATION TO BID (U.S.)

---

## 1. GENERAL CONTRACTORS INVITED TO BID THE PROJECT:

<b>Bales Construction Co., Inc.</b> 2601 North Le Compte Road #A Springfield, MO 65803 P: 417.865.5800 F: 417.865.4418 Justin Block jblock@balesconstruction.com	<b>RE Smith Construction Company</b> 1036 W. Second Joplin, MO 64801 P: 417.623.4545 F: 417.782.6738 Mike Freitas Mike@resmithconst.com
<b>Hunts Taylor Creek Contractors</b> 12074 S 141 <sup>st</sup> Street East Gore, OK 74435 P: 918-489-2146 F: 918-489-2056 Duane Hunt duane.htcc@gmail.com	<b>Nesbitt Construction, Inc.</b> 1400 East Saint Louis Street Springfield, MO 65802 P: 417.866.6199 Michael Nesbitt mnesbitt@nesbittconstruction.com estimator@nesbittconstruction.com

## 2. PROJECT:

Monett Addition and Renovation  
Monett Missouri Stake

## 3. LOCATION:

601 S. Lincoln Ave.  
Monett, MO 65708

## 4. OWNER:

Corporation of the Presiding Bishop of  
The Church of Jesus Christ of Latter-day Saints, a Utah corporation sole  
c/o  
Texas Project Management  
3200 Gary Drive  
Plano, TX 75023-1118

## 5. CONSULTANT:

GHN Architect+Engineers  
300 South Jefferson Avenue, Suite 301  
Springfield, MO 65806

## 6. DESCRIPTION OF PROJECT:

- A. 1,245 SF addition to existing building, reroof of entire building and some renovation of existing restrooms.
- B. Products or systems may be provided under a Value Managed Relationship (VMR) the Owner has negotiated with the supplier. VMR products and systems are indicated as such in the Specifications.

## 7. TYPE OF BID: Bids will be on a lump-sum basis. Segregated bids will not be accepted.

8. **TIME OF SUBSTANTIAL COMPLETION:** The time limit for substantial completion of this work will be 180 calendar days and will be as noted in the Agreement.
9. **BID OPENING:** Sealed bids will be received at 3:00 PM on Tuesday May 17, 2016 at the Springfield FM Office, 1357 S. Ingram Mill Road, Springfield, MO 65804, Properly submitted bids will be publicly opened after the closing of bidding.

10. **BIDDING DOCUMENTS:**

A. Bidding Documents may be examined at the following plan room locations:

Certified Reprographics 2949 S Main Street Salt Lake City, UT 84115 888-422-2270 FAX: 801-466-9153 <a href="http://www.crplots.com">www.crplots.com</a>	Engineer's Reprographics 1600 E. St. Louis Springfield, MO 65802 417-869-2222 <a href="http://www.erdigital.com">www.erdigital.com</a>
Mountainlands Area Plan Room 583 W 350 S, Suite 4 Salt Lake City, UT 84115 801-288-188 fx 801-288-1184 <a href="http://www.MAPRonline.com">www.MAPRonline.com</a>	Builder's Association 521 S Ingram Mill Road Springfield, MO 65808 417-883-6044 FAX: 417-883-9403 <a href="mailto:mboyer@buildersassociation.com">mboyer@buildersassociation.com</a>
Construction Management Data Plan Room 30 Technology Parkway S, Suite 500 Norcross GA 30090-2912 800-699-8640 FAX: 800-508-5370 <a href="http://www.cmdgroup.com">www.cmdgroup.com</a>	

- B. Bidding Documents may be obtained at the Architect's office with a refundable deposit of \$75.00 per set. Deposit will be refunded if documents are returned complete and in good condition within five days of bid opening.
11. **BID BOND:** Bid security in the amount of 5 percent (5%) of the bid will accompany each bid in accordance with the Instruction to Bidders.
12. **BIDDER'S QUALIFICATIONS:** Bidding by the General Contractors will be by invitation only.
13. **OWNER'S RIGHT TO REJECT BIDS:** The Owner reserves the right to reject any or all bids and to waive any irregularity therein.

END OF DOCUMENT

# INSTRUCTIONS TO BIDDERS (U.S.)

---

## 1. DEFINITIONS:

- A. The definitions set forth in Section 1 of the General Conditions are applicable to the documents included under Bidding Requirements.
- B. Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The proposed Contract Documents consist of the documents identified as Contract Documents in the Form of Agreement, except for Modifications. The Bidding Requirements are those documents identified as such in the proposed Project Manual.
- C. Addenda are written or graphic documents issued by the Architect prior to execution of the Contract which modify or interpret the Bidding Documents. They become part of the Contract Documents as noted in the Form of Agreement upon execution of the Contract.

## 2. BIDDER'S REPRESENTATIONS:

- A. By submitting a bid, the bidder represents that
  - 1) Bidder has carefully studied and compared the Bidding Documents with each other. Bidder understands the Bidding Documents and the bid is fully in accordance with the requirements of those documents,
  - 2) Bidder has thoroughly examined the site and any building located thereon, has become familiar with local conditions which might directly or indirectly affect the contract work, and has correlated its personal observations with the requirements of the proposed Contract Documents, and
  - 3) Bid is based on the materials, equipment, and systems required by the Bidding Documents without exception.

## 3. BIDDING DOCUMENTS:

- A. Copies
  - 1) Bidding Documents may be obtained as set forth in the Invitation to Bid.
  - 2) Partial sets of Bidding Documents will not be issued.
  - 3) Bidders will use complete sets of Bidding Documents in preparing bids and make certain that those submitting sub-bids to them have access to all portions of the documents that pertain to the work covered by sub-bid, including General Conditions, Supplementary Conditions, and Division 01. Bidder assumes full responsibility for errors or misinterpretations resulting from use of partial sets of Bidding Documents by itself or any sub-bidder.
- B. Interpretation or Correction of Bidding Documents
  - 1) Bidders will request interpretation or correction of any apparent errors, discrepancies and omissions in the Bidding Documents.
  - 2) Corrections or changes to Bidding Documents will be made by written addenda.
- C. Substitutions and Equal Products
  - 1) Generally speaking, substitutions for specified products and systems, as defined in the Uniform Commercial Code, are not acceptable. However, equal products may be approved upon compliance with Contract Document requirements.
  - 2) The terms '*Acceptable Manufacturers*', '*Approved Manufacturers*', '*Suppliers*', '*Installers*' and '*VMR (Value Managed Relationship) Manufacturers / Suppliers / Installers*' are used throughout the Project Manual to differentiate among the options available to Contractor regarding specified products, manufacturers, and suppliers. See Section 016000 for options available regarding acceptance of equal products.
  - 3) Base bid only on materials, equipment, systems, suppliers or performance qualities specified in the Bidding Documents.

- 4) Architect is only authorized to consider requests for approval of equal products to replace specified products in Sections where the heading 'Acceptable Manufacturers' is used and statement, 'Equal as approved by Architect before bidding. See Section 016000' or 'Equal as approved by Architect before installation. See Section 016000,' appears. In Sections where the afore-mentioned statements do not appear and a different heading is used, Architect is authorized as Owner's representative to decline consideration of requests for approval of equal products. Approvals of equal products in such Sections must be made by Owner and will generally be for subsequent Projects.
- D. Addenda - Addenda will be sent to bidders and to locations where Bidding Documents are on file no later than one week prior to bid opening or by fax no later than 48 hours prior to bid opening.

#### **4. BIDDING PROCEDURES:**

- A. Form and Style of Bids
  - 1) Use Owner's Bid Form.
  - 2) Fill in all blanks on Bid Form. Signatures will be in longhand and executed by representative of bidder duly authorized to make contracts.
  - 3) Bids will bear no information other than that requested on bid form. Do not delete from or add to the information requested on the bid form.
- B. Bid Security
  - 1) Each bid will be accompanied by a bid bond naming Owner, as listed in the Agreement, as obligee. If Bidder refuses to enter into a Contract or fails to provide bonds and insurance required by the General Conditions, amount of bid security will be forfeited to Owner as liquidated damages, not as a penalty.
  - 2) Bid bond will be issued by a surety company meeting requirements of the General Conditions for surety companies providing bonds and will be submitted on AIA Document A310, Bid Bond or AIA authorized equivalent provided by surety company. The attorney-in-fact who executes the bond on behalf of the surety will affix to the bond a certified and current copy of the power of attorney.
  - 3) Owner may retain bid security of bidders to whom an award is being considered until -
    - a. Contract has been executed and bonds have been furnished,
    - b. Specified time has elapsed so bids may be withdrawn, or
    - c. All bids have been rejected.
- C. Submission of Bids
  - 1) Submit bid in sealed opaque envelope containing only bid form and bid security. Envelopes will be sealed, bear bidder's name, and include the following:

#### **BID FOR**

#### **Monett Addition and Renovation – Monett MO Stake 516264516040101**

- If bid is sent by mail, enclose sealed envelope in separate mailing envelope with notation 'SEALED BID ENCLOSED' on face.
- 2) It is bidder's sole responsibility to see that its bid is received at specified time. Bids received after specified bid opening time will be returned to bidders unopened.
  - 3) No oral, facsimile transmitted, telegraphic, or telephonic bids, modifications, or cancellations will be considered.
- D. Modification or Withdrawal of Bid
    - 1) Bidder guarantees there will be no revisions or withdrawal of bid amount for 45 days after bid opening.
    - 2) Prior to bid opening, bidders may withdraw bid by written request or by reclaiming bid envelope.
    - 3) Prior to bid opening, bidder may mark and sign on the sealed envelope that bidder



acknowledges any or all Addenda.

**5. CONSIDERATION OF BIDS:**

- A. Opening of Bids - See Invitation to Bid.
- B. Rejection of Bids - Owner reserves right to reject any or all bids and to waive any irregularity therein.
- C. Acceptance of Bid
  - 1) No bidder will consider itself under contract after opening and reading of bids until Agreement between Owner and Contractor is fully executed.
  - 2) Bidder's past performance, organization, subcontractor selection, equipment, and ability to perform and complete its contract in manner and within time specified, together with amount of bid, will be elements considered in award of contract.

**6. POST-BID INFORMATION:**

- A. The conditionally accepted bidder submitting a bid involving subcontractors will submit its list of proposed subcontractors in a meeting to be held immediately after bid opening.

**7. PERFORMANCE BOND AND PAYMENT BOND:**

- A. Bond Requirements - Performance Bond and Labor and Material Payment bond will be required for this Project as specified in the General Conditions.
- B. Time of Delivery of Bonds - Bonds will be delivered to Owner with Agreement signed by bidder.

**8. FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR:**

- A. Agreement form will be "Agreement Between Owner and Contractor for a Fixed Sum (U.S.)" provided by Owner.

**9. MISCELLANEOUS:**

- A. Pre-Bid Conference
  - 1) A pre-bid conference will be held at 1:00 PM on May 5, 2016 at the jobsite.
- B. Liquidated Damages - Conditions governing liquidated damages are specified in the General Conditions and in the Supplementary Conditions.
- C. Examination Schedule for Existing Building and Site
  - 1) Contact Terrance Thedell, Facilities Manager 417.889.4136
- D. Exemption from local taxes - See Supplementary Conditions

END OF DOCUMENT

BLANK PAGE

# INFORMATION AVAILABLE TO BIDDERS (U.S.)

---

## 1. GEOTECHNICAL DATA

### A. Geotechnical Report -

- 1) Owner has secured the services of a geotechnical engineer to aid in design of the Project. Following conditions apply -
  - a) A geotechnical report has been prepared by Anderson Engineering, referred to as the Geotechnical Engineer.
  - b) A copy of this report will be issued to each invited Contractor.
  - c) This report was obtained solely for use in design by Consultant and is not a part of the Contract Documents. It is not intended that Contractor rely on geotechnical engineer's report.
  - d) Reports are provided for Contractor's information but are not a warranty of subsurface conditions.
- 2) Prior to bidding, Contractor may make his own subsurface investigations to satisfy himself with site and subsurface conditions.

END OF DOCUMENT

BLANK PAGE

## **SUBCONTRACTORS AND MAJOR MATERIALS SUPPLIERS LIST**

Project Name: \_\_\_\_\_ Date: \_\_\_\_\_

Stake: \_\_\_\_\_ Project No: \_\_\_\_\_

General Contractor: \_\_\_\_\_

General Contractor is to provide the names of the following subcontractors and suppliers to the Owner's Project Manager immediately following the bid opening:

### **VMR SUBCONTRACTORS**

Roofing \_\_\_\_\_

Doors, Frames & Hardware \_\_\_\_\_

Storefronts \_\_\_\_\_

### **SUBCONTRACTORS AND SUPPLIERS**

Grading / Site work \_\_\_\_\_

Site Utilities \_\_\_\_\_

Demolition \_\_\_\_\_

Termite Control \_\_\_\_\_

Site Concrete \_\_\_\_\_

Fencing \_\_\_\_\_

Irrigation System \_\_\_\_\_

Landscaping \_\_\_\_\_

Building Concrete \_\_\_\_\_

Masonry \_\_\_\_\_

Structural Steel \_\_\_\_\_

Framing \_\_\_\_\_

Trusses \_\_\_\_\_

Insulation \_\_\_\_\_

EIFS \_\_\_\_\_

Soffit / Fascia \_\_\_\_\_

Steeple \_\_\_\_\_

Millwork \_\_\_\_\_

Drywall \_\_\_\_\_

Ceramic Tile \_\_\_\_\_

Acoustical Tile \_\_\_\_\_

Painting \_\_\_\_\_

Wall Coverings \_\_\_\_\_

Elevators / Lifts \_\_\_\_\_

Draperies \_\_\_\_\_

Fire Sprinklers \_\_\_\_\_

Plumbing \_\_\_\_\_

HVAC \_\_\_\_\_

Electrical \_\_\_\_\_

Controls \_\_\_\_\_

Sound / Satellite \_\_\_\_\_

# EQUAL PRODUCT APPROVAL REQUEST FORM (U.S.)

---

Project Name: \_\_\_\_\_ Request Number: \_\_\_\_\_

TO: \_\_\_\_\_

FROM: \_\_\_\_\_

BID DATE: \_\_\_\_\_

---

A proposed product is not legally approved and cannot legally be included in a bid or used in the Work until it appears in an Addendum or other Contract Modification as defined in the General Conditions. See Instructions To Bidders Paragraph 3.C, General Conditions, and Section 016000.

---

## PROPOSED EQUAL PRODUCT:

Specification Section: \_\_\_\_\_

Specified Products: \_\_\_\_\_

Proposed Product: \_\_\_\_\_

The Undersigned certifies:

1. Proposed equal product has been fully investigated and determined to be equal or superior in all respects to specified products.
2. Same warranty will be furnished for proposed equal product as for specified products.
3. Same maintenance service and source of replacement parts, as applicable, is available.
4. Proposed equal product will have no adverse effect on other trades and will not affect or delay progress schedule.
5. Proposed equal product does not affect dimensions and functional clearances.

## ATTACHMENTS:

Include the following attachments -

1. Copy of the Project Manual Section where the proposed equal product would be specified, rewritten or red-lined to include any changes necessary to correctly specify the proposed equal product. Identify completely changes necessary to the original Project Manual Section.
2. Copies of details, elevations, cross-sections, and other elements of the Project Drawings redone as necessary to show changes necessary to accommodate proposed equal product. Identify completely the changes from the original Drawings.
3. Complete product literature and technical data, installation and maintenance instructions, test results, and other information required to show complete conformance with requirements of the Contract Documents.

**SIGNED:** \_\_\_\_\_

Printed Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City, State, Zip Code \_\_\_\_\_

Telephone \_\_\_\_\_ Fax \_\_\_\_\_

**REVIEW COMMENTS:**

\_\_\_\_\_ Accepted. See Addenda Number \_\_\_\_\_.

\_\_\_\_\_ Submission Not In Compliance With Instructions. Respond to attached comments and resubmit.

\_\_\_\_\_ Proposed Equal Product Not Acceptable. Use specified products.

\_\_\_\_\_ Not Reviewed. Submission received too late. Use specified products.

---

**ADDITIONAL COMMENTS:**

---

**BY:** \_\_\_\_\_ **DATE:** \_\_\_\_\_



# B I D F O R M

FOR GENERAL CONTRACT WORK (U.S.)

---

**PROJECT IDENTIFICATION:**

Monett Addition and Renovation, Monett MO Stake, 516264516040101

**OWNER:**

Corporation of the Presiding Bishop of the Church of Jesus Christ of Latter-day Saints, a Utah corporation  
sole ("Owner")

**ARCHITECT:**

Gaskin Hill Norcross of Missourir, Inc.  
300 S. Jefferson Avenue, Suite 301  
Springfield, MO 65806

---

**B I D**

1. In submitting this Bid, Bidder represents that:
  - a. If this Bid is accepted, Bidder will enter into an agreement with Owner to perform and furnish the Work described in the Bidding Documents for the Bid Price and within the Time of Substantial Completion indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.
  - b. Bidder has carefully examined Set(s) Number \_\_\_\_\_ of the Bidding Documents consisting of the Project Manual containing the Bidding Requirements, the Conditions of the Contract, and the Specifications, entitled \_\_\_\_\_, the Drawings entitled \_\_\_\_\_ and dated \_\_\_\_\_, and including sheets numbered \_\_\_\_\_, and addenda numbers \_\_\_\_\_.
  - c. Bidder has examined the site of the work, existing conditions, and all other conditions affecting the work on the above-named Project.
  - d. Bidder has carefully correlated the information known to Bidder and information and observations obtained from visits to the site with the Bidding Documents.
  - e. Bidder is familiar with federal, State, and local laws and regulations applicable to Project.
  - f. Bidder guarantees there will be no revisions or withdrawal of bid amount for forty-five (45) days after the bid opening.
2. Bidder hereby proposes to furnish all materials, labor, equipment, tools, transportations, services, licenses, fees, permits, etc., required by said documents to complete the Work described by the Contract Documents for the lump-sum of: \_\_\_\_\_ Dollars (\$ \_\_\_\_\_).
3. Unit Prices: The undersigned agrees that the following unit prices shall govern additions and deductions to the Contract sum required during the course of the work. All Unit Prices will be the same for Additions or Deductions. All Unit Prices will be total installed cost, including overhead and profit and all necessary costs.
  - a. Excavation and Fill Earthwork: In addition to the cut and fill shown in the Bidding Documents, an additional fifty (150) cubic yards of removal of existing earth and replacement with compacted material is included in the above Base Proposal. The actual amount (as verified by the Architect) will be adjusted by Change Order at the rate of:  
Add/Deduct \_\_\_\_\_ (\$ \_\_\_\_\_) per cubic yard.
4. Bidder agrees to achieve substantial completion of the Work within the number of days indicated in the Invitation to Bid.
5. Enclosed is a Bid Bond for not less than five percent (5%) of the bid.

RESPECTFULLY SUBMITTED:

---

Signature

---

Printed name

---

Title

---

	Company name	
	Business Address	
Date	City, State, and Zip Code	
License No.	Telephone	Fax
	Contact Email Address	

BLANK PAGE

## CONSTRUCTION MATERIAL ASBESTOS STATEMENT (U.S.)

**PROJECTS FOR:  
CORPORATION OF THE PRESIDING BISHOP OF  
THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS**

Building Name: \_\_\_\_\_

Building Plan Type: \_\_\_\_\_

Building Address: \_\_\_\_\_

Building Owner: Corporation of the Presiding Bishop of The Church of Jesus Christ of Latter-day Saints, a Utah corporation sole.

Project Number: \_\_\_\_\_

Completion Date: \_\_\_\_\_

As PROJECT CONSULTANT and principal in charge; based on my best knowledge, information, inspection, and belief; I certify that on the above referenced Project, no asbestos-containing building materials were specified in the construction documents or given approval in shop drawings or submittals.

\_\_\_\_\_  
Project Consultant and Principal in Charge (signature)      Date

\_\_\_\_\_  
Company Name

As GENERAL CONTRACTOR in charge of construction; based on my best knowledge, information, inspection, and belief; I affirm that on the above-referenced Project, no asbestos-containing building materials were used in the construction.

\_\_\_\_\_  
General Contractor (signature)      Date

\_\_\_\_\_  
Company Name

# GENERAL CONDITIONS

## For a Fixed Sum (U.S.)

---

### TABLE OF CONTENTS

SECTION 1 GENERAL PROVISIONS	SECTION 9 PAYMENTS AND COMPLETION
SECTION 2 OWNER	SECTION 10 PROTECTION OF PERSONS AND PROPERTY
SECTION 3 CONTRACTOR	SECTION 11 INSURANCE AND BONDS
SECTION 4 ADMINISTRATION OF THE CONTRACT	SECTION 12 UNCOVERING AND CORRECTION OF WORK
SECTION 5 SUBCONTRACTORS	SECTION 13 RESOLUTION OF DISPUTES
SECTION 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS	SECTION 14 TERMINATION
SECTION 7 CHANGES IN THE WORK	SECTION 15 MISCELLANEOUS PROVISIONS
SECTION 8 TIME	

### SECTION 1 - GENERAL PROVISIONS

#### 1.1 DEFINITIONS

- A. Adverse Weather: weather conditions that are seasonally abnormal and could not have been reasonably anticipated.
- B. Agreement: the document entitled "Agreement Between Owner and Contractor for a Fixed Sum (U.S.), executed by Owner and Contractor for performance of the Work.
- C. Architect: the entity identified as such in the Agreement.
- D. Change In The Work: a modification to the requirements of the Contract Documents or a delay in Substantial Completion resulting from an instruction from Owner or Architect to Contractor or from another event or circumstance.
- E. Change Order: a written instrument prepared by Architect and signed by Owner, Contractor, and Architect stating their agreement upon the following: (1) the occurrence of a Change in the Work; (2) the amount of the adjustment, if any, in the Contract Sum as a result of the Change in the Work; and (3) the extent of the adjustment, if any, in the Contract Time as a result of the Change in the Work.
- F. Construction Change Directive: a written order prepared by Architect and signed by Architect and Owner which: (1) orders a Change in the Work if the terms of a Change Order cannot be agreed upon prior to performance of a Change in the Work described in Section 7.1 or after occurrence of an event or circumstance described in Section 7.2; and (2) states a proposed basis for adjustment, if any, in the Contract Sum, the Contract Time, or both, resulting from the Change in the Work.
- G. Contract Documents: the documents identified as such in the Agreement.
- H. Contract Sum: the total amount set forth in the Agreement payable by Owner to Contractor for performance of the Work.
- I. Contract Time: the period of time set forth in the Agreement for the Substantial Completion of the Work.
- J. Contractor: the entity identified as such in the Agreement.
- K. Day: calendar day unless otherwise specifically defined.
- L. Direct Costs: actual costs for labor, materials, equipment, insurance, bonds, subcontract costs and onsite supervision relating to the Project. They do not include labor costs for project managers or other off-site administration.
- M. Drawings: the documents identified as such in the Agreement.
- N. Field Change: a written order prepared by Architect and signed by Architect and Contractor for a minor Change in the Work consistent with the general intent of the Contract Documents costing \$1,000 or less, resulting in no time extension, and which is necessary to avoid delaying the Work.
- O. Modification: a written amendment to the Contract Documents in the form of a:
  - 1. Change Order;
  - 2. Construction Change Directive; or
  - 3. Field Change.
- P. Owner: the entity identified as such in the Agreement.
- Q. Project: the total construction designed by Architect of which the Work performed under the Contract Documents may be the whole or a part.

- R. Product Data: standard illustrations, schedules, performance charts, instructions, brochures, diagrams, and other information furnished by Contractor to illustrate details regarding materials or equipment to be used in the Work, or the manner of installation, operation, or maintenance of such materials or equipment.
- S. Project Manual: the document identified as such in the Agreement.
- T. Samples And Mock-ups: physical examples that illustrate materials, equipment, or workmanship and establish standards by which the Work will be judged.
- U. Shop Drawings: drawings, diagrams, illustrations, schedules, performance charts, fabrication and installation drawings, setting diagrams, patterns, templates, and other data which illustrate some portion of the Work and confirm dimensions and conformance to the Contract Documents specially prepared by Contractor or any Subcontractor, manufacturer, supplier, or distributor.
- V. Specifications: the documents identified as such in the Agreement.
- W. Subcontractor: any entity supplying labor, materials, equipment, construction or services for the Work under separate contract with Contractor or any other Subcontractor.
- X. Submittals: Shop Drawings, Product Data, Samples and Mock-ups and any other documents or items furnished by Contractor or its Subcontractors to Owner or Architect to demonstrate how any portion of the Work will be accomplished or the type of materials or products that will be used in the Work.
- Y. Substantial Completion: Completion of the Work to a point where Owner can use the Work for its intended purposes. The date of Substantial Completion is the date certified as such by Architect in accordance with the Contract Documents.
- Z. Work: all labor, materials, equipment, construction, and services required by the Contract Documents.
- AA. Written Notice: notice in writing given from one party to the other at the addresses or facsimile numbers listed in the Agreement, or at such other addresses or facsimile numbers as the parties will designate from time to time by Written Notice, and will be effective at the earliest of:
  - 1. The date of personal delivery to the other party with signed acknowledgment of receipt; or
  - 2. The date sent by facsimile transmission to the other party provided receipt of the facsimile is verified by an electronic confirmation report by the party sending the facsimile transmission and further provided that a confirmation copy is sent to the other party by courier or by registered or certified mail within twenty-four (24) hours after the time and date of the facsimile transmission; or
  - 3. The date of receipt by the other party as stated on the return receipt if sent by registered or certified mail, or by courier.

## 1.2 CORRELATION AND INTENT OF CONTRACT DOCUMENTS

- A. The intent of the Contract Documents is to require Contractor to provide all labor, materials, equipment, construction, and services necessary for the proper execution and completion of the Work. The Contract Documents are complementary and what is required by any one will be as binding as if required by all. Contractor will perform the Work in accordance with the requirements expressly set forth in or reasonably inferable from the Contract Documents.
- B. The organization of the Contract Documents is not intended to control Contractor in dividing the Work among Subcontractors or to establish the extent of the Work to be performed by any trade.
- C. Words used in the Contract Documents that have well known technical or trade meanings are used therein in accordance with such recognized meanings.
- D. In the interest of brevity, the Contract Documents may 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.

## 1.3 OWNERSHIP AND USE OF CONTRACT DOCUMENTS

The Drawings, the Project Manual, and copies thereof are the property of Owner. Contractor will not use these documents on any other project. Contractor may retain one copy of the Drawings and the Project Manual as a contract record set and will return or destroy all remaining copies following final completion of the Work.

## 1.4 PUBLIC STATEMENTS REGARDING PROJECT

Contractor will not make any statements or provide any information to the media about the Project without the prior written consent of Owner. If Contractor receives any requests for information from media, Contractor will refer such requests to Owner.

## 1.5 OWNERSHIP AND USE OF RENDERINGS AND PHOTOGRAPHS

Renderings representing the Work are the property of Owner. All photographs of the Work, whether taken during performance of the Work or at completion, are the property of the Owner. The Owner reserves all rights including copyrights to renderings and photographs of the Work. No renderings or photographs shall be used or distributed without written consent of the Owner.

## **1.6 NO COMMERCIAL USE OF TRANSACTION OR RELATIONSHIP**

Without the prior written consent of Owner, which Owner may grant or withhold in its sole discretion, neither Contractor nor Contractor's affiliates, officers, directors, agents, representatives, shareholders, members, Subcontractors, Sub-subcontractors or employees shall make any private commercial use of their relationship to Owner or the Project, including, without limitation:

- A. By referring to this Agreement, Owner, or the Project verbally or in any sales, marketing or other literature, letters, client lists, press releases, brochures or other written materials except as may be necessary for Contractor to perform Contractor's obligations under the terms of this Agreement;
- B. By using or allowing the use of any photographs of the Project or any part thereof, or of any service marks, trademarks or trade names or other intellectual property now or which may hereafter be associated with, owned by or licensed by Owner in connection with any service or product; or
- C. By contracting with or receiving money or anything of value from any person or commercial entity to facilitate such person or entity obtaining any type of commercial identification, advertising or visibility in connection with the Project.

Notwithstanding the foregoing, Contractor may include a reference to Owner and the services and equipment provided under this Agreement in a professional résumé or other similar listing of Contractor's references without seeking Owner's written consent in each instance; provided, that such reference to Owner, the services and equipment is included with at least several other similar references and is given no more prominence than such other references.

## **1.7 CONFIDENTIALITY / PROPERTY RIGHTS**

- A. Owner will retain ownership and intellectual property rights in all plans, designs, drawings, documents, concepts, and materials provided by or on behalf of Owner to Contractor and to all work products of Contractor for or relative to Work performed under this Agreement, such products, services, and Work of Contractor constituting works made for hire. Contractor will not reuse any portions of such items provided by Owner or developed by Contractor for Owner pursuant to this Agreement, or disclose any such items to any third party without the prior written consent of Owner. Owner may withhold its consent in its' absolute discretion.
- B. In addition, Contractor shall ensure that Contractor, Subcontractors, and the employees, agents and representatives of Contractor and its Subcontractors maintain in strict confidence, and shall use and disclose only as authorized by Owner all Confidential Information of Owner that Contractor receives in connection with the performance of this Agreement. Notwithstanding the foregoing, Contractor may use and disclose any information to the extent required by an order of any court or governmental authority, but only after it has notified Owner and Owner has had an opportunity to obtain reasonable protection for such information in connection with such disclosure. For purposes of this Agreement, "Confidential Information" means:
  - 1. The name or address of any affiliate, customer or contractor of Owner or any information concerning the transactions of any such person with Owner;
  - 2. Any information relating to contracts, agreements, business plans, budgets or other financial information of Owner to the extent such information has not been made available to the public by the Owner; and
  - 3. Any other information that is marked or noted as confidential by the Owner at the time of its disclosure.

## **1.8 COMPLY WITH INTELLECTUAL PROPERTY RIGHTS OF OTHERS**

Contractor represents and warrants that no Work (with its means, methods, goods, and services attendant thereto), provided to Owner will infringe or violate any right of any third party and that Owner may use and exploit such Work, means, methods, goods, and services without liability or obligation to any person or entity (specifically and without limitation, such Work, means, methods, goods, and services will not violate rights under any patent, copyright, trademark, or other intellectual property right or application for the same).

## **SECTION 2 - OWNER**

### **2.1 OWNER'S DESIGNATED REPRESENTATIVE**

Owner will designate in writing a representative who will have express authority to bind Owner with respect to all matters requiring Owner's approval or authorization.

### **2.2 INFORMATION AND SERVICES REQUIRED OF OWNER**

- A. Owner will be responsible for establishment of property lines and benchmarks for grading.
- B. Owner will furnish to Contractor any information or services it is required to furnish under the Contract Documents with reasonable promptness to avoid delay in the orderly progress of the Work.
- C. Owner will furnish to Contractor a reasonable number of copies of the Drawings, the Project Manual, and the Addenda.

### **2.3 OWNER'S RIGHT TO INSPECT THE WORK**

Owner and its representatives will have the right to inspect any portion of the Work wherever located at any time.

### **2.4 OWNER'S RIGHT TO STOP THE WORK**

If Contractor fails to carry out the Work in accordance with the Contract Documents or fails to correct Work which is not in accordance with the Contract Documents in a timely manner, Owner may order Contractor in writing to stop the Work, or any portion thereof, until the cause for that order has been eliminated.

## SECTION 3 - CONTRACTOR

### 3.1 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

- A. By executing the Agreement, Contractor represents that it has visited the Project site, familiarized itself with the local conditions under which the Work is to be performed, and correlated its own observations with the requirements of the Contract Documents.
- B. Contractor will carefully review and compare the Contract Documents and any other available information relating to the Project prior to commencing and during performance of each portion of the Work and will immediately report to Architect any errors, inconsistencies, and omissions it discovers.
- C. Should Contractor or any of its Subcontractors become aware of any question regarding the meaning or intent of any part of the Contract Documents prior to commencing that portion of the Work about which there is a question, Contractor will request an interpretation or clarification from Architect before proceeding. Contractor proceeds at its own risk if it proceeds with the Work without first making such a request and receiving an interpretation or clarification from Architect. If neither Contractor nor its Subcontractors become aware of the question until after work on the relevant portion of the Work has commenced, then the following precedence will govern for purposes of determining whether resolution of the question constitutes a Change in the Work:
  - 1. The Agreement takes precedence over all other Contract Documents.
  - 2. The Supplementary Conditions take precedence over the General Conditions.
  - 3. The General Conditions and Supplementary Conditions take precedence over the Drawings and the Specifications.
  - 4. An Addendum or a Modification takes precedence over the document(s) modified by the Addendum or Modification.
  - 5. The Specifications take precedence over the Drawings.
  - 6. Within the Drawings, larger scale drawings take precedence over smaller scale drawings, figured dimensions over scaled dimensions, and noted materials over graphic indications.
- D. Contractor will give Architect notice of any additional drawings, specifications, or instructions required to define the Work in greater detail, or to permit the proper progress of the Work, sufficiently in advance of the need for information so as not to delay the Work.
- E. It is not Contractor's responsibility to ascertain that the Contract Documents are in accordance with requirements of applicable laws, statutes, ordinances, building codes, rules and regulations. However, if Contractor observes that portions of the Contract Documents are at variance with those requirements, Contractor will immediately notify Architect in writing. Contractor will not proceed unless Owner and/or Architect effects Modifications to the Contract Documents required for compliance with such requirements. Contractor will be fully responsible for any work knowingly performed contrary to such requirements and will fully indemnify Owner against loss and bear all costs and penalties arising therefrom.
- F. Contractor will take field measurements and verify field conditions and will compare such field measurements and conditions and other information known to Contractor with the Contract Documents before ordering any materials or commencing construction activities. Contractor will immediately report errors, inconsistencies, and omissions that it discovers to Architect. If Contractor orders materials or commences construction activities before taking field measurements and verifying field conditions, Contractor will not be entitled to any compensation for additional costs to Contractor resulting from field measurements or conditions different from those anticipated by Contractor which would have been avoided had Contractor taken field measurements and verified field conditions prior to ordering the materials or commencing construction activities.
- G. If site conditions indicated in the Contract Documents or other information provided by Owner or Architect to Contractor differ materially from those Contractor encounters in performance of the Work, Contractor will immediately notify Architect in writing of such differing site conditions.
- H. Where the Contract Documents require the Contractor to provide professional services for architecture or engineering, the Contractor shall cause such services to be performed by appropriately licensed professionals.

### 3.2 SUPERVISION OF CONSTRUCTION PROCEDURES

- A. Contractor will supervise and direct the Work. Contractor will be solely responsible for all construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the Work. All loss, damage, liability, or cost of correcting defective work arising from the use of any construction means, methods, techniques, sequences or procedures will be borne by Contractor, notwithstanding that such construction means, methods, techniques, sequences or procedures are referred to, indicated or implied by the Contract Documents, unless Contractor has given timely notice to Owner and Architect in writing that such means, methods, techniques, sequences or procedures are not safe or suitable, and Owner has then instructed Contractor in writing to proceed at Owner's risk.
- B. Contractor will utilize its best skill, efforts, and judgment to provide efficient business administration and supervision, to furnish at all times an adequate supply of workers and materials, and to perform the Work in an expeditious and economical manner consistent with the interests of Owner.
- C. Contractor will be responsible for:
  - 1. The proper observance of property lines and set back requirements as shown in the Contract Documents;
  - 2. The location and layout of the Work as shown in the Contract Documents with respect to the position of the Work on the property and the elevation of the Work in relation to grade; and
  - 3. Setting and maintaining construction stakes.
- D. Contractor will be responsible to Owner for the acts and omissions of its employees and Subcontractors as well as persons either directly or indirectly employed by Subcontractors.



- E. Contractor will not be relieved of its obligation to perform the Work in accordance with the Contract Documents as a result of any tests, inspections, or approvals by Owner, Architect or their consultants.
- F. Contractor will be responsible for inspection of portions of the Work already completed to determine that such portions are in proper condition to receive subsequent portions of the Work.
- G. Contractor recognizes that the Project site and the surrounding area is frequently visited by the public and is important to Owner's image and function and will maintain the premises free from debris and waste materials resulting from Construction. At the completion of Construction, Contractor shall promptly remove construction equipment, tools, surplus materials, waste materials and debris.

### **3.3 LABOR AND MATERIALS**

- A. Unless otherwise provided in the Contract Documents, Contractor will provide and pay for all labor, materials, equipment, tools, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work.
- B. Contractor will at all times enforce strict discipline and good order among those performing the Work and will not permit employment of any unfit person or anyone not skilled in the tasks assigned to them.
- C. Contractor is fully responsible for the Project and all materials and work connected therewith until Owner has accepted the Work in writing. Contractor will replace or repair at its own expense any materials or work damaged or stolen, regardless of whether it has received payment for such work or materials from the Owner.
- D. Contractor will remedy all damage or loss to any property caused in whole or in part by Contractor, any Subcontractor, or by anyone for whose acts any of them may be liable.
- E. Contractor will be responsible for determining that all materials furnished for the Work meet all requirements of the Contract Documents. Architect may require 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 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 will be furnished at Contractor's expense. This provision will not require 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 Contractor's expense.
- F. Contractor will coordinate and supervise the work performed by Subcontractors so 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. Contractor and all Subcontractors will at all times afford each trade, any separate contractor, or Owner, reasonable opportunity for the installation of Work and the storage of materials.
- G. Contractor warrants to Owner that the materials and equipment furnished for the Work will be new unless otherwise specified by the Contract Documents, and that the Work will be free from defects, and will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective in the discretion of Owner. If required by Architect, Contractor will furnish satisfactory evidence as to the kind and quality of the materials and equipment used in performing the Work.
- H. Owner may elect to purchase materials required for the Work. In that event, Contractor will comply with the procedures set forth in the Contract Documents relating to such materials.

### **3.4 COMPLIANCE WITH LAWS**

Contractor will comply with all applicable laws, ordinances, rules, regulations, and orders of any public authorities relating to performance of the Work.

### **3.5 TAXES**

- A. Contractor will pay all sales, use, consumer, payroll, workers compensation, unemployment, old age pension, surtax, and similar taxes assessed in connection with the performance of the Work.
- B. Owner will pay all taxes and assessments on the real property comprising the Project site.

### **3.6 PERMITS AND FEES**

- A. Owner will obtain and pay for all zoning and use permits and permanent easements necessary for completion of the Work.
- B. Contractor will obtain and pay for the building permit, and all other permits, governmental fees, licenses and inspections necessary for the proper execution and completion of the Work.
- C. Contractor will secure any certificates of inspection and of occupancy required by authorities having jurisdiction over the Work. Contractor will deliver these certificates to Architect prior to issuance of the Certificate of Substantial Completion by Architect.

### **3.7 CONTRACTOR'S ON-SITE REPRESENTATIVE**

Contractor will employ a competent representative acceptable to Owner to supervise the performance of the Work. This representative will be designated in writing by Contractor prior to commencement of work and will not be changed prior to final

inspection of the Work without prior written consent of Owner. This representative will represent Contractor for all purposes, including communication with Owner.

### **3.8 CONTRACTOR'S CONSTRUCTION SCHEDULES**

- A. Contractor will prepare and submit for Owner's and Architect's information Contractor's construction schedule for the Work in accordance with the requirements of the Contract Documents.
- B. Contractor will prepare and maintain a Submittal schedule which is coordinated with Contractor's construction schedule and sets forth specified times for Architect to review Submittals.

### **3.9 DOCUMENTS AND SUBMITTALS AT THE SITE**

Contractor will keep at the Project site for use by Owner, Architect, or their representatives, a record copy of the Project Manual, the Drawings, all Addenda, and all Modifications. These documents will be maintained in good order and currently marked to record changes and selections made during construction. In addition, Contractor will keep at the Project site one copy of all Submittals.

### **3.10 SUBMITTALS**

- A. Submittals are not Contract Documents and do not alter the requirements of the Contract Documents unless incorporated into the Contract Documents by a Modification.
- B. Contractor will review, approve, and submit to Architect Submittals in accordance with the Contract Documents. By approving Submittals, Contractor represents that it has determined and verified field measurements, field construction criteria, materials, catalog numbers, and similar data, and that it has checked and coordinated each Submittal with the requirements of the Work and of the Contract Documents or will make such determination, verification, check, and coordination prior to commencing the relevant portion of the Work. In reviewing Submittals Architect will be entitled to rely upon Contractor's representation that such information is correct and accurate.
- C. Contractor will inform Architect in writing at the time of submission of any Submittal or portion thereof which deviates from the requirements of the Contract Documents. Contractor will provide Architect with documentation demonstrating to Architect that the Submittal is equal to or better than the specified product or work. Contractor will not be relieved of responsibility for deviations from the requirements of the Contract Documents by Architect's acceptance of a Submittal unless Contractor has informed Architect in writing of the deviation and Architect has incorporated the deviation into the Contract Documents by a Modification.
- D. Contractor will not perform any portions of the Work requiring Submittals until the respective Submittal has been reviewed and accepted in writing by Architect.
- E. When professional certification of performance criteria of materials, systems or equipment is required by the Contract Documents, Owner will be entitled to rely upon such certifications, and neither Owner nor Architect will be expected to make any independent examination with respect thereto.
- F. Submittals not required by the Contract Documents may be returned to Contractor without action.

### **3.11 CUTTING AND PATCHING**

Contractor will be responsible for any cutting, fitting, and patching that may be required to complete the Work and make its parts fit together properly.

### **3.12 ACCESS TO WORK**

Contractor will permit Owner, Architect, their representatives and consultants, access to the Work wherever located at any time.

### **3.13 ROYALTIES AND PATENTS**

Contractor will pay all royalties and license fees required by the Work or by Contractor's chosen method of performing the Work. Contractor will defend and hold Owner harmless from all suits or claims for infringement of any patent, license or other intellectual property rights or any loss on account thereof.

### **3.14 INDEMNIFICATION**

- A. Contractor will indemnify and hold harmless Owner and Owner's representatives, employees, agents, architects, and consultants from and against any and all claims, damages, liability, demands, costs, judgments, awards, settlements, causes of action, losses and expenses (collectively "Claims" or "Claim"), including but not limited to attorney fees, consultant fees, expert fees, copy costs, and other expenses, arising out of or resulting from performance of the Work, attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of real or personal property, including loss of use resulting therefrom, except to the extent that such liability arises out of the negligence of Owner, its representatives, agents, and employees. This indemnity includes, without limitation, indemnification of Owner from all losses or injury to Owner's property, except to the extent that such loss or injury arises out of the negligence of Owner, its representatives, agents, and employees. This indemnity applies, without limitation, to include Claims occurring both during performance of the Work and/or subsequent to completion of the Work. In the event that any Claim is caused in part by a party indemnified hereunder, that party will bear the cost of such Claim to the extent it was the cause thereof. In the event that a claimant asserts a Claim for recovery against any party indemnified hereunder, the party indemnified hereunder may tender the defense of such Claim to Contractor. If Contractor rejects such tender of defense and it is later determined that the negligence of the party indemnified hereunder did not cause all

of the Claim, Contractor will reimburse the party indemnified hereunder for all costs and expenses incurred by that party in defending against the Claim. Contractor will not be liable hereunder to indemnify any party for damages resulting from the sole negligence of that party.

- B. In addition to the foregoing, Contractor will be liable to defend Owner in any lawsuit filed by any Subcontractor relating to the Project. Where liens have been filed against Owner's property, Contractor (and/or its bonding company which has issued bonds for the Project) will obtain lien releases and record them in the appropriate county and/or local jurisdiction and provide Owner with a title free and clear from any liens of Subcontractors. In the event that Contractor and/or its bonding company are unable to obtain a lien release, Owner in its absolute discretion may require Contractor to provide a bond around the lien or a bond to discharge the lien, at Contractor's sole expense.
- C. In addition to the foregoing, Contractor will indemnify and hold Owner harmless from any claim of any other contractor resulting from the performance, nonperformance or delay in performance of the Work by Contractor.
- D. The indemnification obligation herein will not be limited by a limitation on the amount or type of damages, compensation or benefits payable by or for Contractor or a Subcontractor under worker's compensation acts, disability benefit acts, or other employee benefit acts.

### **3.15 PROJECT MEETINGS**

Contractor will attend and participate in meetings as required by the Contract Documents.

## **SECTION 4 - ADMINISTRATION OF THE CONTRACT**

### **4.1 ARCHITECT**

In the event that Owner terminates its contractual relationship with Architect, Owner will appoint in writing another architect, whose status under the Contract Documents will be that of the former Architect in all respects.

### **4.2 ARCHITECT'S ADMINISTRATION OF THE CONTRACT**

- A. Architect will make periodic visits to the site to familiarize itself generally with the progress and quality of the Work and to determine if the Work is proceeding in accordance with the Contract Documents. Although Architect is required to make periodic inspections, it is not required to make exhaustive or continuous onsite inspections. On the basis of its observations while at the site, Architect will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defects and deficiencies in the Work. Architect's failure to observe a defect or deficiency in the Work will not relieve Contractor of its duty to perform the Work in accordance with the Contract Documents.
- B. Architect will review Contractor's payment requests and determine the amounts due Contractor in accordance with Section 9.
- C. Communications between Contractor and Owner relating to the Work will be through Architect. Communications between Owner or Contractor with Architect's consultants relating to the Work will be through Architect. Communications between Owner or Architect and subcontractors relating to the Work will be through Contractor. Communications between Contractor and any separate contractor will be through Architect, except as otherwise specified in the Contract Documents.
- D. Owner and/or Architect will have the right to reject and require removal of the following at Contractor's expense:
  - 1. Any portion of the Work that does not meet the requirements of the Contract Documents.
  - 2. Any portion of the Work damaged or rendered unsuitable during installation or resulting from failure to exercise proper protection.
- E. Architect will have authority to suspend the Work, with concurrence of Owner, whenever such suspension may be necessary in its reasonable opinion to insure the proper performance of the Work.
- F. Architect will review Contractor's Submittals and will accept or take other appropriate action regarding the Submittals. Architect's review of the Submittals will be for the limited purpose of checking for general conformance with the Contract Documents and will not be conducted for the purpose of determining the accuracy and completeness of 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 Contractor. Architect's review of Submittals will not relieve Contractor of its obligations under the Contract Documents. Architect's review of Submittals will not constitute acceptance of safety precautions or construction means, methods, techniques, sequences or procedures. Architect's acceptance of a specific item will not indicate acceptance of an assembly of which the item is a component.
- G. Architect has authority to order Construction Change Directives and Field Changes in accordance with Section 7.
- H. Architect will conduct inspections to determine the dates of Substantial Completion and final completion, will receive and review written guarantees and related documents required by the Contract and assembled by Contractor, and will review and certify or reject Contractor's final payment request.
- I. Architect will be the interpreter of the performance and requirements of the Contract Documents. Architect's interpretations will be in writing or in the form of drawings.
- J. Architect's decisions in matters relating to aesthetic effect will be final if consistent with the Contract Documents and approved by Owner.

## **SECTION 5 - SUBCONTRACTORS**

### **5.1 AWARD OF SUBCONTRACTS FOR PORTIONS OF THE WORK**

- A. Contractor will enter into contracts with Subcontractors to perform all portions of the Work that Contractor does not customarily perform with its own employees.
- B. Contractor will not contract with any Subcontractor who has been rejected by Owner. Contractor will not be required to contract with any Subcontractor against whom it has a reasonable objection.
- C. If Owner rejects any Subcontractor proposed by Contractor, Contractor will propose an acceptable substitute to whom Owner has no reasonable objection.
- D. Contractor will not make any substitution for any Subcontractor that has been accepted by Owner and Architect without the prior written approval of Owner and Architect.

### **5.2 SUBCONTRACTUAL RELATIONS**

- A. Contractor's responsibility for the Work includes the labor and materials of all Subcontractors, including those recommended or approved by Owner. Contractor will be responsible to Owner for proper completion and guarantee of all workmanship and materials under any subcontracts. Any warranties required for such work will be obtained by Contractor in favor of Owner and delivered to Architect. It is expressly understood and agreed that there is no contractual relationship between Owner and any Subcontractor, and under no circumstances will Owner be responsible for the non-performance or financial failure of any Subcontractor or any effects therefrom.
- B. Contractor agrees to pay the Subcontractors promptly upon receipt of payment from Owner for that portion of the funds received which represents the Subcontractor's portion of the Work completed to Contractor's satisfaction for which Owner has made payment.
- C. Contractor will require each Subcontractor to:
  - 1. Be licensed by the state in which the Project is located where such licensing is required by the governing authority;
  - 2. Be bound by the terms of the Contract Documents as far as they are applicable to the Subcontractor's work;
  - 3. Assume toward Contractor the same obligations Contractor has assumed toward Owner, including the prompt payment of its Subcontractors;
  - 4. Submit its applications for payment to Contractor in time to permit Contractor to make timely application to Owner;
  - 5. Execute claim or lien releases or lien waivers for payments made by Contractor; and
  - 6. Make all claims for Changes in the Work to Contractor in the same manner as Contractor is required to make such claims to Owner.

## **SECTION 6 - CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS**

### **6.1 OWNER'S RIGHT TO PERFORM WORK OR AWARD SEPARATE CONTRACTS**

- A. Owner reserves the right to perform work itself or to award separate contracts in connection with the Project.
- B. When separate contracts are awarded, "Contractor" in the Contract Documents in each case will mean the contractor who signs each separate contract.

### **6.2 MUTUAL RESPONSIBILITY**

- A. Contractor will afford other contractors reasonable opportunity to place and store their materials and equipment on site and to perform their work and will properly connect and coordinate its Work with theirs where applicable.
- B. If any part of Contractor's Work depends upon the work of any separate contractor for proper performance or results, Contractor will inspect and promptly report to Architect any apparent discrepancies or defects in such work that render it unsuitable for proper performance and results. Failure of Contractor to so inspect and report will constitute an acceptance of the work of the separate contractor as fit and proper to receive Contractor's Work, except as to defects not then reasonably discoverable.
- C. Contractor will promptly remedy damage caused by Contractor or any Subcontractor to the completed or partially completed work of other contractors or to the property of Owner or other contractors.

### **6.3 OWNER'S RIGHT TO CLEAN UP**

If a dispute arises among Contractor and separate contractors as to the responsibility under their separate contracts for maintaining the Project free from waste materials and rubbish, Owner may clean the Project, allocate the cost among those responsible as Owner and Architect determine to be just, and withhold such cost from any amounts due or to become due to Contractor.

## **SECTION 7 - CHANGES IN THE WORK**

### **7.1 CHANGES IN THE WORK RESULTING FROM AN INSTRUCTION BY OWNER OR ARCHITECT TO CONTRACTOR**

- A. If Owner or Architect gives Contractor an instruction that modifies the requirements of the Contract Documents or delays Substantial Completion, Contractor may be entitled to an adjustment in the Contract Sum and/or the Contract Time. If

compliance with the instruction affects the cost to Contractor to perform the Work, the Contract Sum will be adjusted to reflect the reasonable increase or decrease in cost subject to the conditions set forth in Section 7.1, Paragraphs B through G. If compliance with the instruction delays Substantial Completion, the Contract Time will be extended for a period of time commensurate with such delay subject to the conditions set forth in Section 7.1, Paragraphs B through G and Section 7.3, Paragraph A and Contractor will be paid liquidated damages for the delay as set forth in Section 7.3, Paragraph B.

- B. If Contractor receives an instruction from Owner or Architect that Contractor considers to be a Change in the Work, Contractor, before complying with the instruction, will notify Architect in writing that Contractor considers such instruction to constitute a Change in the Work. If Architect agrees that compliance with the instruction will constitute a Change in the Work, Contractor will furnish a proposal for a Modification in accordance with Section 7.1, Paragraphs C. and D. within ten (10) days.
- C. If Contractor claims that it is entitled to an adjustment in the Contract Sum (including without limitation costs related to a time extension) as a result of an instruction by Owner or Architect, Contractor will furnish a proposal for a Change Order containing a price breakdown itemized as required by Owner. The breakdown will be in sufficient detail to allow Owner to determine any increase or decrease in Direct Costs as a result of compliance with the instruction. Any amount claimed for subcontracts will be supported by a similar price breakdown and will itemize the Subcontractor's profit and overhead charges. Profit and overhead will be subject to the following limitations:
  - 1. The Subcontractor's profit and overhead will not exceed ten (10) percent of its Direct Costs on work performed. Subcontractor's profit and overhead will not exceed five (5) percent on work performed by its sub-subcontractors.
  - 2. Contractor's profit and overhead on work performed by its own crews will not exceed ten (10) percent of its Direct Costs.
  - 3. Contractor's profit and overhead mark up on work performed by its Subcontractors will not exceed five (5) percent of the Subcontractors' charges for such work.
  - 4. Amounts due Owner as a result of a credit change will be the actual net savings to Contractor from the Change in the Work as confirmed by Architect. On credit changes, profit and overhead on the originally estimated work will not be credited back to Owner. If both additions and credits are involved in a single Change in the Work, overhead and profit will be figured on the basis of net increase, if any, related to that Change in the Work.
- D. If Contractor claims that it is entitled to an adjustment in the Contract Time as a result of an instruction from Owner or Architect, Contractor will include in its proposal justification to support Contractor's claim that compliance with the instruction will delay Substantial Completion.
- E. Upon receipt of Contractor's proposal for Modification, Architect and Owner will determine whether to proceed with the Change in the Work. If Architect and Owner determine to proceed with the Change in the Work, they will issue a Change Order, a Construction Change Directive or a Field Change as appropriate.
- F. Contractor agrees that if it complies with an instruction from Owner or Architect without first giving written notice to Architect as provided in Section 7.1., Paragraph B, and receiving a Change Order, Construction Change Directive or Field Change, Contractor will not be entitled to any adjustment in the Contract Sum or the Contract Time as a result of the instruction and waives any claim therefor.
- G. If Contractor is instructed to perform work which it claims constitutes a Change in the Work but which Owner and Architect do not agree constitutes a Change in the Work, Contractor will comply with the instruction. Contractor may submit its claim for adjustment to the Contract Sum, the Contract Time, or both as a dispute pursuant to Section 13 within thirty (30) days after compliance with the instruction. Contractor agrees that if it fails to submit its claim for resolution pursuant to Section 13 within thirty (30) days after compliance with the instruction, then Contractor will not be entitled to any adjustment in the Contract Sum or the Contract Time as a result of the instruction and waives any claim therefor.
- H. Contractor agrees that it is responsible for submitting accurate cost and pricing data to support its Change Order Proposals. Owner will have the right to examine the Contractor's records to verify the accuracy and appropriateness of the pricing data used to price change order proposals.

## 7.2 CHANGE IN THE WORK RESULTING FROM AN EVENT OR CIRCUMSTANCE

- A. If an event or circumstance other than an instruction from Owner or Architect affects the cost to Contractor of performing the Work or delays Substantial Completion, Contractor may be entitled to an adjustment in the Contract Sum and/or the Contract Time. If the circumstance or event affects the cost to Contractor to perform the Work and is caused by a willful or negligent act or omission of Owner or Architect, the Contract Sum will be adjusted to reflect the reasonable increase or decrease in Contractor's cost to perform the Work resulting from the event or circumstance, subject to the conditions set forth in Section 7.2, Paragraphs B through F. If the event or circumstance delays Substantial Completion and is described in Section 7.3, Paragraph A, the Contract Time will be extended for a period of time commensurate with such delay subject to the conditions set forth in such section. If the circumstance or event delays Substantial Completion and is caused by a willful or negligent act or omission of Owner or Architect, then Contractor will be compensated for costs incident to the delay in accordance with Section 7.3, Paragraph B. Contractor will not be entitled to any adjustment to the Contract Sum or other damages from Owner as a result of any event or circumstance unless the event or circumstance results from a willful or negligent act or omission of Owner or Architect.
- B. If a Change in the Work results from any event or circumstance caused by the willful or negligent act or omission of Owner or Architect, Contractor will give Owner Written Notice of such event or circumstance within twenty-four (24) hours after commencement of the event or circumstance so that Owner can take such action as is necessary to mitigate the effect of the event or circumstance. Contractor will not be entitled to any adjustment in either the Contract Time or the Contract Sum based on any damages or delays resulting from such event or circumstance during a period more than twenty-four (24) hours prior to Contractor giving such Written Notice to Owner.
- C. Contractor will submit in writing any claims for an adjustment in the Contract Time and/or the Contract Sum resulting from an event or circumstance within the time limits set forth below. In the event that Contractor fails to submit its claim in writing within

the time limits set forth below, then Contractor agrees it will not be entitled to any adjustment in the Contract Time or the Contract Sum or to any other damages from Owner due to the circumstance or event and waives any claim therefor.

1. Claims for an adjustment in the Contract Time due to Adverse Weather will be made by the tenth (10th) of the month following the month in which the delay occurred.
  2. Claims for an adjustment in the Contract Time and/or the Contract Sum due to any other circumstance or event will be submitted within seven (7) days after the occurrence of the circumstance or event.
- D. If Contractor claims that it is entitled to an adjustment in the Contract Sum (including without limitation costs related to a time extension) because of an event or circumstance resulting from the willful or negligent act or omission of Owner or Architect, Contractor will furnish a proposal for a Change Order containing a price breakdown as described in Section 7.1, Paragraph C. Any amount claimed for increased labor costs as a result of the event or circumstance must be supported by a certified payroll. Any claim for rented equipment or additional material costs must be supported by invoices.
- E. If Contractor claims that it is entitled to an adjustment in the Contract Time as a result of an event or circumstance, Contractor will include with its claim copies of daily logs, letters, shipping orders, delivery tickets, Project schedules, and other supporting information necessary to justify Contractor's claim that the event or circumstance delayed Substantial Completion. If Contractor is entitled to an adjustment in the Contract Time as a result of an event or circumstance caused by the willful or negligent act or omission of Owner or Architect, Contractor will be compensated for all costs related to the delay in accordance with Section 7.3, Paragraph B.
- F. Within thirty (30) days after receipt of Contractor's claim, Architect will either deny the claim or recommend approval to Owner. If Owner approves the claim, the adjustment in the Contract Time and/or Contract Sum will be reflected in a Change Order pursuant to Section 7.5 or a Construction Change Directive pursuant to Section 7.6. If Owner or Architect denies Contractor's claim, Contractor may submit its claim as a dispute pursuant to Section 13 within thirty (30) days of receipt of the denial of the claim. If Contractor fails to submit its claim for resolution pursuant to Section 13 within the thirty (30) day time period, then Contractor agrees it is not entitled to any adjustment in the Contract Time and/or Contract Sum or any other damages as a result of the event or circumstance and waives any claim therefor.

### **7.3 EXTENSIONS OF TIME**

- A. If Substantial Completion of the Project is delayed because of any of the following causes, then the Contract Time will be extended by Change Order for a period of time equal to such delay:
1. Labor strikes or lock-outs;
  2. Adverse weather;
  3. Unusual delay in transportation;
  4. Unforeseen governmental requests or requirements;
  5. A Change in the Work resulting from an instruction by Owner or Architect to Contractor subject to the conditions set forth in Section 7.1.; or
  6. Any other event or circumstance caused by the willful or negligent act or omission of Owner or Architect.
- B. Contractor will not be entitled to any compensation for delay described in Section 7.3, Paragraph A, subparagraphs 1, 2, 3 and 4. For each day of delay in Substantial Completion described in Section 7.3, Paragraph A, subparagraphs 5 and 6, Contractor will be paid liquidated damages in the amount per day set forth in the Supplementary Conditions to compensate Contractor for all damages resulting from any delay including but not limited to damages for general conditions costs, additional job site costs, additional home office overhead costs, disruption costs, acceleration costs, increase in labor costs, increase in subcontract costs, increase in materials costs, and any other costs incident to the delay. Contractor will be entitled to no other compensation relating to the delay.
- C. In no event will any time extension or cost adjustment be given on account of delay which reasonably should have been anticipated by the Contractor or in circumstances where performance of the Work is, was, or would have been, delayed by any other cause for which the Contractor is not entitled to an extension.

### **7.4 DOCUMENTATION OF CHANGES IN THE WORK**

Every Change in the Work will be documented by a Change Order, a Construction Change Directive or a Field Change. If Owner, Architect and Contractor reach agreement regarding the adjustment in the Contract Sum, if any, and the adjustment in the Contract Time, if any, resulting from a Change in the Work, then the parties will execute a Change Order pursuant to Section 7.5. If Owner, Architect and Contractor cannot reach agreement regarding the adjustment in Contract Sum or the adjustment in Contract Time resulting from a Change in the Work, then Owner and Architect will issue a Construction Change Directive pursuant to Section 7.6. Field Changes require the agreement of Architect and Contractor only.

### **7.5 CHANGE ORDERS**

Contractor's signature upon a Change Order is Contractor's acknowledgment that it is not entitled to any additional adjustment in the Contract Sum or the Contract Time or any other damages or compensation as a result of the Change in the Work other than that provided for in the Change Order, irrespective of whether a subsequent claim for additional compensation or time extensions relating to the Change in the Work is described as a change in the requirements of the Contract Documents, a delay, a disruption of the Work, an acceleration of the Work, an impact on the efficiency of performance of the Work, an equitable adjustment, or other claim and irrespective of whether the impact of the Change in the Work is considered singly or in conjunction with the impact of other Changes in the Work.

### **7.6 CONSTRUCTION CHANGE DIRECTIVES**

- A. Contractor will promptly comply with all Construction Change Directives.

- B. Pending final resolution of any adjustment in the Contract Sum or Contract Time relating to a Construction Change Directive, the amounts proposed by Owner in the Construction Change Directive may be included in Contractor's payment requests once the work relating thereto is completed.
- C. If after the work described in the Construction Change Directive is completed, Owner, Architect, and Contractor reach agreement on adjustments in the Contract Sum, Contract Time, or both, such agreement will be reflected in an appropriate Change Order.
- D. If the parties do not reach agreement regarding an adjustment to the Contract Sum, Contract Time, or both relating to the Construction Change Directive within thirty (30) days of the completion of the work described therein, then Contractor may submit its claim for an adjustment pursuant to Section 13 within thirty (30) days of the completion of such work. Contractor agrees that if it fails to submit its claim for resolution pursuant to Section 13 within thirty (30) days of completion of the work described in the Construction Change Directive, then it will not be entitled to an adjustment in Contract Sum or Contract Time resulting from such work except as set forth in the Construction Change Directive and waives any claim therefor.

## **7.7 FIELD CHANGES**

Architect and Contractor will sign a Field Change order listing the Change In The Work and the Contract Sum including markups before Contractor proceeds with the Field Change.

## **7.8 WAIVER OF CLAIMS**

Except as set forth in Section 7, Contractor will not be entitled to any adjustment in the Contract Sum or the Contract Time or for any damages of any kind whatsoever resulting from an instruction from Owner or Architect, any event or circumstance, or any act or omission of Owner or Architect and Contractor expressly waives any and all claims therefor.

# **SECTION 8 - TIME**

## **8.1 TIME IS OF THE ESSENCE**

All time limits stated in the Contract Documents are of the essence. By executing the Agreement, Contractor confirms that the Contract Time is a reasonable period for performing the Work. Contractor will proceed expeditiously with adequate resources and will achieve Substantial Completion within the Contract Time.

## **8.2 COMMENCEMENT OF THE WORK**

Contractor will not commence work on the Project site until the date set forth in the Written Notice to proceed. However, Contractor may enter into subcontracts and secure material for the Project after receipt of the Agreement with Owner's authorized signature. Owner will issue the Written Notice to proceed within forty-five (45) days after Owner receives acceptable bonds and evidence of insurance pursuant to Section 11 unless Owner earlier terminates the Agreement pursuant to Section 14.

## **8.3 DELAY IN COMPLETION OF THE WORK**

- A. For each day after the expiration of the Contract Time that Contractor has not achieved Substantial Completion, Contractor will pay Owner the amount set forth in the Supplementary Conditions as liquidated damages for Owner's loss of use of the Project and the added administrative expense to Owner to administer the Project during the period of delay. In addition, Contractor will reimburse Owner for any additional Architect's fees, attorneys' fees, expert fees, consultant fees, copy costs, and other expenses incurred by Owner as a result of the delay. Owner may deduct any liquidated damages or reimbursable expenses from any money due or to become due to Contractor. If the amount of liquidated damages and reimbursable expenses exceeds any amounts due to Contractor, Contractor will pay the difference to Owner within ten (10) days after receipt of a written request from Owner for payment.
- B. At the time Architect certifies that Contractor has achieved Substantial Completion, Architect will identify the remaining items to be completed for final completion of the Work and will establish with Contractor a reasonable time for completion of those items. Architect will set forth the items to be completed and the time established for their completion in a Certificate of Substantial Completion. For each day that Contractor exceeds the time allowed for completion of the items set forth in the Certificate of Substantial Completion, Contractor will pay to Owner as liquidated damages for additional administrative expenses the amount set forth in the Supplementary Conditions. In addition, Contractor will reimburse Owner for any additional Architect's fees, attorneys' fees, expert fees, consultant fees, copy costs, and other expenses incurred by Owner as a result of the delay in completing such items.

# **SECTION 9 - PAYMENTS AND COMPLETION**

## **9.1 SCHEDULE OF VALUES**

Contractor will submit to Architect a schedule of values which allocates the Contract Sum to various portions of the Work. The schedule of values will be supported by such data to substantiate its accuracy as required by Architect. This schedule, when accepted by Owner and Architect, will be used as a basis for reviewing Contractor's payment requests.

## **9.2 PAYMENT REQUESTS**

- A. Not more than once a month, Contractor will submit a payment request to Architect for Work completed, materials stored on the site, and for materials stored offsite as of the date of the payment request. The amount of the payment request will be based upon the schedule of values and will be equal to the value of the Work completed:
  1. Less retention amounts specified in Supplementary Conditions;

2. Less all prior amounts paid by Owner to Contractor as part of the Contract Sum; and
3. Less allowable offsets.

The payment request may include Changes in the Work that have been performed by Contractor and authorized by Owner and/or Architect pursuant to Section 7. If a payment request includes materials stored offsite, Contractor will include with the payment request a list of the materials, the location where they are stored and the written request of Contractor and its performance bond surety that payment be made for such materials.

- B. Contractor warrants and guarantees that upon the receipt of payment for materials and equipment, whether incorporated in the Project or not, title to such materials and equipment will pass to Owner free and clear of all liens, claims, security interests, or encumbrances. Notwithstanding this payment and passage of title, Contractor will remain responsible for all such materials and equipment until actual delivery to the project site, incorporation into the Work, and final acceptance by Owner. Contractor further warrants that no material or equipment covered by a payment request is subject to an agreement under which an interest therein or an encumbrance thereon is retained by the seller or any other person or entity.

### 9.3 PAYMENT REQUEST CERTIFICATION

- A. Architect will, within seven (7) days after receipt of Contractor's payment request, forward to Owner the payment request certified for such amount as Architect determines is properly due. If Architect certifies less than the full amount of the payment request, Architect will notify Contractor and Owner of Architect's reasons for withholding certification of the full amount requested.
- B. The certification of the payment request will constitute a representation by Architect to Owner based upon Architect's observations at the site and the data comprising the payment request, that the Work has progressed to the point indicated and that, to the best of Architect's knowledge, information, and belief, 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 minor deviations from the Contract Documents correctable prior to completion, and to specific qualifications expressed by Architect. However, the certification of the payment request will not constitute a representation that Architect has:
  1. Conducted exhaustive or continuous on-site inspections to check the quantity or quality of the Work;
  2. Reviewed construction means, methods, techniques, sequences, or procedures;
  3. Reviewed copies of requisitions received from Subcontractors or other data requested by Owner to substantiate Contractor's right to payment; or
  4. Made examination to ascertain how or for what purpose Contractor has used money previously paid on account of the Contract Sum.
- C. In taking action on Contractor's payment request, Owner will be entitled to rely on the accuracy and completeness of the information furnished by Contractor.

### 9.4 DECISIONS TO WITHHOLD CERTIFICATION AND PAYMENT

- A. Architect may withhold certification of a payment request in whole or in part to the extent reasonably necessary to protect Owner if, in the opinion of Architect, the representations to Owner required by Section 9.3, Paragraph B cannot be accurately made. If Architect is unable to certify payment in the amount of the payment request, Architect will notify Contractor and Owner as provided in Section 9.3, Paragraph A. If Contractor and Architect cannot agree on a revised amount, Architect will promptly certify a payment request for the amount for which Architect is able to make such representations to Owner. Architect may also decide not to certify payment or, because of subsequently discovered evidence or subsequent observations, may nullify the whole or a part of a payment request previously certified, to such extent as may be necessary in Architect's opinion to protect Owner from loss because of:
  1. Defective work not remedied;
  2. Third-party claims filed or reasonable evidence indicating probable filing of such claims;
  3. Failure of Contractor to make payments properly to Subcontractors for labor, materials, equipment, construction or services;
  4. Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
  5. Damage to Owner or another contractor for which Contractor is responsible;
  6. Reasonable evidence that the Work will not be completed within the Contract Time and that the unpaid balance will not be adequate to cover the cost of completing the Work and damages for the anticipated delay; or
  7. Contractor's persistent failure to carry out the Work in accordance with the Contract Documents.
- B. Owner reserves the right to withhold payments to Contractor, subsequent to Architect's certification of any payment request, in order to protect Owner from loss due to any condition described in Section 9.4, Paragraph A, Subparagraphs 1 through 7. Upon satisfactory resolution of any such conditions, payments so withheld will be made.

### 9.5 PROGRESS PAYMENTS

- A. Owner will pay Contractor progress payments within the parameters of Section 9.2 within fifteen (15) days after Owner receives the certified payment request from Architect.
- B. Owner will make payments to Contractor by either placing the payments in the mail addressed to Contractor or by electronic transfer at Owner's discretion.
- C. Upon receipt of any payment from Owner, Contractor will pay to each Subcontractor the amount paid to Contractor on account of such Subcontractor's portion of the Work.
- D. Contractor will maintain a copy of each payment request at the Project site for review by the Subcontractors.



- E. No payment made under the Contract Documents, either in whole or in part, will be construed to be an acceptance of defective or improper materials or workmanship.
- F. In addition and notwithstanding the foregoing, Owner will also withhold and retain 10% of payments made to Contractor.
- G. Owner will pay any unpaid retention less any amounts withheld pursuant to Section 9.4 within forty-five (45) days after Contractor achieves Substantial Completion, submits its payment request for retained funds, delivers to the Architect Owner's form entitled "Contractor's Substantial Completion Affidavit and Consent of Surety" fully executed by Contractor and its surety, obtains Waiver and Release documents executed by all subcontractors and suppliers having claim against the retained funds, and Owner receives a certificate of occupancy.

## **9.6 FINAL PAYMENT**

- A. Owner will make full and final payment of the Contract Sum within thirty (30) days of the completion of all of the following requirements:
  - 1. Contractor has submitted its final payment request;
  - 2. Architect has declared to Owner in writing that the Work is complete;
  - 3. Contractor has obtained waiver and release upon final payment documents executed by all of the subcontractors performing work and/or providing materials covered by the Contractor's final payment request; and
  - 4. Contractor has collected and provided to Owner all manufacturers' and other guaranties and warranties, properly signed and endorsed to Owner, that are required by the Contract Documents that extend for a period beyond one year after substantial completion. (Delivery of such guaranties and warranties will not relieve Contractor for any obligation assumed under any other provision of the Contract Documents.).
- B. Acceptance of final payment by Contractor or any Subcontractor will constitute a waiver of claims by the payee except for those claims previously made in writing pursuant to Section 7 and identified by Contractor in its affidavit as still pending.
- C. If the aggregate of previous payments made by Owner exceeds the amount due Contractor, Contractor will reimburse the difference to Owner.

## **SECTION 10 - PROTECTION OF PERSONS AND PROPERTY**

### **10.1 SAFETY PRECAUTIONS AND PROGRAMS**

Contractor will be responsible to Owner for initiating and supervising all safety programs in connection with the performance of the Work.

### **10.2 SAFETY OF PERSONS AND PROPERTY**

- A. Contractor will take reasonable precautions to prevent damage, injury, or loss to:
  - 1. All persons on the site;
  - 2. The Work and materials and equipment to be incorporated into the Work; and
  - 3. Other property at the site or adjacent to it.
- B. Contractor will give notices and comply with applicable laws, ordinances, rules, regulations, and other lawful requirements of public authorities bearing on the safety or protection of persons and property. No work will be performed that may pose an undue safety hazard to Contractor, Contractor's employees, or any other person.
- C. Contractor will designate a responsible member of its organization at the site whose duty will be the prevention of accidents. This person will be Contractor's onsite representative unless otherwise designated in writing by Contractor to Owner and Architect.

### **10.3 EMERGENCIES**

In case of an emergency endangering life or threatening the safety of any person or property, Contractor may, without waiting for specific authorization from Architect or Owner, act at its own discretion to safeguard persons or property. Contractor will immediately notify Architect of such emergency action and make a full written report to Architect within five (5) days after the event.

### **10.4 HAZARDOUS MATERIALS**

In the event the Contractor encounters on the site material reasonably believed to be hazardous materials which have not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner and Architect in writing. The Work in the affected area shall be resumed in the absence of hazardous materials, or when it has been rendered harmless, by written agreement of the Owner and Contractor.

## **SECTION 11 - INSURANCE AND BONDS**

### **11.1 CONTRACTOR'S LIABILITY INSURANCE**

- A. Contractor will obtain the following insurance and provide evidence thereof as described below prior to commencement of the Work or within ten (10) days after signing the Agreement, whichever is earlier:
  - 1. Workers Compensation Insurance.
  - 2. Employers Liability Insurance with minimum limits of the greater of \$500,000 E.L. each accident, \$500,000 E. L. disease- each employee, \$500,000 E.L. disease-policy limit or as required by the law of the state in which the Project is located.

3. Commercial General Liability Insurance – ISO Form CG 00 01 (12/07) or equivalent Occurrence policy which will provide primary coverage to the additional insureds (the Owner and the Architect) in the event of any Occurrence, Claim, or Suit with:
    - a. Limits of the greater of: Contractor's actual coverage amounts or the following:
      - 1) \$2,000,000 General Aggregate;
      - 2) \$2,000,000 Products - Comp/Ops Aggregate;
      - 3) \$1,000,000 Personal and Advertising Liability;
      - 4) \$1,000,000 Each Occurrence;
      - 5) \$50,000 Fire Damage to Rented Premises (Each Occurrence).
    - b. Endorsements attached to the General Liability policy including the following or their equivalent:
      - 1) ISO Form CG 25 03 (05/09), Amendment of Limits of Insurance (Designated Project or Premises), describing the Agreement and specifying limits as shown above.
      - 2) ISO Form CG 20 10 (07/04), Additional Insured -- Owners, Lessees, Or Contractors (Form B), naming Owner and Architect as additional insureds.
  4. Automobile Liability Insurance, with:
    - a. Combined Single Limit each accident in the amount of \$1,000,000 or Contractor's actual coverage, whichever is greater; and
    - b. Coverage applying to "Any Auto."
- B. Contractor will provide evidence of such insurance to Owner as follows:
1. Deliver to Owner a Certificate of Liability Insurance, on ACORD 25 (2010/05) Form, or equivalent:
    - a. Listing Owner as the Certificate Holder and Additional Insured on the general liability and any excess liability policies;
    - b. Attaching the ISO or equivalent endorsements set forth above to the Certificate of Liability Insurance;
    - c. Identifying the Project;
    - d. Listing the insurance companies providing coverage (All companies listed must be rated in A.M. Best Company Key Rating Guide-Property-Casualty and each company must have a rating of B+ Class VII or higher. Companies which are not rated are not acceptable); and
    - e. Bearing the name, address and telephone number of the producer and signed by an authorized representative of the producer. The signature may be original, stamped, or electronic.
- C. Contractor will maintain, from commencement of the Work, Insurance coverage required in Section 11.1 as follows:
1. Commercial General Liability Insurance through expiration of warranty period specified in Section 12.2, Paragraph B. including completion of any warranty repairs; and
  2. All other insurance through Final Payment.
- D. Owner reserves the right to reject any insurance company, policy, endorsement, or certificate of insurance with or without cause.
- E. Owner may, in writing and at its sole discretion, modify the insurance requirements.
- F. The cost of insurance as required above will be the obligation of Contractor. Contractor will be responsible for payment of all deductible amounts under all insurance.
- G. Owner will provide builders risk insurance for the cost of the Project. The policy will be written on an all risk basis with coverage for perils of wind, flood, earthquake, and terrorism, with exclusions standard for the insurance industry. The policy will be subject to a \$5,000 deductible per occurrence which will be the responsibility of Contractor and will not be a reimbursable expense. Owner will provide a copy of the terms and conditions of the builders risk policy to Contractor upon Contractor's request. Contractor will comply with terms, conditions, and deadlines of the builders risk policy. The terms, conditions, and deadlines of the builders risk policy shall govern coverage. In addition, when there is a loss which may be covered by the builders risk insurance policy, Contractor will comply with the following:
1. Contractor will report the loss immediately to builders risk commercial insurer by calling 1-866-537-7475 and shall make such further written submissions as required and otherwise comply with all requirements of the builders risk policy.
  2. Contractor will report the loss immediately to the Owner.
  3. Contractor will immediately notify its general liability insurance carrier of the loss.
  4. Contractor will take all necessary and appropriate actions to protect the property and individuals from further loss, harm, and injury. In the event there are damages resulting from fire or water, restoration shall be performed only by a certified restoration contractor.
  5. To the extent possible, Contractor will preserve and not disturb the evidence of the loss until after the builders risk commercial insurer and all interested parties and their insurance carriers have had the opportunity to view and investigate the site and loss.
  6. Contractor will cooperate with Owner and the builders risk commercial insurer in the investigation, documentation, and settlement of loss claims, including without limitation promptly responding to all requests for information and documentation from the builders risk commercial insurer and/or Owner.

## 11.2 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

- A. Prior to commencement of the Work or within ten (10) days after signing the Agreement, whichever is earlier, Contractor will furnish to Owner a performance bond and a labor and material payment bond each in an amount equal to one hundred percent (100%) of the Contract Sum as security for all obligations arising under the Contract Documents. Such bonds will:
1. Be written on Form AIA Document A312 (1984).
  2. Be issued by a surety company or companies licensed in the state in which the Project is located and holding valid certificates of authority under Sections 9304 to 9308, Title 31, of the United States Code as acceptable sureties or reinsurance companies on federal bonds.
  3. Have a penal sum obligation not exceeding the authorization shown in the current revision of Circular #570 as issued by the United States Treasury Department, i.e. "Treasury List".

4. Be accompanied by a certified copy of the power of attorney stating the authority of the attorney-in-fact executing the bonds on behalf of the surety.
- B. Owner reserves the right to reject any surety company, performance bond, or labor and material payment bond with or without cause.
- C. The cost of the bonds as required above will be the obligation of Contractor.

## **SECTION 12 - UNCOVERING AND CORRECTION OF WORK**

### **12.1 UNCOVERING OF WORK**

Contractor will notify Architect at least twenty-four (24) hours in advance of performing work that would cover up work or otherwise make it difficult to perform inspections required by the Specifications or by applicable governing authorities. Should any such work be covered without proper notification having been given to Architect, Contractor will uncover that work for inspection at its own expense.

### **12.2 CORRECTION OF WORK**

- A. Contractor will promptly correct any portion of the Work that is rejected by Architect or which fails to conform to the requirements of the Contract Documents, whether observed before or after Substantial Completion and whether or not fabricated, installed, or completed. Contractor will bear the cost of correcting such rejected Work, including additional testing and inspection costs, compensation for Architect's services, and any other expenses made necessary thereby.
- B. Contractor will remedy any defects due to faulty materials, equipment, or workmanship which appear within a period of one (1) year from the date of Substantial Completion or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by the Contract Documents. Contractor will pay all costs of correcting faulty work, including without limitation additional Architect's fees, attorneys' fees, expert fees, consultant fees, copy costs, and other expenses when incurred.
- C. Nothing in the Contract Documents will be construed to establish a period of limitation within which Owner may enforce the obligation of Contractor to comply with the Contract Documents. The one-year period specified above has no relationship to the time within which compliance with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish Contractor's liability with respect to Contractor's obligations.

### **12.3 ACCEPTANCE OF NONCONFORMING WORK**

- A. If Owner prefers to accept any portion of the Work not in conformance with the Contract Documents, Owner may do so instead of requiring removal and correction of the nonconforming Work. In that event, the Contract Sum will be reduced by an amount agreed upon by the parties that reflects the difference in value to Owner between the Work as specified and the nonconforming Work. Such adjustment may consider increased maintenance costs, early replacement costs, increased inefficiency of use, and the like and will be effective whether or not final payment has been made. Such adjustment will be reflected in a Change Order pursuant to Section 7.5.
- B. Temporary or trial usage by Owner or Architect of mechanical devices, machinery, apparatus, equipment, or other work or materials supplied under the Contract Documents prior to written acceptance by Architect, will not constitute Owner's acceptance.

## **SECTION 13 - RESOLUTION OF DISPUTES**

### **13.1 SUBMITTAL OF DISPUTE**

In the event there is any dispute arising under this Agreement which cannot be resolved by agreement between the parties, either party may submit the dispute with all documentation upon which it relies to the Director of Architecture, Engineering, and Construction, Physical Facilities Department, 50 East North Temple, Salt Lake City, Utah 84150, who will convene a dispute resolution conference within thirty (30) days. The dispute resolution conference will constitute settlement negotiations and any settlement proposal made pursuant to the conference will not be admissible as evidence of liability. In the event that the parties do not resolve their dispute pursuant to the dispute resolution conference, either party may commence legal action to resolve the dispute. Any such action must be commenced within six (6) months from the first day of the dispute resolution conference or be time barred. Submission of the dispute to the Director as outlined above is a condition precedent to the right to commence legal action to resolve any dispute. In the event that either party commences legal action to adjudicate any dispute without first submitting the dispute to the Director, the other party will be entitled to obtain an order dismissing the litigation without prejudice and awarding such other party any costs and attorneys fees incurred by that party in obtaining the dismissal, including without limitation copy costs, and expert and consultant fees and expenses.

### **13.2 CONTRACTOR TO PROCEED WITH DILIGENCE**

Pending final resolution of a dispute hereunder, Contractor will proceed diligently with the performance of its obligations under this Agreement.

## **SECTION 14 - TERMINATION**

### **14.1 TERMINATION BY CONTRACTOR**

In the event Owner materially breaches any term of the Contract Documents, Contractor will promptly give Written Notice of the breach to Owner. If Owner fails to cure the breach within ten (10) days of the Written Notice, Contractor may terminate the

Agreement by giving Written Notice to Owner and recover from Owner the percentage of the Contract Sum represented by the Work completed on the Project site as of the date of termination together with any out of pocket loss Contractor has sustained with respect to materials and equipment as a result of the termination prior to completion of the Work, less any offsets. Contractor will not be entitled to unearned profits or any other compensation or damages as a result of the termination and hereby waives any claim therefor. Contractor will provide to Owner all warranty, as built, inspection, and other close out documents as well as materials that Contractor has in its possession or control at the time of termination. Without limitation, Contractor's indemnities and obligations under section 3.14 as well as all warranties in the specifications relative to Work provided through the date of termination survive a termination hereunder.

#### **14.2 TERMINATION BY OWNER FOR CAUSE**

Should Contractor fail to provide Owner with the bonds and certificates of insurance required by Section 11 within the time specified therein, make a general assignment for the benefit of its creditors, fail to apply enough properly skilled workmen or specified materials to properly prosecute the Work in accordance with Contractor's schedule, or otherwise materially breach any provision of the Contract Documents, then Owner may, without any prejudice to any other right or remedy, give Contractor Written Notice thereof. If Contractor fails to cure its default within ten (10) days, Owner may terminate the Agreement by giving Written Notice to Contractor. In such case, Owner may, in Owner's sole discretion, take legal assignment of subcontracts and other contractual rights of Contractor and/or take possession of the premises and all materials, tools, equipment, and appliances thereon, and finish the Work by whatever method Owner deems expedient. Contractor will not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Sum exceeds the expense of finishing the Work, including compensation for additional administrative, architectural, consultant, and legal services (including without limitation attorneys fees, expert fees, copy costs, and other expenses), such excess will be paid to Contractor. If such expense exceeds the unpaid balance, Contractor will pay the difference to Owner. Contractor will provide to Owner all warranty, as built, inspection, and other close out documents as well as materials that Contractor has in its possession or control at the time of termination. Without limitation, Contractor's indemnities and obligations under section 3.14 as well as all warranties in the specifications relative to Work provided through the date of termination survive a termination hereunder.

#### **14.3 TERMINATION BY OWNER FOR CONVENIENCE**

Notwithstanding any other provision contained in the Contract Documents, Owner may, without cause and in its absolute discretion, terminate the Agreement at any time. In the event of such termination, Contractor will be entitled to recover from Owner the percentage of the Contract Sum equal to the percentage of the Work which Architect determines has been completed on the Project site as of the date of termination together with any out of pocket loss Contractor has sustained with respect to materials and equipment as a result of the termination prior to completion of the Work, less any offsets. Contractor will not be entitled to unearned profits or any other compensation as a result of the termination and hereby waives any claim therefor. Contractor will provide to Owner all warranty, as built, inspection, and other close out documents as well as materials that Contractor has in its possession or control at the time of termination. Owner may, in Owner's sole discretion, take legal assignment of subcontracts and other contractual rights of Contractor. Without limitation, Contractor's indemnities and obligations under section 3.14 as well as all warranties in the specifications relative to Work provided through the date of termination survive a termination hereunder.

### **SECTION 15 - MISCELLANEOUS PROVISIONS**

#### **15.1 GOVERNING LAW**

The parties acknowledge that the Contract Documents have substantial connections to the State of Utah. The Contract Documents will be deemed to have been made, executed, and delivered in Salt Lake City, Utah. To the maximum extent permitted by law, (i) the Contract Documents and all matters related to their creation and performance will be governed by and enforced in accordance with the laws of the State of Utah, excluding conflicts of law rules; and (ii) all disputes arising from or related to the Contract Documents will be decided only in a state or federal court located in Salt Lake City, Utah and not in any other court or state. Toward that end, the parties hereby consent to the jurisdiction of the state and federal courts located in Salt Lake City, Utah and waive any other venue to which they might be entitled by virtue of domicile, habitual residence, place of business, or otherwise.

#### **15.2 NO WAIVER**

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

#### **15.3 RULE OF CONSTRUCTION**

Owner and Contractor agree that the Contract Documents will be deemed to have been drafted by both Owner and Contractor and will not be construed against either Owner or Contractor because of authorship.

#### **15.4 ENFORCEMENT**

In the event either party commences legal action to enforce or rescind any term of the Contract Documents, the prevailing party will be entitled to recover its attorneys fees and costs, including without limitation all copy costs and expert and consultant fees and expenses, incurred in that action and on all appeals, from the other party.

#### **15.5 TESTS AND INSPECTIONS**

- A. Owner and Architect have the right to have tests made when they deem it necessary. Tests conducted by Owner or Architect will be paid for by Owner. Should a test reveal a failure of the Work to meet Contract Document requirements, the cost of the test as well as subsequent tests related to the failure necessary to determine compliance with the Contract Documents will be paid for by Owner, with the cost thereof deducted from the Contract Sum by Modification.

- B. Tests will be made in accordance with recognized standards by a competent, independent testing laboratory. Materials found defective or not in conformity with Contract Document requirements will be promptly replaced or repaired at the expense of Contractor.
- C. Owner and Architect have the right to obtain samples of materials to be used in the Work and to test samples for determining whether they meet Contract Document requirements. Samples required for testing will be furnished by Contractor and selected as directed by Architect. Samples may be required from the sample's source, point of manufacture, point of delivery, or point of installation at Architect's discretion. Samples not required as a Submittal in the Specifications will be paid for by Owner. Should tests reveal a failure of the Sample to meet the Contract Document requirements, Contractor will provide other Samples that comply with the requirements of the Contract Documents.

END OF DOCUMENT



BLANK PAGE





# **SUPPLEMENTARY CONDITIONS**

## **FIXED SUM (U.S.)**

---

### **ITEM 1 - GENERAL**

1. Conditions of the Contract apply to each Division of the Specifications.
2. Provisions contained in Division 01 apply to all Divisions of the Specifications.

### **ITEM 2 - LIQUIDATED DAMAGE AMOUNTS:**

1. The amount of liquidated damages to the benefit of the Contractor for delays under General Conditions Section 7.3, Paragraph B is \$\_\_\_\_\_ per day.
2. The amount of liquidated damages to the benefit of the Owner for delays in Substantial Completion of the Work under General Conditions Section 8.3, Paragraph A is \$\_\_\_\_\_ per day.
3. The amount of liquidated damages to the benefit of the Owner for delays in completing work itemized on the Substantial Completion Certificate under General Conditions Section 8.3, Paragraph B is \$\_\_\_\_\_ per day.

### **ITEM 3 - NOT USED**

### **ITEM 4 - NOT USED**

### **ITEM 5 - STATE SPECIFIC SUPPLEMENTARY CONDITIONS**

#### **Missouri**

#### **PAYMENT OF RETAINED FUNDS IN MISSOURI:**

*Replace section 9.5 G of the General Conditions with the following:*

- G. Owner will pay any unpaid retention less any amounts withheld pursuant to Section 9.4 within thirty (30) days after Contractor achieves Substantial Completion, submits its payment request for retained funds, delivers to the Architect Owner's form entitled "Contractor's Substantial Completion Affidavit and Consent of Surety" fully executed by Contractor and its surety, obtains Waiver and Release documents executed by all subcontractors and suppliers having claim against the retained funds, and Owner receives a certificate of occupancy.

#### **MISSOURI STATE SALES TAX:**

*Add the following to the General Conditions:*

1. The Church of Jesus Christ of Latter-day Saints is a Religious Organization exempt from sales tax in accordance with Section 144.062 RSMO as modified by the 1994 Missouri General Assembly.
2. The Owner will furnish a 'Missouri Project Exemption Certificate' and a MO Tax Exemption Letter' to the Contractor.
3. The Owner's tax exempt number is 12473863.

END OF DOCUMENT

BLANK PAGE

**SECTION 01 1100****SUMMARY OF WORK****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements Summary of Work requirements.

**1.2 WORK COVERED BY CONTRACT DOCUMENTS**

- A. Provisions contained in Division 01 apply to Sections of Divisions 02 through 49 of Specifications. Instructions contained in Specifications are directed to Contractor. Unless specifically provided otherwise, obligations set forth in Contract Documents are obligations of Contractor.
- B. Contractor shall furnish total labor, materials, equipment, and services necessary to perform The Work in accordance with Contract Documents.

**1.3 WORK BY OWNER**

- A. Owner will furnish and install some portions of The Work with its own forces. Contractor will be provided with schedule of when these items are to be performed.
1. General:
    - a. Complete work necessary to accommodate work to be performed by Owner before scheduled date for performance of such work. Contractor will be back charged for actual expenses incurred by Owner for failure to timely complete such work.
    - b. Store and protect completed work provided by Owner until date of Substantial Completion.
  2. Work furnished and installed by Owner include, but are not limited to, following:
    - a. High Security Cylinders and Cores:
    - b. Selected Commercial Toilet Accessories.
    - c. Carpet and Carpet Base.

**PART 2 - PRODUCTS Not Used****PART 3 - EXECUTION Not Used****END OF SECTION**

**BLANK PAGE**

**SECTION 01 1200****MULTIPLE CONTRACT SUMMARY****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Multiple Contracts.

**1.2 SUMMARY OF CONTRACTS**

- A. Owner has issued or will issue separate contracts for operations scheduled to be completed between Notice to Proceed and Substantial Completion.
1. General:
    - a. Schedule performance of work covered by such separate contracts in Contractor's Construction Schedule so as to avoid delays in Substantial Completion. Give written notice to such contractors and to Owner of any revisions to scheduled delivery and work dates at least 90 days in advance.
    - b. Complete work necessary to accommodate items provided under such separate contracts before scheduled date for performance of such work. Contractor will be back charged for actual expenses incurred by Owner for failure to timely complete such work including, but not limited to, cost of crews during downtime or for call backs and costs to correct substrate deficiencies.
    - c. Store and protect completed work provided under separate contracts until date of Substantial Completion.
  2. Sheet Carpeting. See Section 09 6816.
  3. Testing and Inspection. See Section 01 4523 "Testing and Inspection" for testing and inspection, and testing laboratory services for materials, products, and construction methods:
    - a. Aggregate Base. See Section 31 1123.
    - b. Air System Testing, Adjusting, and Balance. See Section 01 4546.
    - c. Concrete. See Section 03 3111.
    - d. Concrete Moisture Vapor Emission and Alkalinity level. See Section 09 0503, Section 09 6466, Section 09 6519, Section 09 6813, and Section 09 6816.
    - e. Drill-In Mechanical Anchors / Adhesive Anchors / Screw Anchors. See Section 03 1511 and Section 04 0519.
    - f. Fill / Engineering Fill. See Section 31 2323.
    - g. Prefabricated Metal Plate Wood Trusses. See Section 06 1753.
    - h. Reinforcing Steel. See Section 03 2100.
  4. Tile Carpeting. See Section 09 6813.
- B. Owner has issued or will issue separate contracts for operations normally scheduled to follow Substantial Completion.
1. General:
    - a. Give written notice to such contractors and to Owner of any revisions of scheduled date of Substantial Completion at least 90 days in advance. Contractor will be back charged for actual expenses incurred by Owner for failure to accurately report date of Substantial Completion.
    - b. Complete work necessary to accommodate items provided under such separate contracts before Substantial Completion. Contractor will be back charged for actual expenses incurred by Owner for failure to complete such work before Substantial Completion.
  2. Furnishings.

**PART 2 - PRODUCTS Not Used**

**PART 3 - EXECUTION Not Used**

**END OF SECTION**

**SECTION 01 1400****WORK RESTRICTIONS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Work Restrictions.

**1.2 PROJECT CONDITIONS**

- A. During construction period, Contractor will have use of premises for construction operations. Contractor will ensure that Contractor, its employees, subcontractors, and their employees comply with following requirements:
1. Confine operations to areas within Contract limits shown on Drawings. Do not disturb portions of site beyond Contract limits.
  2. Do not allow alcoholic beverages, illegal drugs, or persons under their influence on Project site.
  3. Do not allow use of tobacco in any form on Project Site.
  4. Do not allow pornographic or other indecent materials on site.
  5. Do not allow work on Project site on Sundays except for emergency work.
  6. Refrain from using profanity or being discourteous or uncivil to others on Project Site or while performing The Work.
  7. Wear shirts with sleeves, wear shoes, and refrain from wearing immodest, offensive, or obnoxious clothing, while on Project Site.
  8. Do not allow playing of obnoxious and loud music on Project Site. Do not allow playing of any music within existing facilities.
  9. Do not build fires on Project Site.
  10. Do not allow weapons on Project Site, except those carried by law enforcement officers or other uniformed security personnel who have been retained by Owner or Contractor to provide security services.
- B. Existing Facilities:
1. Reasonably accommodate use of existing facilities by Owner.
- C. Do not load or permit any part of the structure to be loaded with a weight that will endanger its safety. Questions of structural loading as part of construction means and methods shall be addressed by a licensed structural engineer engaged by Contractor, subject to the review by Architect.

**PART 2 - PRODUCTS Not Used****PART 3 - EXECUTION Not Used****END OF SECTION**

**BLANK PAGE**



**SECTION 01 2200****UNIT PRICES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
  - 1. Administrative and procedural requirements for Unit Prices.

**1.2 UNIT PRICE MEASUREMENT**

- A. Unit prices listed by Contractor on Bid Form will be used to price changes to Contract Sum. Such unit prices include all labor, material, equipment, overhead, profit, and taxes.
- B. Unit Price Measurement:
  - 1. Keep daily log of each Unit Price item which includes:
    - a. A description of Unit Price Item.
    - b. Quantity.
    - c. Date.
    - d. Time of Day with place for AM and PM.
    - e. Signature of person preparing log.
  - 2. Submit copy of log to Architect with daily construction reports.

**1.3 UNIT PRICE PAYMENT**

- A. Contract Sum will be adjusted by change order to reflect variance, if any, of actual quantities from amount included in base bid for each Unit Price.

**PART 2 - PRODUCTS Not Used****END OF SECTION**

**BLANK PAGE**

**SECTION 01 2600****CONTRACT MODIFICATION PROCEDURES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
  - 1. Administrative and procedural requirements for handling and processing Contract Modifications.

**1.2 REQUESTS FOR INTERPRETATIONS (RFI's)**

- A. This document will be issued by the General Contractor to the Architect when there are questions regarding the Scope of Work or clarity of the work described in the Contract Documents.

**1.3 SUPPLEMENTAL INSTRUCTIONS**

- A. This document is issued by the Architect and is intended to clarify the Scope of Work. Directions provided in this document do not affect Contract Time or Sum.

**1.4 AMENDMENTS**

- A. Also called Addenda, this document will be issued by the Architect and distributed to all General Contractors invited to bid, prior to Bid opening.

**1.5 CONSTRUCTION CHANGE DIRECTIVES**

- A. This document will be issued by the Architect and provides a time and materials, not to exceed number for a proposed change in the work. This document is used to expedite a change without holding up any work.

**1.6 CHANGE ORDER REQUESTS**

- A. This document is issued by the Architect and proposes changes to the Scope of Work that will add to the Contract Sum or time. The General Contractor will reply to this document with a Change Order Request or Proposal.

**1.7 CHANGE ORDER PROPOSALS**

- A. This document will be issued by the General Contractor to the Architect for a proposed change in Contract sum or time.

**1.8 CHANGE ORDERS**

- A. This document will be issued by the Architect modifying the contract time and/or sum. The information required to prepare this document comes from Construction Change Directives, Change Order Requests or Proposals, and Daily Reports indicating weather days.

**PART 2 - PRODUCTS Not Used**

**PART 3 - EXECUTION Not Used**

**END OF SECTION**

**SECTION 01 2900****PAYMENT PROCEDURES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements to prepare and process Applications for Payments.

**1.2 PAYMENT REQUESTS**

- A. Use Payment Request forms provided by Owner.
- B. Each Payment Request will be consistent with previous requests and payments certified by Architect and paid for by Owner.
- C. Request Preparation:
1. Complete every entry on Payment Request form.
  2. Entries will match data on approved schedule of values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.
  3. Submit signed Payment Request to Architect with current Construction Schedule.
- D. Provide following submittals before or with submittal of Initial Payment Request:
1. List of Subcontractors.
  2. Initial progress report.
  3. Contractor's Construction Schedule.
  4. Submittal Schedule.
- E. Provide Affidavit of Contractor and Consent of Surety with Payment Request following Substantial Completion.

**1.3 SCHEDULE OF VALUES**

- A. Submit schedule of values on Owner's standard form to Architect 20 days minimum before submission of Initial Payment Request as a necessary condition before payment will be processed. Coordinate preparation of schedule of values with preparation of Contractor's Construction Schedule. Correlate line items in Schedule of Values with other required administrative schedules and forms, including:
1. Contractor's Construction Schedule.
  2. Payment Request form.

**PART 2 - PRODUCTS Not Used****PART 3 - EXECUTION Not Used****END OF SECTION**

**BLANK PAGE**

**SECTION 01 3100****PROJECT MANAGEMENT AND COORDINATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
  - 1. Administrative and procedural requirements for Project Management and Coordination on Projects.

**1.2 PROJECT COORDINATION**

- A. Project designation for this Project is **LDS 516264516040101** Monett MO Stake.
- B. This Project designation will be included on documents generated for Project by Contractor and Subcontractors, or be present on a cover letter accompanying such documents.

**1.3 MULTIPLE CONTRACT COORDINATION**

- A. Contractor shall be responsible for accurately maintaining and reporting schedule of The Work from Notice to Proceed to date of Substantial Completion.
- B. Contractor shall be responsible for providing Temporary Facilities And Controls for those who perform work on Project from Notice to Proceed to date of Substantial Completion.
- C. Contractor shall be responsible for providing Construction Waste Management And Disposal services for those who perform work on Project from Notice to Proceed to date of Substantial Completion.
- D. Contractor shall be responsible for Final Cleaning for entire Project.

**1.4 PROJECT MEETINGS AND CONFERENCES**

- A. Preconstruction Conference:
  - 1. Attend preconstruction conference and organizational meeting scheduled by Architect at Project site or other convenient location.
  - 2. Be prepared to discuss items of significance that could affect progress, including such topics as:
    - a. Construction schedule.
    - b. Critical Work sequencing.
    - c. Current problems.
    - d. Designation of responsible personnel.
    - e. Distribution of Contract Documents.
    - f. Equipment deliveries and priorities.
    - g. General schedule of inspections by Architect and its consultants.
    - h. General inspection of tests.
    - i. Office, work, and storage areas.
    - j. Preparation of record documents and O & M manuals.
    - k. Procedures for processing interpretations and Modifications.
    - l. Procedures for processing Payment Requests.
    - m. Project cleanup.
    - n. Security.
    - o. Status of permits.
    - p. Submittal of Product Data, Shop Drawings, Samples, Quality Assurance / Control submittals.

- q. Use of the premises.
- r. Work restrictions.
- s. Working hours.
- 3. Architect will record minutes of meetings and distribute copies to Owner and Contractor within three (3) working days.

**B. Progress Meetings:**

- 1. Attend progress meetings at Project site at regularly scheduled intervals determined by Architect, at least once a month.
- 2. Progress meetings will be open to Owner, Architect, Subcontractors, and anyone invited by Owner, Architect, and Contractor.
- 3. Be prepared to discuss items of significance that could affect progress, including following:
  - a. Progress since last meeting.
  - b. Whether Contractor is on schedule.
  - c. Activities required to complete Project within Contract Time.
  - d. Labor and materials provided under separate contracts.
  - e. Off-site fabrication problems.
  - f. Access.
  - g. Site use.
  - h. Temporary facilities and services.
  - i. Hours of work.
  - j. Hazards and risks.
  - k. Project cleanup.
  - l. Quality and Work standards.
  - m. Status of pending modifications.
  - n. Documentation of information for Payment Requests.
  - o. Maintenance of Project records.
- 4. Architect will prepare minutes of progress meetings and distribute copies of minutes to Owner and Contractor within three (3) working days.

**C. Pre-Installation Conferences:**

- 1. Attend pre-installation conferences specified in Contract Document.
  - a. If possible, schedule these conferences on same day as regularly scheduled Progress Meetings. If this is not possible, coordinate scheduling with Architect.
  - b. Request input from attendees in preparing agenda.
- 2. Be prepared to discuss following items:
  - a. Requirements of Contract Documents.
  - b. Completed work necessary for installation of items or systems.
  - c. Conditions not in compliance with installation requirements.
  - d. Installation and inspection schedule.
  - e. Coordination between trades.
  - f. Space and access limitations.
  - g. Testing.
- 3. Architect will prepare meeting minutes and distribute minutes to Owner and Contractor within three (3) working days.

**PART 2 - PRODUCTS Not Used**

**PART 3 - EXECUTION Not Used**

**END OF SECTION**



**SECTION 01 3200****CONSTRUCTION PROGRESS DOCUMENTATION****PART 1 - GENERAL****1.1 SUMMARY****A. Section Includes But is Not Limited To:**

1. Administrative and procedural requirements for documenting the progress of construction during performance of the Work.

**1.2 SCHEDULING OF WORK****A. Bar Chart Schedule:**

1. Submit horizontal bar chart schedule before Preconstruction Conference. Provide separate time bar for each construction activity listed on Owner's payment request form. Within each time bar, show estimated completion percentage. Provide continuous vertical line to identify first working day of each week. Show each activity in chronological sequence. Show graphically sequences necessary for completion of related portions of The Work. As The Work progresses, place contrasting mark in each bar to indicate actual completion.
2. Provide copies of schedule for Architect and Owner and post copy in field office.
3. Revise schedule monthly. Send copy of revised schedule to Owner and Architect and post copy in field office.
4. Project Management Software Programs:
  - a. Any software project management program capable of Bar Chart Scheduling for projects of equal size and complexity is approved by Contractor and approved by Owner's Project Manager.

**B. Daily Construction Reports:**

1. Prepare daily reports of operations at Project including at least following information:
  - a. List of Subcontractors at site.
  - b. Approximate count of personnel at site by trade.
  - c. High and low temperatures, general weather conditions.
  - d. Major items of equipment on site.
  - e. Materials, equipment, or Owner-furnished items arriving at or leaving site.
  - f. Accidents and unusual events.
  - g. Site or structure damage by water, frost, wind, or other causes.
  - h. Meetings, conferences, and significant decisions.
  - i. Visitors to the job including meeting attendees.
  - j. Stoppages, delays, shortages, losses.
  - k. Any tests made and their result if known.
  - l. Meter readings and similar recordings.
  - m. Emergency procedures.
  - n. Orders and requests of governing authorities.
  - o. Modifications received, carried out.
  - p. Services connected, disconnected.
  - q. Equipment or system tests and start-ups.
  - r. Brief summary of work accomplished that day.
  - s. Signature of person preparing report.
2. Submit daily reports to Architect at least weekly.
3. Maintain copies of daily reports at field office.

**PART 2 - PRODUCTS Not Used**

**PART 3 - EXECUTION Not Used**

**END OF SECTION**

**SECTION 01 3300****SUBMITTAL PROCEDURES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Submittal Procedures.

**1.2 SUBMITTAL SCHEDULE**

- A. Furnish submittal schedule within 20 days after receipt of Notice to Proceed, listing items specified to be furnished for review to Architect including product data, shop drawings, samples, and Informational submittals.
1. Coordinate submittal schedule with Contractor's construction schedule.
  2. Enclose the following information for each item:
    - a. Scheduled date for first submittal.
    - b. Related Section number.
    - c. Submittal category.
    - d. Name of Subcontractor.
    - e. Description of part of the Work covered.
    - f. Scheduled date for resubmittal.
    - g. Scheduled date for Architect's final release or approval.
- B. Print and distribute copies to Architect and Owner and post copy in field office. When revisions are made, distribute to same parties and post in same location.
- C. Revise schedule monthly. Send copy of revised schedule to Owner and Architect and post copy in field office.

**1.3 SUBMITTAL PROCEDURES**

- A. Coordination:
1. Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently before performance of related construction activities to avoid delay.
    - a. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
    - b. Coordinate transmittal of different types of submittals required for related elements of The Work so processing will not be delayed by need to review submittals concurrently for coordination. Architect reserves right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
  2. Processing Time:
    - a. Allow sufficient review time so installation will not be delayed by time required to process submittals, including time for resubmittals.
      - 1) Allow 21 days for initial review. Allow additional time if processing must be delayed to allow coordination with subsequent submittals. Architect will promptly advise Contractor when submittal being processed must be delayed for coordination.
      - 2) If an intermediate submittal is necessary, process same as initial submittal.
      - 3) Allow 10 days for reprocessing each submittal.
      - 4) No extension of Contract Time will be authorized because of failure to transmit submittals to Architect in sufficient time before work is to be performed to allow processing.

3. Identification:
  - a. Place permanent label or title block on each submittal for identification. Include name of entity that prepared each submittal on label or title block.
    - 1) Provide space approximately 4 by 5 inches on label or beside title block on Shop Drawings to record Contractor's review and approval markings and action taken.
    - 2) Include following information on label for processing and recording action taken:
      - a) Project name.
      - b) Date.
      - c) Name and address of Architect.
      - d) Name and address of Contractor.
      - e) Name and address of Subcontractor.
      - f) Name and address of supplier.
      - g) Name of manufacturer.
      - h) Number and title of appropriate Specification Section.
      - i) Drawing number and detail references, as appropriate.
4. Transmittal:
  - a. Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Architect using transmittal letter. On transmittal, record relevant information and requests for data. Include Contractor's certification that information complies with Contract Document requirements, or, on form or separate sheet, record deviations from Contract Document requirements, including minor variations and limitations.
  - b. Submittals received from sources other than Contractor or not marked with Contractor's approval will be returned without action.

#### 1.4 ACTION SUBMITTALS

- A. Product Data:
  1. Submit Product Data, as required by individual Sections of Specifications.
  2. Mark each copy of each set of submittals to show choices and options used on Project. Where printed Product Data includes information on products that are not required for Project, mark copies to indicate information relating to Project.
  3. Certify that proposed product complies with requirements of Contract Documents. List any deviations from those requirements on form or separate sheet.
  4. Submit electronic files PDF: Architect will return a PDF copy marked with action taken and with corrections or modifications required.
- B. Shop Drawings:
  1. Submit newly prepared graphic data to accurate scale. Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least **8-1/2 by 11 inches** but no larger than **36 by 48 inches**. Highlight, encircle, or otherwise show deviations from Contract Documents. Include following information as a minimum:
    - a. Dimensions.
    - b. Identification of products and materials included.
    - c. Compliance with specified standards.
    - d. Notation of coordination requirements.
    - e. Notation of dimensions established by field measurement.
  2. Do not reproduce Contract Documents or copy standard information as basis of Shop Drawings. Standard printed information prepared without specific reference to Project is not acceptable as Shop Drawings.
  3. Review and designate (stamp) approval of shop drawings. Unless otherwise specified, submit to Architect electronic file PDF.. Shop drawings not required by Contract Documents, but requested by Contractor or supplied by Subcontractor, need not be submitted to Architect for review.
- C. Samples:
  1. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with 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.

- a. Mount, display, or package Samples so as to ease review of qualities specified. Prepare Samples to match samples provided by Architect, if applicable. Include following:
  - 1) Generic description of Sample.
  - 2) Sample source.
  - 3) Product name or name of manufacturer.
  - 4) Compliance with recognized standards.
  - 5) Availability and delivery time.
2. Submit Samples for review of kind, color, pattern, and texture, for final check of these characteristics with other elements, and for a comparison of these characteristics between final submittal and actual component as delivered and installed.
  - a. Where variations in color, pattern, texture or other characteristics are inherent in material or product represented, submit set of three samples minimum that show approximate limits of 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.
  - c. Refer to other Sections for Samples to be returned to Contractor for incorporation into The Work. Such Samples shall be undamaged at time of use. On transmittal, indicate special requests regarding disposition of Sample submittals.
3. Where Samples are for selection of color, pattern, texture, or similar characteristics from a range of standard choices, submit full set of choices for material or product. Preliminary submittals will be reviewed and returned with Architect's mark indicating selection and other action.
4. Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit three sets. One will be returned marked with action taken.
5. Samples, as accepted and returned by Architect, will be used for quality comparisons throughout course of construction.
  - a. Unless noncompliance with Contract Documents is observed, submittal may serve as final submittal.
  - b. Sample sets may be used to obtain final acceptance of construction associated with each set.

## 1.5 INFORMATIONAL SUBMITTALS

- A. Informational submittals are design data, test reports, certificates, manufacturer's instructions, manufacturer's field reports, and other documentary data affirming quality of products and installations. Submit five copies of each required submittal unless otherwise required. Architect will return three copies marked with action taken and with corrections or modifications required. [or] Submit electronic files: PDF. Architect will return a PDF copy marked with action taken and with corrections or modifications required.
  1. Certificates: Describe certificates intended to document affirmations by Contractor or others that the work is in accordance with the Contract Documents, but do not repeat provisions of Parts 2 or 3.
  2. Delegated Design Submittals / Design Data: Describe submittals intended to demonstrate design work prepared by Contractor's licensed professionals.
  3. Test And Evaluation Reports: Describe submittal of test reports or evaluation service reports intended to document required tests.
  4. Manufacturer Instructions: Describe submittals intended to document manufacturer instructions.
  5. Source Quality Control Submittals: Describe submittal of source quality control documentation.
  6. Field Quality Control Submittals: Describe submittal of field quality control documentation.
  7. Manufacturer Reports: Describe submittal of Manufacturer reports as documentation of manufacturer activities.
  8. Special Procedure Submittals: Describe submittals intended to document special procedures. An example would be construction staging or phasing for remodeling an existing facility while keeping it in operation. While the Contractor would normally be responsible for managing this, submittal of his plan as documentation could be specified.
  9. Qualification Statements: Describe submittals intended to document qualifications of entities employed by Contractor.

**1.6 CLOSEOUT SUBMITTALS**

- A. This title groups submittals that occur during project closeout. Coordinate with section 01 7800 Closeout Submittals.
1. Maintenance Contracts: Describe submittal of the maintenance contract.
  2. Operations & Maintenance Data: Describe submittal of operation and maintenance data necessary for products of the Section.
  3. Bonds: Describe submittals of bonds specific to this Section.
  4. Warranty Documentation: Describe submittal of final executed warranty document.
  5. Record Documentation: Describe submittal of record documentation specific to this Section.
  6. Sustainable (LEED) Design Closeout Documentation: Describe submittal intended to document sustainable design requirements that cannot be submitted until closing or later.
  7. Software: Describe submittal of extra copy operating system and other utility software necessary to operate and maintain software during life of product.

**1.7 MAINTENANCE MATERIAL SUBMITTALS**

- A. This title groups maintenance material submittals required by Section.
1. Spare Parts: Describe spare parts necessary for Owner's use in facility operation and maintenance. 'Parts' are generally understood to be items such as filters, motor drive belts, lamps, and other similar manufactured items that require only simple replacement.
  2. Extra Stock Materials: Describe extra stock materials to be provided for Owner's use in facility operation and maintenance. Extra stock materials are generally understood to be items such as ceiling tiles, flooring, paint etc.
  3. Tools and Software:
    - a. Describe tools to be provided for Owner's use in facility operation and maintenance. Tools are generally understood to be wrenches, gauges, circuit setters, etc, required for proper operation or maintenance of a system.
    - b. If necessary, describe submittal of an extra copy of operating system and other utility software necessary to operate and maintain the software during expected life of product.

**PART 2 - PRODUCTS Not Used****PART 3 - EXECUTION Not Used****END OF SECTION**

**SECTION 01 3500****SPECIAL PROCEDURES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Special Procedures.

**1.2 REFERENCES**

- A. Association Publications:
1. U.S. Department of Labor, Occupational Safety and Health Administration:
    - a. 29 CFR 1926 OSHA, 'Construction Industry Regulations' (January 2014 or latest version).
      - 1) 29 CFR 1926.20, 'General Safety And Health Provisions'.
      - 2) 29 CFR 1926.64, 'Hot Work Permit'.
      - 3) 29 CFR 1926.352, 'Fire Prevention'.
      - 4) 29 CFR 1926.500, 'Fall Protection'.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Acceleration of Work:
1. Complete The Work in accordance with Construction Schedule. If Contractor falls behind schedule, take such actions as are necessary, at no additional expense to Owner, to bring progress of The Work back in accordance with schedule.
  2. Owner may request proposal for completion of The Work at date earlier than expiration of Contract Time:
    - a. Promptly provide requested proposal showing cost of such acceleration of The Work. Consult with Owner and Architect regarding possible options to decrease cost of such acceleration.
    - b. If Owner determines to order acceleration of The Work, change in Contract Sum and Contract Time resulting from acceleration will be included in a Change Order.

**1.4 QUALITY ASSURANCE**

- A. Regulatory Agency Sustainability Approvals:
1. Meet regulations of 29 CFR 1926 OSHA, 'Construction Industry Regulations'.
  2. Owner's Safety Requirements:
    - a. Personal Protection:
      - 1) Contractor shall ensure:
        - a) Positive means of fall protection, such as guardrails system, safety net system, personal fall arrest system, etc, is provided to employees whenever exposed to a fall **6 feet** or more above a lower level.
        - b) Personnel working on Project shall wear hard hats and safety glasses as required by regulation and hazard.
        - c) Personnel working on Project shall wear long or short sleeve shirts, long pants, and hard-toed boots or other sturdy shoes appropriate to type and phase of work being performed.
    - b. Contractor Tools And Equipment:
      - 1) Contractor shall ensure:
        - a) Tools and equipment are in good working condition, well maintained, and have necessary guards in place.

- b) Ground Fault Circuit Interrupters (GFCI) is utilized on power cords and tools.
- c) Scaffolding and man lifts are in good working condition, erected and maintained as required by governmental regulations.
- d) Ladders are in good condition, well maintained, used as specified by Manufacturer, and secured as required.
- c. Miscellaneous:
  - 1) Contractor shall ensure:
    - a) Protection is provided on protruding rebar and other similar objects.
    - b) General Contractor Superintendent has completed the OSHA 10-hour construction outreach training course or equivalent.
    - c) Implementation and administration of safety program on Project.
    - d) Material Safety Data Sheets (MSDS) are provided for substances or materials for which an MSDS is required by governmental regulations before bringing on site.
    - e) Consistent safety training is provided to employees on Project.
    - f) Implement and coordinate Lockout / Tagout procedures with Owner's Representative as required.
  - 2) Report accidents involving injury to employees on Project that require off-site medical treatment to Owner's designated representative.
- d. Hot Work Permit:
  - 1) Permit shall document that fire prevention and protection requirements in 29 CFR 1926.352, 'Fire Prevention' have been implemented prior to beginning hot work operations.
  - 2) Required for doing hot work involving open flames or producing heat or sparks such as:
    - a) Brazing.
    - b) Cutting.
    - c) Grinding.
    - d) Soldering.
    - e) Thawing pipe.
    - f) Torch applied roofing.
    - g) Welding.

**PART 2 - PRODUCTS Not Used****PART 3 - EXECUTION Not Used****END OF SECTION**



**SECTION 01 4100****REGULATORY REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Regulatory Requirements.

**1.2 ASBESTOS**

- A. Contract Documents for this Project have been prepared in accordance with generally accepted professional architectural and engineering practices. Accordingly, no asbestos or products containing asbestos have been knowingly specified for this Project. Notify Architect immediately for instructions if materials containing asbestos are brought to site for inclusion in the Work.
- B. At Architect's direction and with Owner's approval, a certified asbestos inspector will collect samples and an independent testing laboratory will perform testing procedures on suspect materials.
- C. Certify that based upon best knowledge, information, inspection, and belief no building materials containing asbestos were used in construction of Project. Submit certification on form provided by Owner.

**PART 2 - PRODUCTS Not Used****PART 3 - EXECUTION Not Used****END OF SECTION**

**BLANK PAGE**

**SECTION 01 4200****REFERENCES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Reference standards, definitions, specification format, and industry standards.

**1.2 REFERENCES**

- A. Definitions:
1. Approved: The term "approved," when used to convey Architect's action on Contractor's submittals, applications, and requests, is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
  2. Directed: The term "directed" is a command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," and "permitted" have the same meaning as "directed."
  3. Experienced: The term "experienced," when used with an entity, means having successfully completed a minimum often previous projects similar in size and scope to this Project; being familiar with the special requirements indicated, and having complied with requirements of authority having jurisdiction.
  4. Furnish: The term "furnish" means supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
  5. General: Basic Contract definitions are included in the Conditions of the Contract.
  6. Indicated: The term "indicated" refers to requirements expressed by graphic representations, or in written form on Drawings, in Specifications, and in other Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference.
  7. Install: The term "install" describes operations at Project site including unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
  8. Installer: An "Installer" is the Contractor or another entity engaged by the Contractor, as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
  9. Project Site: The term "Project site" means the space available for performing construction activities. The extent of the Project site is shown on the Drawings and mayor may not be identical with the description of the land on which the Project is to be built.
  10. Provide: The term "provide" means to furnish and install, complete and ready for the intended use.
  11. Regulations: The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
  12. Submitted: The terms "submitted," "reported," "satisfactory" and similar words and phrases means submitted to Architect, reported to Architect and similar phrases.
  13. Testing Agencies: A "testing agency" is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, or to report on and, if required, to interpret results of those inspections or tests.
  14. Trades: Using terms such as "carpentry" does not 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.

## B. References Standards:

1. Specification Format: Specifications will follow MasterFormat™ 2004 for organizing numbers and titles. (The Construction Specifications Institute, Project Resource Manual/CSI Manual of Practice, 5<sup>th</sup> Edition. New York, McGraw-Hill, 2005).
  - a. Specification Identifications:
    - 1) The Specifications use section numbers and titles to help cross referencing in the Contract Documents.
    - 2) Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.
  - b. Specification Language:
    - 1) Specifications should be prepared, with concern and respect for their legal status. Specifications should be Clear, Concise, Correct and Complete.
    - 2) Streamlining: Streamlining is used to list products, materials, reference standards, and other itemized specifications. This technique places the subject first and provides keywords for quick reference
  - c. Sentence Structure:
    - 1) Specifications to be written in the "Imperative Mood".
      - a) The verb that clearly defines the action becomes the first word in the sentence.
      - b) The imperative sentence is concise and readily understandable.
    - 2) Streamlining is used to list products, materials, reference standards, and other itemized specifications. This technique places the subject first and provides keywords for quick reference.
  - d. Abbreviated Language:
    - 1) Abbreviations should be used only on drawings and schedules where space is limited.
    - 2) Abbreviations with multiple meanings should be avoided, unless used in different disciplines where their meaning is clear from the context in which they are used.
    - 3) Abbreviations should be limited to five or fewer letters
      - a) The verb that clearly defines the action becomes the first word in the sentence.
  - e. Symbols:
    - 1) Caution should apply to symbols substituted for words or terms.
  - f. Numbers:
    - 1) The use of Arabic numerals rather than words for numbers is recommended.

## C. Industry Standards:

1. Except where Contract Documents specify otherwise, construction industry standards will apply and are made a part of Contract Documents by reference.
2. Where compliance with two or more standards is specified and standards apparently establish different or conflicting requirements for minimum quantities or quality levels, refer to Architect for decision before proceeding. Quantity or quality level shown or specified will be minimum provided or performed. Actual installation may comply exactly with minimum quantity or quality specified, or it may exceed minimum within reasonable limits. In complying with these requirements, indicated numeric values are minimum or maximum, as appropriate for context of requirements. Refer uncertainties to Architect for decision before proceeding.
3. Each entity engaged in construction on Project is required to be familiar with industry standards applicable to that entity's construction activity. Copies of applicable standards are not bound with Contract Documents. Where copies of standards are needed for performance of a required construction activity, Contractor will obtain copies directly from publication source.
4. Trade Association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations, as referenced in Contract Documents, are defined to mean association names. Names and addresses are subject to change and are believed to be, but are not assured to be, accurate and up to date as of date of Contract Documents.

AABC	Associated Air Balance Council	Washington	DC	(202) 737-0202	<a href="http://www.aabchq.com">www.aabchq.com</a>
AAMA	American Architectural Manufacturers Association	Schaumburg	IL	(847) 303-5664	<a href="http://www.aamanet.org">www.aamanet.org</a>
AASHTO	American Association of State Highway & Transporta-	Washington	DC	(202) 624-5800	<a href="http://www.aashto.org">www.aashto.org</a>

	tion Officials				
AAMA	American Architectural Manufacturers Association	Schamamburg	IL	(847) 303-5774	<a href="http://www.aamanet.org">www.aamanet.org</a>
AASHTO	American association of State Highways and Transportation Officials	Washington	DC		<a href="http://www.transportation.org">www.transportation.org</a> <a href="http://www.aashto.org">www.aashto.org</a>
ACI	American Concrete Institute International	Farmington Hills	MI	(248) 848-3700	<a href="http://www.aci-int.org">www.aci-int.org</a>
AGA	American Gas Association	Washington	DC	(202) 824-7000	<a href="http://www.aga.org">www.aga.org</a>
AHRI	Air Conditioning Heating & Refrigeration Institute	Arlington	VA	(703) 524-8800	<a href="http://www.ari.org">www.ari.org</a>
AIA	American Institution of Architects	Washington	DC	(202) 626-7300	<a href="http://www.aia.org">www.aia.org</a>
AISC	American Institute of Steel Construction	Chicago	IL	(312) 670-2400	<a href="http://www.aisc.org">www.aisc.org</a>
AISI	American Iron & Steel Institute	Washington	DC	(202) 452-7100	<a href="http://www.steel.org">www.steel.org</a>
AITC	American Institution of Timber Construction	Englewood	CO	(303) 792-9559	<a href="http://www.aitc-glulam.org">www.aitc-glulam.org</a>
AMCA	Air Movement & Control Association International	Arlington Heights	IL	(847) 394-0150	<a href="http://www.amca.org">www.amca.org</a>
ANSI	American National Standards Institute	New York	NY	(212) 642-4900	<a href="http://www.ansi.org">www.ansi.org</a>
APA	APA-Engineered Wood Association	Tacoma	WA	(253) 565-6600	<a href="http://www.apawood.org">www.apawood.org</a>
API	American Petroleum Institute	Washington	DC	(202) 682-8000	<a href="http://www.api.org">www.api.org</a>
AQMD	South Coast Air Quality Management District	Diamond Bar	CA	(909) 396-2000	<a href="http://www.aqmd.gov">www.aqmd.gov</a>
ASHRAE	American Society of Heating, Refrigerating, & Air-Conditioning Engineers	Atlanta	GA	(404) 636-8400	<a href="http://www.ashrae.org">www.ashrae.org</a>
ASME	American Society of Mechanical Engineers International	New York	NY	(800) 843-2763	<a href="http://www.asme.org">www.asme.org</a>
ASTM	ASTM International	West Conshohocken	PA	(610) 832-9500	<a href="http://www.astm.org">www.astm.org</a>
AWI	Architectural Woodwork Institute	Potomac Falls	VA	(571) 323-3636	<a href="http://www.awinet.org">www.awinet.org</a>
AWPA	American Wood Protection Association	Birmingham	AL	(205) 733-4077	<a href="http://www.awpa.com">www.awpa.com</a>
AWS	American Welding Society	Miami	FL	(800) 443-9353	<a href="http://www.aws.org">www.aws.org</a>
AWWA	American Water Works Assoc	Denver	CO	(303) 794-7711	<a href="http://www.awwa.org">www.awwa.org</a>
BHMA	Builders Hardware Manufacturers Association	New York	NY	(212) 297-2122	<a href="http://www.buildershardware.com">www.buildershardware.com</a>
BIA	Brick Industry Association	Reston	VA	(703) 620-0010	<a href="http://www.bia.org">www.bia.org</a>
CFI	International Certified Floor-covering Installers, Inc.	Kansas City	MO	(816) 231-4646	<a href="http://www.cfi-installers.org">www.cfi-installers.org</a>
CRI	Carpet & Rug Institution	Dalton	GA	(706) 278-3176	<a href="http://www.carpet-rug.com">www.carpet-rug.com</a>
CRSI	Concrete Reinforcing Steel Institute	Schaumburg	IL	(847) 517-1200	<a href="http://www.crsi.org">www.crsi.org</a>
CISPI	Cast Iron Soil Pipe Institute	Chattanooga	TN	(423) 892-0137	<a href="http://www.cispi.org">www.cispi.org</a>
DHI	Door & Hardware Institute	Chantilly	VA	(703) 222-2010	<a href="http://www.dhi.org">www.dhi.org</a>
DIPRA	Ductile Iron Pipe Research Association.	Birmingham	AL	(205) 402-8700	<a href="http://www.dipra.org">www.dipra.org</a>
EIMA	EIFS Industry Members Association	Morrow	GA	(800) 294-3462	<a href="http://www.eima.com">www.eima.com</a>
FM	FM Global	Johnston	RI	(401) 275-3000	<a href="http://www.fmglobal.com">www.fmglobal.com</a>

FSC	Forest Stewardship Council	Bonn, Germany		+49 (0) 228 367 66 0	<a href="http://www.fsc.org">www.fsc.org</a>
GA	Gypsum Association	Hyattsville	MD	(301) 277-8686	<a href="http://www.gypsum.org">www.gypsum.org</a>
GS	Green Seal	Washington	DC	(202) 872-6400	<a href="http://www.greenseal.org">www.greenseal.org</a>
HPVA	Hardwood Plywood & Veneer Association	Reston	VA	(703) 435-2900	<a href="http://www.hpva.org">www.hpva.org</a>
ICC	International Code Council	Washington	DC	(888) 422-7233	<a href="http://www.iccsafe.org">www.iccsafe.org</a>
ICC-ES	ICC Evaluation Service	Whittier	CA	(562) 699-0543	<a href="http://www.icc-es.org">www.icc-es.org</a>
ICBO	International Conference of Building Officials				(See ICC)
ISO	International Organization for Standardization	Geneva, Switzerland			<a href="http://www.iso.org">www.iso.org</a>
ISSA	International Slurry Surfacing Association	Annapolis	MD	(410) 267-0023	<a href="http://www.slurry.org">www.slurry.org</a>
KCMA	Kitchen Cabinet Manufacturers Association	Reston	VA	(703) 264-1690	<a href="http://www.kcma.org">www.kcma.org</a>
LPI	Lightning Protection Institute	Maryville	MO	(800) 488-6864	<a href="http://www.lightning.org">www.lightning.org</a>
MFMA	Maple Flooring Manufacturers' Association	Deerfield	IL	(888) 480-9138	<a href="http://www.maplefloor.org">www.maplefloor.org</a>
MSS	Manufacturer's Standardization Society of The Valve and Fittings Industry	Vienna	VA	(703) 281-6613	<a href="http://www.mss-hq.com">www.mss-hq.com</a>
NAAMM	National Association of Architectural Metal Manufacturers	Glen Ellyn	IL	(630) 942-6591	<a href="http://www.naamm.org">www.naamm.org</a>
NEC	National Electric Code	(from NFPA).			
NEMA	National Electrical Manufacturer's Association	Rosslyn	VA	(703) 841-3200	<a href="http://www.nema.org">www.nema.org</a>
NFPA	National Fire Protection Association	Quincy	MA	(800) 344-3555	<a href="http://www.nfpa.org">www.nfpa.org</a>
NFRC	National Fenestration Rating Council	Greenbelt	MD	(301) 589-1776	<a href="http://www.nfrc.org">www.nfrc.org</a>
NSF	NSF International	Ann Arbor	MI	(734) 769-8010	<a href="http://www.nsf.org">www.nsf.org</a>
PCA	Portland Cement Association	Skokie	IL	(847) 966-6200	<a href="http://www.cement.org">www.cement.org</a>
PCI	Precast / Prestressed Concrete Institute	Chicago	IL	(312) 786-0300	<a href="http://www.pci.org">www.pci.org</a>
PEI	Porcelain Enamel Institute	Norcross	GA	(770) 676-9366	<a href="http://www.porcelainenamel.com">www.porcelainenamel.com</a>
RFCI	Resilient Floor Covering Institute	LaGrange	GA	(706) 882-3833	<a href="http://www.rfci.com">www.rfci.com</a>
SCTE	Society of Cable Telecommunications Engineers	Exton	PA	(800) 542-5040	<a href="http://www.scte.org">www.scte.org</a>
SDI	Steel Deck Institute	Fox River Grove	IL	(847) 458-4647	<a href="http://www.sdi.org">www.sdi.org</a>
SDI	Steel Door Institute	Westlake	OH	(440) 899-0010	<a href="http://www.steeldoor.org">www.steeldoor.org</a>
SIGMA	Sealed Insulating Glass Manufacturer's Association	Chicago	IL	(312) 644-6610	<a href="http://www.arcata.com">www.arcata.com</a>
SJI	Steel Joist Institute	Myrtle Beach	SC	(843) 293-1995	<a href="http://www.steeljoist.org">www.steeljoist.org</a>
SMACNA	Sheet Metal & Air Conditioning Contractors National Association	Chantilly	VA	(703) 803-2980	<a href="http://www.smacna.org">www.smacna.org</a>
SPIB	Southern Pine Inspection Bureau	Pensacola	FL	(850) 434-2611	<a href="http://www.spib.org">www.spib.org</a>
SSMA	Steel Stud Manufacturer's Association	Glen Ellyn	IL	(630) 942-6592	<a href="http://www.ssma.com">www.ssma.com</a>
TCNA	Tile Council of North America	Anderson	SC	(864) 646-8453	<a href="http://www.tileusa.com">www.tileusa.com</a>
TPI	Truss Plate Institute	Alexandria	VA	(703) 683-1010	<a href="http://www.tpinst.org">www.tpinst.org</a>

TPI	Turfgrass Producers International (formally American Sod Producers Association)	East Dundee	IL	(847) 649-5555	<a href="http://www.turfgrasssod.org">www.turfgrasssod.org</a>
UL	Underwriters Laboratories	Camas	WA	(877) 854-3577	<a href="http://www.ul.com">www.ul.com</a>
WDMA	Window and Door Manufacturer's Association	Chicago	IL	(312) 321-6802	<a href="http://www.nwwda.org">www.nwwda.org</a>
WWPA	Western Wood Products Association	Portland	OR	(503) 224-3930	<a href="http://www.wwpa.org">www.wwpa.org</a>

## D. Federal Government Agencies:

- Names and titles of federal government standard or specification producing agencies are often abbreviated. Following acronyms or abbreviations referenced in Contract Documents represent names of standard or specification producing agencies of federal government. Names and addresses are subject to change but are believed to be, but are not assured to be, accurate and up to date as of date of Contract Documents.

CS	Commercial Standard (U S Department of Commerce)	Washington	DC	(202) 512-0000	<a href="http://www.doc.gov">www.doc.gov</a>
EPA	Environmental Protection Agency	Washington	DC	(202) 272-0167	<a href="http://www.epa.gov">www.epa.gov</a>
FCC	Federal Communications Commission	Washington	DC	(888) 225-5322	<a href="http://www.fcc.gov">www.fcc.gov</a>
FS	Federal Specifications Unit (Available from GSA)	Washington	DC	(202) 619-8925	<a href="http://www.gsa.gov">www.gsa.gov</a>
MIL	Military Standardization Documents (U S Department of Defense)	Philadelphia	PA	(215) 697-2179	<a href="http://www.dod.gov">www.dod.gov</a>
NIST	National Institute of Standards and Technology, technology Administration (US Department of Commerce)	Gaithersburg	MD	(301) 975-4500	<a href="http://www.ts.nist.gov">www.ts.nist.gov</a>
OSHA	Occupational Safety & Health Administration (U S Department of Labor)	Washington	DC	202) 219-8148	<a href="http://www.osha.gov">www.osha.gov</a>
PS	Product Standard of NBS (U S Department of Commerce)	Washington	DC	(202) 512-1800	<a href="http://www.doc.gov">www.doc.gov</a>

## E. Governing Regulations / Authorities:

- Contact authorities having jurisdiction directly for information and decisions having a bearing on the Work.
- Obtain copies of regulations required to be retained at Project Site, available for reference by parties who have a reasonable need for such reference.

**PART 2 - PRODUCTS Not Used****PART 3 - EXECUTION Not Used****END OF SECTION**

**BLANK PAGE**



**SECTION 01 4301****QUALITY ASSURANCE - QUALIFICATIONS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Related Documents:
  - 1. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.
- B. Related Requirements:
  - 1. Section 01 4000: 'Quality Requirements' includes administrative and procedural requirements for quality assurance and quality control.
  - 2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Accreditation: Process in which certification of competency, authority, or credibility is presented. Verify that laboratories have an appropriate quality management system and can properly perform certain test methods (e.g., ANSI, ASTM, and ISO test methods) and calibration parameters according to their scopes of accreditation.
  - 2. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
  - 3. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
  - 4. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
- B. Reference Standards:
  - 1. ASTM International:
    - a. ASTM E329-14a, 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.'

**1.3 QUALIFICATIONS**

- A. Qualifications: Qualifications paragraphs in this Article establish minimum qualification levels required; individual Specification Sections specify additional requirements:
  - 1. Fabricator / Supplier / Installer Qualifications: Firm experienced in producing products similar to those indicated for this Project and with record of successful in-service performance, as well as sufficient production capacity to produce required units.
    - a. VMR (Value Managed Relationship):
      - 1) Where heading '*VMR (Value Managed Relationship) / Manufacturers / Suppliers / Installers*' is used to identify list of specified suppliers or installers, Owner has established relationships that extend beyond requirements of this Project.
      - 2) No other *Suppliers / Installers* will be acceptable.
      - 3) Follow specified procedures to preserve relationships between Owner and specified suppliers / installers and advantages that accrue to Owner from those relationships.
      - 4) Following areas of the Work have restrictions on sub-bids by Contractor:
        - a) Accordion Folding Partitions, Section 10 2233: VMR, no other Manufacturer / Installers accepted.

- b) Aluminum-Framed Entrances And Storefronts, Section 08 4113: VMR, no other Manufacturer / Installers accepted.
  - c) Asphalt Shingles, Section 07 3113: VMR, no other Manufacturer / Installers accepted.
  - d) Common Finish Hardware Requirements, Section 08 7101: VMR Supplier, no other Supplier accepted:
    - (1) Accessories, Section 08 7109.
    - (2) Accessories for Pairs of Doors, Section 08 7105.
    - (3) Closing Devices, Section 08 7106.
    - (4) Hanging Devices, Section 08 7102.
    - (5) Operating Trim, Section 08 7104.
    - (6) Protective Plates and Trim, Section 08 7107.
    - (7) Securing Devices, Section 08 7103.
    - (8) Stops and Holders, Section 08 7108.
  - e) Flush Wood Doors, Section 08 1416: VMR Supplier, no other Supplier accepted.
  - f) Flush Wood Doors: Factory Finished, Clear, Section 08 1429: VMR Supplier, no other Supplier accepted.
  - g) Hollow Metal Frames, Section 08 1213: VMR Supplier, no other Supplier accepted.
  - h) Hollow Metal Doors, Section 08 1313: VMR Supplier, no other Supplier accepted.
  - i) Sheet Carpeting, Section 09 6816: VMR, no other Manufacturer / Installers accepted.
  - j) Tile Carpeting, Section 09 6813: VMR, no other Manufacturer / Installers accepted.
- b. Approved:
- 1) Where heading '*Approved Suppliers / Distributors / Installers / Applicators / Fabricators*' is used to identify list of specified suppliers / distributors / installers / applicators / fabricators, use only listed suppliers / installers / fabricators.
  - 2) No substitutions will be allowed.
  - 3) Following areas of the Work have restrictions on sub-bids by which may be accepted by Contractor:
    - a) Audio Systems, Section 27 5117: Alternate Installers approved by Owner before bidding.
    - b) Ceramic Tiling, Section 09 3013: No other Suppliers accepted.
    - c) Electric And Electronic Control System for HVAC, Section 23 0933, No other Distributors accepted.
    - d) Sound, Division 27: Installers approved by Architect before bidding.
    - e) Video Systems, Section 27 4117: Alternate Installers approved by Owner before bidding.
- c. Acceptable Suppliers / Installers:
- 1) Where heading '*Acceptable Suppliers / Installers / Fabricators*' is used, qualifications as specified in Quality Assurance in Part 1 of individual sections will be used to determine requirements of those that will be acceptable to be used on Project. Lists for acceptable installers can include additional installers that may be approved before bidding or by addendum.
    - a) Underground Sprinklers, Section 32 8423: Acceptable Landscape Installers approved by Landscape Architect before bidding. Equal Landscape Installers to be approved by Architect before bidding.
  - 2) Following areas of the Work have restrictions on sub-bids by Contractor:
    - a) Baptismal Font Railing, Section 11 9119, Acceptable Installers are listed for each state. Equal Installers to be approved by Architect before installation.
2. Factory-Authorized Service Representative Qualifications:
- a. Authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
3. Installer Qualifications:
- a. Firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
4. Manufacturer Qualifications:

- a. Firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
5. Manufacturer's Field Services Qualifications:
  - a. Experienced authorized representative of manufacturer to inspect field-assembled components and equipment installation, including service connections.
6. Professional Engineer Qualifications:
  - a. Professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of kind indicated. Engineering services are defined as those performed for installations of system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.
7. Specialists:
  - a. Certain sections of Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations.
  - b. Specialists shall satisfy qualification requirements indicated and shall be engaged for activities indicated.
  - c. Requirement for specialists shall not supersede building codes and regulations governing the Work.
8. Testing Agency Qualifications:
  - a. Independent Testing Agency with experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E329; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
    - 1) Testing Laboratory:
      - a) AASHTO Materials Reference Laboratory (AMRL) Accreditation Program.
      - b) Cement and Concrete Reference Laboratory (CCRL).
      - c) Nationally Recognized Testing Laboratory (NRTL): Nationally recognized testing laboratory according to 29 CFR 1910.7.
      - d) National Voluntary Laboratory (NVLAP): Testing Agency accredited according to National Institute of Standards and Technology (NIST) Technology Administration, U. S. Department of Commerce Accreditation Program.

**PART 2 - PRODUCTS Not Used****PART 3 - EXECUTION Not Used****END OF SECTION**

**BLANK PAGE**

**SECTION 01 4523****TESTING AND INSPECTING SERVICES****PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section

**1.2 SUMMARY**

- A. This Section includes testing, inspections, special testing, special inspections, and testing laboratory services for materials, products, and construction methods as specified hereafter for the Work.
- B. Specified tests, inspections, and related actions do not limit Contractor's quality control procedures to fully comply with Contract Document requirements in all regards.
- C. Costs: Costs of initial services for testing and inspection personnel will be paid by Owner unless otherwise noted.
  - 1. If initial tests indicate non-compliance with contract document requirements, any subsequent testing will be performed by same personnel and paid for by Contractor.
- D. Related Requirements:
  - 1. Section 01 4000: 'Quality Requirements' includes administrative and procedural requirements for quality assurance and quality control.
  - 2. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
  - 3. Division 01 through Division 50 establish responsibility for providing specific testing and inspections and Field Tests and Inspections.

**1.3 REFERENCES**

- A. Association Publications:
  - 1. Council of American Structural Engineers. CASE Form 101: *Statement of Special Inspections*. Washington, DC: CASE, 2001. (c/o American Council of Engineering Companies, 1015 15<sup>th</sup> St., NW, Washington, DC 20005; 202-347-7474; [www.acec.org](http://www.acec.org)).
  - 2. International Code Council (IBC):
    - a. IBC Chapter 17, 'Structural Tests and Special Inspections'.
- B. Definitions:
  - 1. Accreditation: Process in which [certification](#) of competency, authority, or credibility is presented. Verify that laboratories have an appropriate quality management system and can properly perform certain test methods (e.g., ANSI, ASTM, and ISO test methods) and calibration parameters according to their scopes of accreditation.
  - 2. Approved: To authorize, endorse, validate, confirm, or agree to.
  - 3. Contract Documents: Engineering and Architectural Drawings and Specifications issued for construction, plus clarification drawings, addenda, approved change orders and contractor designed elements.
  - 4. Experienced: When used with an entity, "experienced" means having successfully completed minimum of five previous projects similar in size and scope to this Project; being familiar with requirements indicated; and having complied with requirements of authorities having jurisdiction.
  - 5. Field Quality Control: Testing, Inspections, Special Testing and Special Inspections to assure compliance to Contract Documents.

6. Inspection/Special Inspection:
  - a. Inspection: Not required by code provisions but may be required by Contract Documents.
  - b. Special Inspection: Inspection required of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and reference standards (required by code provisions and by Contract Documents).
  - c. Special Inspection-Continuous: Full-time observation of the Work requiring inspection by approved inspector who is present in area where the Work is being performed.
  - d. Special Inspection-Periodic: Part-time or intermittent observation of the Work requiring inspection by approved inspector who is present in area where the Work has been or is being performed and at completion of the Work.
7. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform particular construction operation, including installation, erection, application, and similar operations:
  - a. Inspection: Not required by code provisions but may be required by Contract Documents.
  - b. Using term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of corresponding generic name, such as "carpenter."
  - c. It also does not imply that requirements specified apply exclusively to trades people of corresponding generic name.
8. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation. They are not samples. Approved mockups establish standard by which the Work will be judged.
9. Observation: Visual observation of building / site elements or structural system by registered design professional for general conformance to approved construction documents at significant construction stages and at completion. Observation does not include or waive responsibility for performing inspections or special inspections.
10. Owner's Representative: Owner's Designated Representative (Project Manager or Facilities Manager) who will have express authority to bind Owner with respect to all matters requiring Owner's approval or authorization.
11. Preconstruction Testing: Tests and inspections that are performed specifically for Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
12. Product Testing: Tests and inspections that are performed by testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
13. Quality Assurance: Testing, Inspections, Special Testing and Special Inspections provided for by Owner.
14. Quality Control: Testing, Inspections, Special Testing and Special Inspections provided for by Contractor.
15. Relative Compaction: Ratio of field dry density as determined by ASTM D6938 or ASTM D2216, and laboratory maximum dry density as determined by ASTM D698.
16. Service Provider: Agency or firm qualified to perform required tests and inspections.
17. Source Quality Control Testing: Tests and inspections that are performed at source, i.e., plant, mill, factory, or shop.
18. Special Inspection: See Inspection.
19. Special Inspector: Certified individual or firm that implements special inspection program for project.
20. Special Test: See Test.
21. Test/Special Test: Field or laboratory tests to determine characteristics and quality of building materials and workmanship:
  - a. Test: Not required by code provisions but may be required by Contract Documents.
  - b. Special Test: Required by code provisions and by Contract Documents.
22. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
23. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
24. Verification: Act of reviewing, inspecting, testing, etc. to establish and document that product, service, or system meets regulatory, standard, or specification requirements.

## C. Reference Standards:

1. ASTM International:
  - a. ASTM C1021-08(2014), 'Standard Practice for Laboratories Engaged in Testing of Building Sealants'.
  - b. ASTM C1077-14, 'Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation'.
  - c. ASTM C1093-13a, 'Standard Practice for Accreditation of Testing Agencies for Masonry'.
  - d. ASTM D3666-13, 'Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials'.
  - e. ASTM D3740-12a, 'Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction'.
  - f. ASTM E329-14a: 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing'.
  - g. ASTM E543-13, 'Standard Specification for Agencies Performing Nondestructive Testing'.
  - h. ASTM E1212-12, 'Standard Practice for Quality Management Systems for Nondestructive Testing Agencies'.
2. International Code Council (IBC) (2006):
  - a. IBC Chapter 17, 'Structural Tests And Special Inspections':
    - 1) Section 1704, 'Special Inspections':
      - a) Section 1704.3, 'Steel Construction'.
      - b) Section 1704.4, 'Concrete Construction'.
      - c) Section 1704.5, 'Masonry Construction'.
      - d) Section 1704.6, 'Wood Construction'.
      - e) Section 1704.7, 'Soils'.
      - f) Section 1704.8, 'Pile Foundations'.
      - g) Section 1704.9, 'Pier Foundations'.
      - h) Section 1704.10, 'Sprayed Fire-Resistant Materials'.
      - i) Section 1704.11, 'Mastic And Intumescent Fire-Resistant Coatings'.

**1.4 SUBMITTALS**

## A. Informational Submittals:

1. General: Additional submittal requirements are specified in Individual Sections in Division 01 through Division 50.
2. Certificates:
  - a. Testing Agency will submit certified written report of each inspection, test, or similar service.
3. Tests and Evaluation Reports:
  - a. Testing Agency or Agencies will prepare logs, test reports, and certificates applicable to specific tests and inspections and deliver copies (or electronic record) distributed as follows:
    - 1) 1 copy to Owner's Representative.
    - 2) 1 copy to Architect.
    - 3) 1 copy to Consulting Engineers (Engineer of Record).
    - 4) 1 copy to General Contractor.
    - 5) 1 copy to Authorities Having Jurisdiction (if required).
  - b. Other tests, certificates, and similar documents will be obtained by Contractor and delivered to Owner's Representative and Architect in such time as not to delay progress of the Work or final payment therefore.
4. Source Quality Control Submittals:
  - a. Testing Agency will submit following prior to commencing the Work:
    - 1) Qualifications of Testing Agency management and personnel designated to project.
    - 2) Testing Agency 'Written Practice for Quality Assurance'.
    - 3) Qualification records for Inspector and non-destructive testing technicians designated for project.
    - 4) Testing Agency non-destructive testing procedures, equipment calibration records, and personnel training records.
    - 5) Testing Agency Quality Control Plan for monitoring and control of testing operations.
    - 6) Welding Inspection Procedures (Structural Steel testing).
    - 7) Bolting Inspection Procedures (Structural Steel testing).

- 8) Shear Connector Stud Inspection Procedures (Structural Steel testing).
- 9) Seismic Connections Inspection Procedures (Structural Steel testing).

## 1.5 QUALITY ASSURANCE

- A. Owner or Owner's designated representative(s) will perform quality assurance. Owner's quality assurance procedures may include observations, inspections, testing, verification, monitoring and any other procedures deemed necessary by Owner to verify compliance with Contract Documents.
- B. Owner will employ independent Testing Agencies to perform certain specified testing, as Owner deems necessary.
- C. Certification:
  1. Product producers and associations, which have instituted approved systems of quality control and which have been approved by document approval agencies, are not required to have further testing.
  2. Concrete mixing plants, plants producing fabricated concrete and wood or plywood products certified by agency, lumber, plywood grade marked by approved associates, and materials or equipment bearing underwriters' laboratory labels require no further testing and inspection.
- D. Written Practice for Quality Assurance:
  1. Testing Agency will maintain written practice for selection and administration of inspection personnel, describing training, experience, and examination requirements for qualification and certification of inspection personnel.
  2. Written practice will describe testing agency procedures for determining acceptability of structure in accordance with applicable codes, standards, and specifications.
  3. Written practice will describe Testing Agency inspection procedures, including general inspection, material controls, visual welding inspection, and bolting inspection.

## 1.6 QUALITY CONTROL

- A. Quality Control will be sole responsibility of Contractor. Contractor will be responsible for testing and inspections, coordination, start-up, operational checkout, and commissioning of all items of the Work included in Project. All costs for these services will be included in Contractor's cost of the Work.
- B. Contractor will assign one (1) employee to be responsible for Quality Control. This individual may have other responsibilities and may be Contractor's Project superintendent or Contractor's Project Manager.
- C. Notify results of all Testing and Inspection performed by Contractor's independent Testing Agencies to Architect and Owner's Representative within twenty four (24) hours of test or inspection having been performed.
  1. Testing and Inspection Reports will be distributed as follows:
    - a. 1 copy to Owner's Representative.
    - b. 1 copy to Architect.
    - c. 1 copy to Consulting Engineer(s) (Engineer of Record).
    - d. 1 copy to Authorities Having Jurisdiction (if required).
- D. Contractor's Responsibility:
  1. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents.
  2. Tests and inspections that are not explicitly assigned to Owner are responsibility of Contractor.
  3. Cooperate with Testing Agency(s) performing required inspections, tests, and similar services and provide reasonable auxiliary services as requested. Notify Testing Agency before operations to allow assignment of personnel. Auxiliary services required include but are not limited to:



- a. Providing access to the Work and furnishing incidental labor, equipment, and facilities deemed necessary by Testing Agency to facilitate inspections and tests at no additional cost to Owner.
  - b. Taking adequate quantities of representative samples of materials that require testing or helping Testing Agency in taking samples.
  - c. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
  - d. Providing Testing Agency with preliminary design mix proposed for use for materials mixes that require control by Testing Agency.
4. Contractor will integrate Owner's independent Testing Agency services within Baseline Project Schedule and with other Project activities.
5. For any requested inspection, Contractor will complete prior inspections to ensure that items are ready for inspection.
6. All Work is subject to testing and inspection and verification of correct operation prior to 100% payment to Contractor of line item(s) pertaining to that aspect of the Work.
7. For Mechanical Equipment, inspection and documented approval of individual equipment and/or system(s) must be accomplished prior to requesting Substantial Completion Inspection for any area affected by said equipment and/or system:
  - a. Contractor will perform thorough checkout of operations with manufacturer's representatives prior to requesting formal inspection by Owner.
  - b. Contractor must notify Owner's Representative, in advance, as to when manufacturer's representative is scheduled to arrive at Site.
8. Comply:
  - a. Upon completion of Testing Agency's 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. Comply with Contract Documents in making such repairs.
9. Data: Furnish records, drawings, certificates, and similar data as may be required by testing and inspection personnel to assure compliance with Contract Documents.
10. Defective Work (Non-Conforming Work): Non-conforming Work as covered in General Conditions applies, but is not limited to following requirements:
  - a. Where results of inspections, tests, or similar services show that the Work does not comply with Contract Document requirements, correct deficiencies in the Work promptly to avoid Work delays.
  - b. Where testing personnel take cores or cut-outs to verify compliance, repair prior to acceptance.
  - c. Contractor responsible for any and all costs incurred resulting from inspection that was scheduled prematurely or retesting due to failed tests.
  - d. Remove and replace any Work found defective or not complying with contract document requirements at no additional cost to Owner.
  - e. Should test return unacceptable results, Contractor will bear all costs of retesting and re-inspection as well as cost of all material consumed by testing, and replacement of unsatisfactory material and/or workmanship.
11. Protection:
  - a. Protect construction exposed by or for quality assurance and quality control service activities, and protect repaired construction.
12. Scheduling: Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities:
  - a. Schedule testing and inspections in advance so as not to delay the Work and to eliminate any need to uncover Work for testing or inspection.
  - b. Notify Testing Agency and Architect as noted in Sections in Division 01 through Division 50 prior to any time required for such services.
  - c. Incorporate adequate time for performance of all inspections and correction of noted deficiencies.
  - d. Schedule sequence of activities to accommodate required services with minimum of delay.
  - e. Schedule sequence of activities to avoid necessity of removing and replacing construction to accommodate testing and inspections
13. Test and Inspection Log:
  - a. Provide system of tracking all field reports, describing items noted, and resolution of each item. Prepare record of tests and inspections. Include following:

- 1) Date test or inspection was conducted.
  - 2) Description of the Work tested or inspected.
  - 3) Date test or inspection results were transmitted to Architect.
  - 4) Identification of Testing Agency or inspector conducting test or inspection.
- b. Maintain log at Project site:
- 1) Post changes and modifications as they occur.
  - 2) Provide access to test and inspection log for Architect's reference during normal working hours.

## 1.7 TESTING AND INSPECTIONS - GENERAL

- A. Testing specifically identified to be conducted by Owner, will be performed by an independent entity and will be arranged and paid for by Owner.
- B. Individual Sections in Division 01 through Division 50 indicate if Owner will provide testing and inspection of the Work of that Section.
- C. Owner may engage additional consultants for testing, air balancing, commissioning, or other special services:
1. Activities of any such Owner consultants are in addition to Contractor testing of materials or systems necessary to prove that performance is in compliance with Contract requirements.
  2. Contractor must cooperate with persons and firms engaged in these activities.
- D. Tests include but not limited to those described in detail in 'Field Quality Control' in Part 3 of Individual Sections in Divisions 01 through Division 50.
- E. Taking Specimens:
1. Except as may be specifically otherwise approved by Architect, only testing laboratory shall secure, handle, transport, or store any samples and specimens for testing.
- F. Scheduling Testing Agency:
1. Contractor will coordinate the Work and facilitate timeliness of such testing and inspecting services so as not to delay the Work.
  2. Contractor will notify Testing Agency and Architect to schedule tests and / or inspections.
- G. For 'building-wide' and/or life safety systems, such as emergency lighting, emergency power uninterruptible power supply systems, fire alarm, fire sprinkler systems, smoke evacuation systems, toxic gas monitoring, capturer exhaust systems, etc. formal start-up inspection will be completed prior to requesting Substantial Completion Inspection for any area of Project:
1. Manufacturer's representatives and installing contractor will demonstrate both operation and compliance to Owner's agents and consultants. If coordinated and scheduled appropriately by Contractor, these equipment and/or systems inspections may also serve to provide required Owner training, if approved in advance by Owner.
  2. Contractor responsible for requesting that Architect arrange for inspection of materials, equipment, and work prior to assembly or enclosure that would make materials, equipment, or work inaccessible for inspection and at other times as may be required.

## 1.8 TESTING AGENCY SERVICES AND RESPONSIBILITIES

- A. Testing Agency, including independent testing laboratories, will be licensed and authorized to operate in jurisdiction in which Project is located.
1. Approved Testing Agency Qualifications: Requirements of Section 01 4301 apply.
- B. Testing and Inspection Services:
1. Testing Agency will not release, revoke, alter, or increase Contract Document requirements or approve or accept any portion of the Work.
  2. Testing Agency will not give direction or instruction to Contractor.

3. Testing Agency will have full authority to see that the Work is performed in strict accordance with requirements of Contract Documents and directions of Owner's Representative and/or Architect.
4. Testing Agency will not provide additional testing and inspection services beyond scope of Work without prior approval of Owner's Representative and / or Architect.

C. Testing Agency Duties:

1. Independent Testing Agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual specification Sections will cooperate with Architect and Contractor in performance of its duties and will provide qualified personnel to perform required inspections and tests.
2. Testing Agency will test or obtain certificates of tests of materials and methods of construction, as described herein or elsewhere in technical specification.
3. Testing Agency will provide management, personnel, equipment, and services necessary to perform testing functions as outlined in this section.
4. Testing Agency must have experience and capability to conduct testing and inspecting indicated by ASTM standards and that specializes in types of tests and inspections to be performed.
5. Testing Agency will comply with requirements of ASTM E329, ASTM E543, ASTM C1021, ASTM C1077, ASTM C1093, ASTM D3666, ASTM D3740, and other relevant ASTM standards.
6. Testing Agency must calibrate all testing equipment at reasonable intervals (minimum yearly) with accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.
7. Welding Procedure Review: Testing Agency will provide review and approval or rejection of all welding procedures to be used and will verify compliance with all reference standard requirements.

D. Testing and Inspection Reports:

1. Conduct and interpret tests and inspections and state in each report whether tested and inspected the Work complies with or deviates from requirements.
2. Laboratory Reports: Testing Agency will furnish reports of materials and construction as required, including:
  - a. Description of method of test.
  - b. Identification of sample and portion of the Work tested.
    - 1) Description of location in the Work of sample.
    - 2) Time and date when sample was obtained.
    - 3) Weather and climatic conditions at time when sample was obtained.
  - c. Evaluation of results of tests including recommendations for action.
3. Inspection Reports:
  - a. Testing Agency will furnish 'Inspection at Site' reports for each site visit documenting activities, observations, and inspections.
  - b. Include notation of weather and climatic conditions, time and date conditions and status of the Work, actions taken, and recommendations or evaluation of the Work.
4. Reporting Testing and Inspection (Conforming Work):
  - a. Submit testing and inspection reports as required within twenty four (24) hours of test or inspection having been performed.
5. Reporting Testing and Inspection Defective Work (Non-Conforming Work):
  - a. Testing Agency, upon determination of irregularities, deficiencies observed or test failure(s) observed in the Work during performance of its services of test or inspection having been performed, will:
    - 1) Verbally notify results to Architect, Contractor, and Owner's Representative within one hour of test or inspection having been performed (if Defective Work (Non-Conforming Work) is incorporated into project).
    - 2) Submit written inspection report and test results as required within twenty four (24) hours of test or inspection having been performed.
6. Final Report:
  - a. Submit final report of tests and inspections at Substantial Completion, which identify unresolved deficiencies.

**1.9 ARCHITECT'S RESPONSIBILITIES**

- A. Architect Duties:
  - 1. Notify Owner's Representative before each test and/or inspection.

**PART 2 - PRODUCTS Not Used****PART 3 - EXECUTION****3.1 FIELD QUALITY CONTROL**

- A. Field Tests And Inspections:
  - 1. Field Tests and Inspections requirements are described in 'Field Quality Control' of individual Sections in Division 01 through Division 50.

**END OF SECTION**

**SECTION 01 4546****DUCT TESTING, ADJUSTING, AND BALANCING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Is Not Limited To:
  - 1. Test, balance, and adjust air duct systems services provided by Owner as described in Contract Documents..
- B. Related Requirements:
  - 1. Section 01 1200: 'Multiple Contract Summary': Owner will provide test, balance, and adjust air duct systems. PART 3 of this Section establishes requirements for field tests of 'Testing Agency'.
  - 2. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
  - 3. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
  - 4. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
  - 5. Section 01 7800: 'Closeout Submittals'.
  - 6. Division 23:
    - a. Completing installation and start-up of mechanical systems, and changing sheaves, belts, and dampers as required for correct balance.
    - b. Maintain HVAC system and equipment in full operation each working day of testing, balancing, and adjusting.

**1.2 REFERENCES**

- A. Definitions (Following are specifically referenced for testing):
  - 1. Approved: To authorize, endorse, validate, confirm, or agree to.
  - 2. Field Quality Control: Testing, Inspections, Special Testing and Special Inspections to assure compliance to Contract Documents.
  - 3. Inspection/Special Inspection: Inspection of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards:
    - a. Inspection: Not required by code provisions but may be required by Contract Documents.
    - b. Special Inspection: Required by code provisions and by Contract Documents.
    - c. Inspection-Continuous: Full-time observation of the Work requiring inspection by approved inspector who is present in area where the Work is being performed.
    - d. Inspection-Periodic: Part-time or intermittent observation of the Work requiring inspection by approved inspector who is present in area where the Work has been or is being performed and at completion of the Work.
  - 4. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform particular construction operation, including installation, erection, application, and similar operations.
  - 5. Observation: Visual observation of building / site elements or structural system by registered design professional for general conformance to approved construction documents at significant construction stages and at completion. Observation does not include or waive responsibility for performing inspections or special inspections.
  - 6. Owner's Representative: Owner's Designated Representative (Project Manager or Facilities Manager) who will have express authority to bind Owner with respect to all matters requiring Owner's approval or authorization.
  - 7. Quality Assurance: Testing, Inspections, Special Testing and Special Inspections provided for by Owner.

8. Quality Control: Testing, Inspections, Special Testing and Special Inspections provided for by Contractor.
  9. Service Provider: Agency or firm qualified to perform required tests and inspections.
  10. Special Inspection: See Inspection.
  11. Special Test: See Test.
  12. Test/Special Test: Field or laboratory tests to determine characteristics and quality of building materials and workmanship.
    - a. Test: Not required by code provisions but may be required by Contract Documents.
    - b. Special Test: Required by code provisions and by Contract Documents.
  13. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
  14. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
  15. Verification: Act of reviewing, inspecting, testing, etc. to establish and document that product, service, or system meets regulatory, standard, or specification requirements.
- B. Reference Standards:
1. ASTM International (Following are specifically referenced for Testing Agencies):
    - a. ASTM E329-11a: 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.'

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Contractor to assist Testing Agency in testing and balancing of mechanical system.
- B. Scheduling:
1. Contractor to schedule this work in cooperation with other Sections involved and to comply with completion date for test, balance, and adjust air duct systems as described in Contract Documents.
  2. Contact Testing Agency and coordinate (Owner' Representative to provide 'Testing Agency' contact information):
    - a. One inspection when 60 percent of ductwork is installed.
    - b. One inspection when 90 percent of equipment and ductwork is installed.
  3. Contact Testing Agency and coordinate date(s) for test and balance work when following is completed:
    - a. HVAC and exhaust systems including installation of specialties, devices, and new filters.
    - b. Proper function of control system components including electrical interlocks, damper sequences, air and water reset, and fire and freeze stats has been verified.
    - c. Automatic temperature controls have been calibrated and set for design operating conditions.
    - d. Verification of proper thermostat calibration and setting of control components such as static pressure controllers and other devices that may need set points changed during process of balancing system.
  4. If, in opinion of Testing Agency, systems are not ready for test and balance, reschedule as required.

### 1.4 SUBMITTALS

- A. Informational Submittals:
1. Test and Evaluation Reports:
    - a. Preliminary Report(s):
      - 1) Four copies to be given to Owner's Representative.
    - b. Final Report :
      - 1) Four copies to be given to Owner's Representative.
- B. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:

- a. Record Documentation:
  - 1) Testing and Inspection Reports:
    - a) Testing Agency Testing and Evaluation Final Report of testing, balancing, and adjusting air duct systems. Bind approved copy of Testing and Evaluation Report in Operations And Maintenance Manual for Division 23.

## 1.5 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Approved Testing Agency. Section 01 4301 applies, but is not limited to following:
    - a. Testing Agency shall specialize in testing and balancing of heating, ventilating, and cooling systems to balance, adjust, and test air moving equipment, air distribution, and exhaust systems.
    - b. Testing Agency shall provide proof of having successfully completed at least five years of specialized experience in air and hydronic system balancing.
    - c. Testing Agency shall provide testing under direct supervision of qualified heating and ventilating engineer.
    - d. Neither Architect's engineering consultant nor anyone performing work on this Project under other Sections of Division 23 shall be permitted to do this work.

## PART 2 - PRODUCTS: Not Used

## PART 3 - EXECUTION

### 3.1 OWNER-FURNISHED TESTING AND INSPECTION

- A. Owner to provide Testing and Inspection for testing, balancing, and adjusting air duct systems:
  - 1. See Section 01 1200: Multiple contracts for administrative and procedural requirements for Testing and Inspection services.

### 3.2 FIELD QUALITY CONTROL

- A. Field Tests
  - 1. Air System Testing, Adjusting, And Balance:
    - a. Inspections and site visits. (For paragraph a thru c, note deficiencies, if any, that needs to be corrected and report this to Owner's Representative, Architect, and Mechanical Engineer):
      - 1) One inspection when ductwork installation is 60% complete.
      - 2) One inspection when ductwork is installation is 90% complete.
      - 3) One inspection when potable hot and cold water system is 90% complete.
      - 4) Site visit for test and balance. Before commencing test and balance, perform an inspection to verify 100% completion of system. Confirm completion of work, correction of previously noted deficiencies, and look for new deficiencies not noted in previous inspections. If the work is complete, then proceed with test and balance. If the work is not complete and ready for test and balance, inform Contractor and submit an invoice to Owner's Representative for compensation for travel time, expenses, and time on site. Report deficiencies or incomplete work to Owner's Representative, Architect, and Mechanical Engineer.
      - 5) Additional site visits (beyond those set forth above) to complete the work after issues are resolved may be needed and will be paid for separately from compensation for services set forth in this Agreement, pursuant to hourly rates and conditions set forth in Attachment "A".
    - b. Checklist for Inspections and site visits:
      - 1) Pre-Startup Inspection – use for inspections and site visits a thru d in paragraph 1 above. All pertinent items shall be checked, including but not limited to following:

- a) Removal of shipping blocks and stops.
- b) Vibration isolators' alignment and adjustment.
- c) Flexible connections properly installed and aligned.
- d) Safety controls, safety valves and high or low limits in operation.
- e) All systems properly filled.
- f) Filters in place and seal provided around edges.
- g) Filters and strainers are clean.
- h) Fire damper installation and operation, and access door installation.
- i) Installation of all gauges on equipment.
- j) Control system is operating.
- k) All dampers, valves, and operators are properly installed and operating.
- l) All ductwork is installed and sealed.
- m) Voltage to unit matches nameplate voltage.
- 2) First Run Inspection – use for inspections and site visits d and e in paragraph 1 above. Recheck items in Pre-Startup list, and check for following items:
  - a) Excessive vibration or noise.
  - b) Loose components.
  - c) Initial control settings.
  - d) Motor amperages.
  - e) Heat buildup in motors.
  - f) Control system is calibrated and functioning as required.
- 3) System Operation Inspection – use for inspections and site visits d and e in paragraph 1 above. Observe mechanical systems under operation for sufficient amount of time to ensure proper operation in all running modes. Check following items periodically.
  - a) Filters and strainers.
  - b) Filters and strainers.
  - c) Check for system leaks at seals and valves.
- c. Performance Requirements:
  - 1) Testing and balancing in complete accordance with Associated Air Balance Council (AABC) Standards for Field Measurement & Instructions, Form P1266, Volume I.
- d. Site tests: Air Test and Balancing Procedure:
  - 1) Instruments used by Consultant shall be accurately calibrated and maintained in good working order.
  - 2) All supply air and return air fans in all HVAC zone systems, energy recovery ventilators, and exhaust fans in building shall be operating when final setup of all units is performed.
  - 3) Perform tests at high and low speeds of multi-speed systems and single speed systems.
  - 4) Perform following testing and balancing functions in accordance with Associated Air Balance Council National Standards.
    - a) Fan Speeds - Air handling units (with variable pitch pulleys and sheaves): Test and adjust fan RPM to achieve design CFM requirements.
    - b) Fan Speeds - Furnaces (with direct drive motors): Set fan speed to lowest possible setting that will achieve design CFM requirements. Adjust down from Contractor setting, if necessary. Adjust low voltage fan speed jumpers (provided and installed by installing contractor) as necessary to achieve design cooling air flow at lowest possible setting. An exception to this would be when furnace is variable speed blower for dehumidification applications.
    - c) Current And Voltage: Measure and record motor current and voltage.
    - d) Pitot-Tube Traverse Method:
      - (1) Make measurements in duct where velocity is uniform, 7-1/2 duct diameters downstream and 2 duct diameters minimum upstream from any turbulence, i.e., elbow, damper, take-off, etc.
      - (2) Perform pitot-tube traverse of outdoor ventilation air duct serving each piece of air moving equipment.
      - (3) Where single outdoor ventilation air trunk duct serves multiple pieces of equipment, perform pitot-tube traverse of duct branch serving each piece of equipment as well as pitot-tube traverse of total air flow in trunk with all pieces of equipment operating.



- e) Where pitot-tube traverse is not possible or if pitot-tube traverse is unreliable, flow hood measurement over exterior intake louver or grille is acceptable for measuring outdoor ventilation air.
- f) Use proportionate method of air balance leaving fan at lowest possible speed and at least one branch balance damper fully open.
- 5) Static Pressure: Test and record system static pressures, including suction and discharge static pressure of each fan.
- 6) Air Temperature: Take dry bulb air temperatures on entering and leaving side of each cooling coil. Dry bulb temperatures shall be taken on entering and leaving side of each heating unit.
- 7) Zone Ducts: Adjust zone ducts to within design CFM requirements. At least one zone balancing damper shall be completely open.
- 8) Branch Ducts: Adjust branch ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
- 9) Tolerances: Test and balance all fans, zone ducts, registers, diffusers etc. to + or – 10 percent of design CFM.
- 10) Identification: Identify location and area of each grille, diffuser, register, and terminal box. Record on air outlet data sheets.
- 11) Description: Record size, type, and manufacturer of each diffuser, grille, and register on air outlet data sheets.
- 12) Drafts: Adjust diffusers, grilles, and registers to minimize drafts. For high sidewall supply air diffusers install horizontal blade core to direct air flow upward 15 degree and set adjustable vertical blades to spread air flow horizontally and evenly in fan pattern.
- 13) Permanently mark all outside air, supply air, and return air damper positions after balancing has been completed.
- 14) Smoke testing: Smoke testing, or some other approved means, may be required to determine leak locations if air balance report indicates that any system's CFM total is less than 90 percent of design CFM. Prior to test, verify that system's duct joints have been sealed as specified and that air moving device in question is supplying required design system air flow. Mechanical Engineer will approve test method required. If smoke test is selected, use following procedure. Provide necessary precautions to protect those performing or observing test from being exposed to smoke.
  - a) Use zinc chloride smoke candles, titanium tetrachloride ampules or sticks, or other devices acceptable to Mechanical engineer to generate smoke.
  - b) Close openings in duct except for one opening at farthest end of duct run.
  - c) Circulate smoke at pressurized condition of **1/2 inch (13 mm)** minimum water gauge static pressure.
  - d) Report findings to mechanical engineer in writing.
- e. Air System Test and Evaluation Report:
  - 1) Record test data on AABC standard forms or facsimile.
  - 2) Preliminary Report: Provide and deliver four copies of complete data for evaluation and approval to Owner.
  - 3) Final report: Provide and deliver complete four copies of final report to Owner prior to project Substantial Completion date.
  - 4) Complete with logs, data, and records as required herein. Print logs, data, and records on white bond paper bound together in report form.
  - 5) Certified accurate and complete by Consultant's certified test and balance engineer.
  - 6) Contain following general data in format selected by Consultant:
    - a) Project Number.
    - b) Project Title.
    - c) Project Location.
    - d) Project Architect and Mechanical Engineer.
    - e) Consultant and Certified Engineer.
    - f) Contractor and mechanical sub-contractor.
    - g) Dates tests were performed.
    - h) Certification Document.
    - i) Report Forms similar to AABC Standard format.
  - 7) Report shall include following:
    - a) Instrumentation List including type, model, manufacturer, serial number, and calibration dates.

- b) HVAC zone identification to include reduced ductwork floor plan from project documents with outlets and inlets numbered to match written test and balance report. This page may be oversized but it should fold up neatly within standard 8 1/2 x 11 report paper size.
- c) Record following for each piece of air handling equipment:
  - (1) Manufacturer, model number, and serial number.
  - (2) Design and manufacture rated data.
  - (3) Actual CFM.
  - (4) Suction and discharge static pressure of each fan.
  - (5) Outdoor-ventilation-air and return-air total CFM.
  - (6) Final RPM of each motor or speed tap.
  - (7) Actual operating current and voltage of each fan motor.
  - (8) Fan and motor sheave manufacturer, model, size, number of grooves and center distance.
  - (9) Belt size and quantity.

### **3.3 PREPARATION**

- A. Heating, ventilating, and cooling systems and equipment shall be in full operation and continue in operation during each working day of testing and balancing.

**END OF SECTION**

**SECTION 01 5100****TEMPORARY UTILITIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Temporary Utilities.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Where necessary, engage appropriate local utility companies to install temporary service or connect to existing service. Where utility company provides only part of service, provide remainder with matching, compatible materials and equipment. Comply with utility company's recommendations.
1. Comply with industry standards and applicable laws and regulations of authorities having jurisdiction.
  2. Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.
  3. Arrange with utility company and existing users for time when service can be interrupted, where necessary, to make connections for temporary services.
  4. Provide adequate capacity at each stage of construction. Before temporary utility availability, provide trucked-in services.
  5. Obtain construction easements necessary to bring temporary and/or permanent utilities to site.
  6. Use qualified personnel for installation and maintenance of temporary facilities. Locate temporary utilities where they will serve Project adequately and result in minimum interference with the Work of Owner or other Contractors on Project Site. Relocate and modify temporary utilities as required.
  7. Pay cost and use charges for temporary and permanent utilities until Substantial Completion has been granted by Owner.
- B. Prepare schedule indicating dates for implementation and termination of each temporary utility. At earliest feasible time, change over from use of temporary service to use of permanent service.
- C. Keep temporary utilities clean and neat in appearance. Operate in safe and efficient manner. Take necessary fire prevention measures. Do not overload utilities, or allow them to interfere with progress of The Work. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on Project site.
- D. Limit availability of temporary utilities to essential and intended uses to reduce waste and abuse.
- E. Maintain temporary utilities 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 24-hour day basis where required to achieve indicated results and to avoid possibility of damage.
  2. Prevent water filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- F. Remove each temporary utility and control when need has ended, or when replaced by permanent utility, but not later than Substantial Completion. Complete permanent construction that may have been delayed because of interference with temporary utility. Repair damaged work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
1. Materials and facilities that make up temporary utilities are property of Contractor.

2. By Substantial Completion, clean and renovate permanent utilities used during 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 subjected to unusual operating conditions.
  - c. Replace lamps that are burned out or noticeably dimmed by substantial hours of use.

### **1.3 TEMPORARY ELECTRIC POWER**

- A. Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period.

### **1.4 TEMPORARY FIRE PROTECTION**

- A. Install and maintain temporary fire protection facilities of types needed to protect against predictable and controllable fire losses. At a minimum, provide and maintain in working order two Standard UL Labeled ABC all-purpose 10 lb fire extinguishers. Do not incorporate these extinguishers into final Project.
  1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
  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.
  4. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.

### **1.5 HEATING, COOLING, AND VENTILATING:**

- A. Install and operate temporary heating, cooling, and ventilating units including fuel, temporary piping, fittings, wiring, and connections necessary to provide environmental conditions specified for various portions of the Work. Coordinate ventilation requirements to produce ambient conditions required and reduce consumption of energy.
- B. Repair damage to building and contents caused by cold, heat, dampness, and/or heating, cooling, and ventilating equipment. Select equipment that will not have harmful effect on completed installations or on elements being installed.
- C. Maintain safe conditions for use of temporary heating, cooling, and ventilating systems including, but not limited to, following requirements:
  1. Operate equipment according to equipment manufacturer's instructions.
  2. Provide fresh air ventilation required by equipment manufacturer.
  3. Keep temperature of fuel containers stabilized.
  4. Secure fuel containers from overturning.
  5. Operate equipment away from combustible materials.
- D. Permanent mechanical system may be operated subject to following conditions:
  1. Do not operate system when work causing air-borne dust is occurring or when dust caused by such work is present without installation of temporary filtering system approved by Architect.
  2. Operate system at no cost to Owner, including cost of fuel.
  3. Assume all responsibility and risk for operation of system.
  4. Return permanent mechanical equipment to 'like-new' condition for Substantial Completion Inspection.

**1.6 TEMPORARY LIGHTING**

- A. Install and operate temporary lighting that will provide adequate illumination for construction operations and traffic conditions.

**1.7 TEMPORARY TELEPHONES**

- A. Provide temporary telephone service for all personnel engaged in construction activities, throughout construction period.
- B. Contractor will pay for Local calls. Party making call will pay for long-distance and toll calls.
- C. At each telephone, post list of important telephone numbers.

**1.8 TEMPORARY WATER SERVICE**

- A. Install water service and distribution piping of sizes and pressures adequate for construction until permanent water service is in use.

**PART 2 - PRODUCTS Not Used****PART 3 - EXECUTION Not Used**

**END OF SECTION**

**BLANK PAGE**

**SECTION 01 5200****CONSTRUCTION FACILITIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
  - 1. Administrative and procedural requirements for Construction Facilities.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Prepare schedule indicating dates for implementation and termination of each temporary facility.
- B. Keep temporary facilities clean and neat in appearance. Operate in safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or allow them to interfere with progress of The Work. Do not allow hazardous, dangerous or unsanitary conditions, or public nuisances to develop or persist on Project site.
- C. Maintain facilities in good operating condition until removal.
- D. Remove each temporary facility when need has ended, or when replaced by authorized use of permanent facility, or by Substantial Completion. Complete permanent construction that may have been delayed because of interference with temporary facility. Repair damaged work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
  - 1. Materials and facilities that make up temporary facilities are property of Contractor.
  - 2. By Substantial Completion, clean and renovate permanent facilities used during construction period.

**1.3 FIELD OFFICES**

- A. Provide and maintain insulated, weather tight temporary office of sufficient size to accommodate Contractor's personnel at Project site and for use by Owner, Architect and Subcontractors.
  - 1. Keep office clean and orderly.
  - 2. Heat and cool office as needed.
  - 3. Furnish office with locking door, light(s), table(s), bench(es), rack(s) for drawings, telephone, and FAX machine.
  - 4. Make office available for progress meetings.
  - 5. Provide an operable fire extinguisher in facility.
  - 6. Provide hardhats for Owner's Representatives for site visits.
- B. If Owner agrees to permit removal of temporary office before Substantial Completion, Contractor may use a room as an office after temporary office is removed. Equip room as specified above and restore to 'like-new' condition before Substantial Completion.

**1.4 SANITARY FACILITIES**

- A. Provide temporary sanitary toilet. Service and maintain temporary toilet in a clean, sanitary condition.

**PART 2 - PRODUCTS Not Used****PART 3 - EXECUTION Not Used****END OF SECTION**

**BLANK PAGE**



**SECTION 01 5400**

**CONSTRUCTION AIDS**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
  - 1. Administrative and procedural requirements for Construction Aids.

**1.2 SCAFFOLDING, PLATFORMS, STAIRS, ETC**

- A. Furnish and maintain equipment such as temporary stairs, ladders, ramps, platforms, scaffolds, hoists, runways, derricks, chutes, and elevators as required for proper execution of The Work.
- B. Apparatus, equipment, and construction shall meet requirements of applicable laws and safety regulations.

**PART 2 - PRODUCTS Not Used**

**PART 3 - EXECUTION Not Used**

**END OF SECTION**

**BLANK PAGE**

**SECTION 01 5600****TEMPORARY BARRIERS AND ENCLOSURES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
  - 1. Administrative and procedural requirements for Temporary Barriers and Enclosures.

**1.2 GENERAL**

- A. Protection Of Existing Improvements: Protect streets, private roads, and sidewalks, including overhead protection where required. Repair damage to existing improvements caused by construction activities.
- B. Protection Of Adjacent Property: Provide necessary protection for adjacent property and lateral support thereof.

**1.3 TEMPORARY AIR BARRIERS**

- A. Provide temporary air barriers as required for the stage of construction to maintain heating and cooling.

**1.4 TEMPORARY DUST BARRIERS**

- A. Provide temporary dust barrier as required to protect existing building.

**1.5 TEMPORARY BARRICADES**

- A. Comply with standards and code requirements in erecting barricades, warning signs, and lights.
- B. Take necessary precautions to protect persons, including members of the public, from injury or harm.

**1.6 TEMPORARY SECURITY BARRIERS**

- A. Install temporary enclosures of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and other violations of security.
- B. Secure materials and equipment stored on site.
- C. Secure building at the end of each work day.
- D. Maintain exterior building security until Substantial Completion.

**1.7 TEMPORARY TREE AND PLANT PROTECTION**

- A. Protection:
  - 1. Before commencing site work, build and maintain protective fencing around existing trees and vegetation as shown on the drawings.

2. Individual trees will have protective fencing built beyond drip line.
3. Build protective fencing around groups of trees and other vegetation as indicated on Drawings.
4. Keep areas within protective fencing undisturbed and do not use for any purpose.

B. Maintenance:

1. Maintain existing tree, shrubs, and vegetation as indicated in Contract Documents:
  - a. Remove and replace vegetation that dies or is damaged beyond repair due to construction activities.
  - b. Damage to any tree, shrub, or vegetation that has been indicated to remain and be protected, will have a cost associated with it. This includes branches, trunk and root systems:
    - 1) Trees: \$1,000.00.
    - 2) Shrubs: \$ 100.00.
    - 3) Vegetation: \$ 50.00.

C. Pruning:

1. Provide a qualified Tree Service Firm if pruning is required:
  - a. Coordinate with authorities having jurisdiction.
  - b. Coordinate with Owner and Architect on site before pruning is to begin.

**PART 2 - PRODUCTS Not Used**

**PART 3 - EXECUTION Not Used**

**END OF SECTION**

**SECTION 01 5700****TEMPORARY CONTROLS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
  - 1. Administrative and procedural requirements for Temporary Controls.

**1.2 TEMPORARY EROSION AND SEDIMENT CONTROL**

- A. Take precautions necessary to prevent erosion and transportation of soil downstream, to adjacent properties, and into on-site or off-site drainage systems.
- B. Develop, install, and maintain an erosion control plan if required by law.
- C. Repair and correct damage caused by erosion.

**1.3 TEMPORARY ENVIRONMENTAL CONTROLS**

- A. Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations, and reduce possibility that air, waterways, and subsoil might be contaminated or polluted, or that other undesirable effects might result:
  - 1. Avoid use of tools and equipment that produce harmful noise.
  - 2. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near site.
- B. Provide protection against weather (rain, winds, storms, frost, or heat) to maintain all work, materials, apparatus, and fixtures free from injury or damage.
- C. Protect excavation, trenches, and building from damage from rain water, spring water, ground water, backing up of drains or sewers, and all other water:
  - 1. For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with requirements of applicable local regulations. Where feasible, use permanent facilities.
  - 2. If sewers are not available or cannot be used, provide drainage ditches, dry wells, stabilization ponds, and similar facilities. Filter out excessive amounts of soil, construction debris, chemicals, oils and similar contaminants that might clog sewers or pollute waterways before discharge.
- D. Comply with governing ordinances relating to weed control and removal.

**PART 2 - PRODUCTS Not Used****PART 3 - EXECUTION Not Used****END OF SECTION**

**BLANK PAGE**

**SECTION 01 5800****PROJECT IDENTIFICATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Project Identification.

**1.2 TEMPORARY PROJECT SIGNAGE**

- A. Contractor may, at its option, erect a temporary project identification sign.
1. Sign may be free-standing or attached to temporary field office or storage shed.
  2. No other signs or advertisements are allowed on building site.
  3. Sign will be no larger than **4 feet by 8 feet (1 200 mm by 2 450 mm)** and include following information:
    - a. Project Name as shown in Contract Documents.
    - b. Contractor's name.
    - c. Architectural firm name.
  4. Owner reserves the right to remove and/or take possession of any project identification sign.

**PART 2 - PRODUCTS Not Used****PART 3 - EXECUTION Not Used****END OF SECTION**

**BLANK PAGE**



**SECTION 01 6100****COMMON PRODUCT REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Common Product Requirements.

**1.2 GENERAL**

- A. Provide products that comply with Contract Documents, that are undamaged, and, unless otherwise indicated, new and unused at time of installation. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for complete installation and for intended use and effect.
- B. Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on surfaces of products that will be exposed to view in occupied spaces or on building exterior.
1. Locate required product labels and stamps on concealed surface or, where required for observation after installation, on accessible surface that is not conspicuous.
  2. Provide permanent nameplates on items of service-connected or power-operated equipment. Locate on easily accessible surface that is inconspicuous in occupied spaces. Nameplate will contain following information and other essential operating data:
    - a. Name of product and manufacturer.
    - b. Model and serial number.
    - c. Capacity.
    - d. Speed.
    - e. Ratings.
- C. Where specifications describe a product or assembly by specifying exact characteristics required, with or without use of brand or trade name, provide product or assembly that provides specified characteristics and otherwise complies with Contract requirements.
- D. Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by manufacturer for application described. General overall performance of product is implied where product is specified for specific application. Manufacturer's recommendations may be contained in published product literature, or by manufacturer's certification of performance.
- E. Where specifications only require compliance with an imposed code, standard, or regulation, select product that complies with standards, codes or regulations specified.
- F. Where Specifications require matching an established Sample, Architect's decision will be final on whether proposed product matches satisfactorily. Where no product available within specified category matches satisfactorily nor complies with other specified requirements, refer to Architect.
- G. Where specified product requirements include phrase *' . . . as selected from manufacturer's standard colors, patterns, textures . . . '* or similar phrase, select product and manufacturer that comply with other specified requirements. Architect will select color, pattern, and texture from product line selected.

- H. Remove and replace products and materials not specified in Contract Documents but installed in the Work with specified products and materials at no additional cost to Owner and for no increase in Contract time.

**PART 2 - PRODUCTS Not Used****PART 3 - EXECUTION Not Used****END OF SECTION**

**SECTION 01 6200****PRODUCT OPTIONS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for Product Options.

**1.2 GENERAL**

- A. Product Selection:
1. When option of selecting between two or more products is given, product selected will be compatible with products previously selected, even if previously selected products were also options.
- B. Non-Conforming Work:
1. Non-conforming work as covered in Article 12.3 of General Conditions applies, but is not limited, to use of non-specified products or manufacturers.
- C. Product selection is governed by Contract Documents and governing regulations, not by previous Project experience. Procedures governing product selection include:
1. Substitutions And Equal Products:
    - a. Generally speaking, substitutions for specified products and systems, as defined in the Uniform Commercial Code, are not acceptable. However, equal products may be approved upon compliance with Contract Document requirements.
    - b. Approved Products / Manufacturers / Suppliers / Installers:
      - 1) Category One:
        - a) Owner has established 'Value Managed Relationships' that extend beyond requirements of this Project. No substitutions or equal products will be allowed on this Project.
        - b) Follow specified procedures to preserve relationships between Owner and specified manufacturers / suppliers and advantages that accrue to Owner from those relationships.
      - 2) Category Two:
        - a) Owner has established National Contracts that contain provisions extending beyond requirements of this Project. No substitutions or equal products will be allowed on this Project.
        - b) Follow specified procedures to preserve relationships between Owner and specified manufacturers / suppliers and advantages that accrue to Owner from those relationships.
      - 3) Category Three:
        - a) Specified products are provided to Church Projects under a National Account Program. Use these products to preserve advantages that accrue to Owner from those programs. No substitutions or equal products will be allowed on this Project.
      - 4) Category Four:
        - a) Provide only specified products available from manufacturers listed. No substitutions, private-labeled, or equal products, or mixing of manufacturers' products is allowed on this Project.
        - b) In Sections where lists recapitulating Manufacturers previously mentioned in Section are included under heading '*Manufacturers*' or '*Approved Manufacturers*', this is intended as a convenience to Contractor as a listing of contact information only. It is not intended that all manufacturers in list may provide products where specific products and manufacturers are listed elsewhere in Section.

- c. Acceptable Products / Manufacturers / Suppliers / Installers:
  - 1) Type One: Use specified products / manufacturers unless approval to use other products / manufacturers has been obtained from Architect by Addendum.
  - 2) Type Two: Use specified products / manufacturers unless approval to use other products and manufacturers has been obtained from Architect in writing before installing or applying unlisted or private-labeled products.
  - 3) Use 'Equal Product Approval Request Form' to request approval of equal products, manufacturers, or suppliers before bidding or before installation, as noted in individual Sections.
- d. Quality / Performance Standard Products / Manufacturers:
  - 1) Class One: Use specified product / manufacturer or equal product from specified manufacturers only.
  - 2) Class Two: Use specified product / manufacturer or equal product from any manufacturer.
  - 3) Products / manufacturers used shall conform to Contract Document requirements.

**PART 2 - PRODUCTS Not Used****PART 3 - EXECUTION Not Used****END OF SECTION**

**SECTION 01 6400****OWNER - FURNISHED PRODUCTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Administrative and procedural requirements for Owner-Furnished Products. Install items furnished by Owner or receive and store in safe condition items purchased directly by Owner according to requirements of Contract Documents:
  - 1. Baby Changing Station. See Section 10 2814.
  - 2. Fixed Markerboards. See Section 10 1116.
  - 3. Fixed Tackboards. See Section 10 1123.
  - 4. Interior Signage. See Section 10 1495.
  - 5. Network Equipment. See Section 27 1501:
    - a. Internet Firewall.
    - b. ISP Modem.
    - c. Network Switch.
    - d. Wireless Access Port.
  - 6. Network Streaming Equipment: See Section 27 4117 and Section 27 5117.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. General:
  - 1. Review 'Contractor Notification Report' listing Owner-furnished products to be delivered for Project:
    - a. Review delivery dates and vendor lead times for each item and coordinate with construction schedule. Immediately report recommended changes to Owner's Purchasing Coordinator listed in 'Contractor Notification Report.' Contact vendors directly if changes to delivery dates become necessary during construction.
    - b. Report problems in coordinating delivery dates with construction schedule to Architect and Owner's Purchasing Coordinator.
  - 2. Receive and unload Owner-furnished materials and products.
    - a. Provide labor and equipment necessary to receive, unload, and store materials and products.
    - b. Verify that number of packages received matches number listed on bill of lading.
    - c. Check for external damage.
    - d. Note discrepancies between pieces received and pieces listed on bill of lading as well as instances of visible damage on bill of lading before signing. Include Project Name and Project Number on bill of lading
    - e. Store and protect deliveries. Report deliveries made outside of delivery schedule to Owner's Purchasing Coordinator.
  - 3. Within twenty four (24) hours of delivery:
    - a. Open and inspect each piece of freight delivered. Note concealed damage not observed at time of delivery.
    - b. Compare 'Contractor Notification Report' with packing slips. Note discrepancies in number, size, color, model numbers, etc.
    - c. Deliver bills of lading on which loss or damage is recorded, or copy, to Owner's Purchasing Coordinator together with report of concealed damage and discrepancies.
    - d. Notify Owner's Purchasing Coordinator immediately of damage and discrepancies.
  - 4. As directed by Owner, either repair or replace shortages and damaged items not recorded and reported as specified above at no additional cost to Owner.

**PART 2 - PRODUCTS Not Used**

**PART 3 - EXECUTION Not Used**

**END OF SECTION**

**SECTION 01 6600****PRODUCT DELIVERY, STORAGE, AND HANDLING REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
  - 1. Administrative and procedural requirements for Product Delivery, Storage, and Handling Requirements.

**1.2 GENERAL**

- A. Deliver, store, and handle products according to manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

**1.3 DELIVERY AND ACCEPTANCE REQUIREMENTS**

- A. Schedule delivery to reduce long-term storage at site and to prevent overcrowding of construction spaces.
- B. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
- C. Deliver products to site in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
- D. Inspect products upon delivery to ensure compliance with Contract Documents, and to ensure that products are undamaged and properly protected.

**1.4 STORAGE AND HANDLING REQUIREMENTS**

- A. Store products at site in manner that will simplify inspection and measurement of quantity or counting of units.
- B. Store heavy materials away from Project structure so supporting construction will not be endangered.
- C. Store products subject to damage by elements above ground, under cover in weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

**PART 2 - PRODUCTS Not Used****PART 3 - EXECUTION Not Used****END OF SECTION**

**BLANK PAGE**



**SECTION 01 7300****EXECUTION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
1. Administrative and procedural requirements for governing Execution of the Work.

**1.2 COMMON INSTALLATION PROVISIONS**

- A. Manufacturer's Instructions: Comply with Manufacturer's installation instructions and recommendations to extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents. Notify Architect of conflicts between Manufacturer's installation instructions and Contract Document requirements.
- B. Provide attachment and connection devices and methods necessary for securing Work. Secure work true to line and level. Anchor each product securely in place, accurately located, and aligned with other Work. Allow for expansion and building movement.
- C. Visual Effects: Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain best visual effect. Refer questionable choices to Architect for final decision.
- D. Install each component during weather conditions and Project status that will ensure best possible results. Isolate each part of completed construction from incompatible material as necessary to prevent deterioration.
- E. Coordinate temporary enclosures with required inspections and tests, to reduce necessity of uncovering completed construction for that purpose.
- F. Mounting Heights: Where mounting heights are not shown, install individual components at standard mounting heights recognized within the industry or local codes for that application. Refer questionable mounting height decisions to Architect for final decision.

**PART 2 - PRODUCTS Not Used****PART 3 - EXECUTION Not Used****END OF SECTION**

**BLANK PAGE**

**SECTION 01 7400****CLEANING AND WASTE MANAGEMENT****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Administrative and procedural requirements for Cleaning and Waste Management as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 01 1200: Coordination of responsibilities for waste management.
  - 2. Section 01 6400: Waste removal of Owner furnished products.
  - 3. In addition to standards described in this section, comply with all requirements for cleaning-up as described in various other Sections of these Specifications.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Asphalt Pavement, Brick, and Concrete (ABC) Rubble: Rubble that contains only weathered (cured) asphalt pavement, clay bricks and attached mortar normally used in construction, or concrete that may contain rebar. The rubble shall not be mixed with, or contaminated by, another waste or debris.
  - 2. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
  - 3. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
  - 4. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
  - 5. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
  - 6. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
  - 7. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

**PART 2 - PRODUCTS Not Used****PART 3 - EXECUTION****3.1 PROGRESS CLEANING**

- A. Comply with regulations of authorities having jurisdiction and safety standards for cleaning.
- B. Keep premises broom clean during progress of the Work.
- C. Keep site and adjoining streets reasonably clean. If necessary, sprinkle rubbish and debris with water to suppress dust.
- D. During handling and installation, protect construction in progress and adjoining materials in place. Apply protective covering where required to ensure protection from soiling, damage, or deterioration until Substantial Completion.
- E. Clean and maintain completed construction as frequently as necessary throughout construction period. Adjust and lubricate operable components to ensure ability to operate without damaging effects.

- F. Supervise construction activities to ensure that no part of construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.
- G. Before and during application of painting materials, clear area where such work is in progress of debris, rubbish, and building materials that may cause dust. Sweep floors and vacuum as required and take all possible steps to keep area dust free.
- H. Clean exposed surfaces and protect as necessary to avoid damage and deterioration.
- I. Place extra materials of value remaining after completion of associated work have become Owner's property as directed by Owner or Architect.
- J. Construction Waste Management And Disposal:
  - 1. Remove waste materials and rubbish caused by employees, Subcontractors, and contractors under separate contract with Owner and dispose of legally. Remove unsuitable or damaged materials and debris from building and from property.
    - a. Provide adequate waste receptacles and dispose of materials when full.
    - b. Properly store volatile waste and remove daily.
    - c. Do not deposit waste into storm drains, sanitary sewers, streams, or waterways. Do not discharge volatile, harmful, or dangerous materials into drainage systems.
  - 2. Do not burn waste materials or build fires on site. Do not bury debris or excess materials on Owner's property.

### **3.2 FINAL CLEANING**

- A. Immediately before Substantial Completion, thoroughly clean building and area where The Work was performed. Remove all rubbish from under and about building, landscaped areas and parking lot and leave building and Project Site ready for occupancy by Owner.
- B. Comply with individual manufacturer's cleaning instructions.
- C. Clean each surface or unit to condition expected in normal, commercial building cleaning and maintenance program, including but not limited to:
  - 1. Interior Cleaning:
    - a. Clean inside glazing, exercising care not to scratch glass.
    - b. Remove marks, stains, fingerprints and dirt.
    - c. Clean and polish woodwork and finish hardware.
    - d. Remove labels that are not permanent labels.
    - e. Clean plumbing fixtures and tile work. Remove spots, soil or paint.
    - f. Clean surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean light fixtures and lamps.
    - g. Clean other fixtures and equipment and remove stains, paint, dirt, and dust.
    - h. Remove temporary floor protection and clean floors.
  - 2. Exterior Cleaning:
    - a. Clean outside glazing, exercising care not to scratch glass.
    - b. Remove marks, stains, and dirt from exterior surfaces.
    - c. Clean and polish finish hardware.
    - d. Remove temporary protection systems.
    - e. Clean dirt, mud, and other foreign material from paving, sidewalks, and gutters.
    - f. Clean drop inlets, through-curb drains, and other drainage structures.
    - g. Remove trash, debris, and foreign material from landscaped areas.

**END OF SECTION**

**SECTION 01 7700****CLOSEOUT PROCEDURES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
  - 1. Administrative and procedural requirements for Closeout Procedures.

**1.2 GENERAL**

- A. Closeout process consists of three specific project closeout inspections. Contractor shall plan sufficient time in construction schedule to allow for required inspections before expiration of Contract Time.
- B. Contractor shall conduct his own inspections of The Work and shall not request closeout inspections until The Work of the contract is reasonably complete and correction of obvious defects or omissions are complete or imminent.
- C. Date of Substantial Completion shall not occur until completion of construction work, unless agreed to by Architect and included on Certificate of Substantial Completion.

**1.3 PRELIMINARY CLOSEOUT REVIEW**

- A. When Architect, Owner and Contractor agree that project is ready for closeout, Pre-Substantial Inspection shall be scheduled. Preparation of floor substrate to receive carpeting and any work which could conceivably damage or stain carpet must be completed, as carpet installation will be scheduled immediately following this inspection.
- B. Prior to this inspection, completed test and evaluation reports for HVAC system and font, where one occurs, are to be provided to Project Manager, Architect, and applicable consultants.
- C. Architect and his appropriate consultants, together with Contractor and mechanical, plumbing, fire protection, and electrical sub-contractors shall conduct a space by space and exterior inspection to review materials and workmanship and to demonstrate that systems and equipment are operational.
  - 1. Punch list of items requiring completion and correction will be created.
  - 2. Time frame for completion of punch list items will be established, and date for Substantial Completion Inspection shall be set.

**1.4 SUBSTANTIAL COMPLETION INSPECTION**

- A. When Architect, Owner and Contractor agree that project is ready for Substantial Completion, an inspection is held. Punch list created at Pre-Substantial Inspection is to be substantially complete.
- B. Prior to this inspection, Contractor shall discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups and similar elements.
- C. Architect, Owner and Contractor review completion of punch list items. When Owner and Architect confirm that Contractor has achieved Substantial Completion of The Work, Owner, Architect and Contractor will execute Certificate of Substantial Completion that contains:
  - 1. Date of Substantial Completion.
  - 2. Punch List Work not yet completed, including seasonal and long lead items.

3. Amount to be withheld for completion of Punch List Work.
  4. Time period for completion of Punch List Work.
  5. Amount of liquidated damages set forth in Supplementary Conditions to be assessed if Contractor fails to complete Punch List Work within time set forth in Certificate.
- D. Contractor shall present Closeout Submittals to Architect and place tools, spare parts, extra stock, and similar items required by Contract Documents in locations as directed by Facilities Manager.

## **1.5 FINAL ACCEPTANCE MEETING**

- A. When punch list items except for any seasonal items or long lead items which will not prohibit occupancy are completed, Final Acceptance Meeting is held.
- B. Owner, Architect and Contractor execute Owner's Project Closeout - Final Acceptance form, and verify:
1. All seasonal and long lead items not prohibiting occupancy, if any, are identified, with committed to completion date and amount to be withheld until completion.
  2. Owner's maintenance personnel have been instructed on all system operation and maintenance as required by the Contract Documents.
  3. Final cleaning requirements have been completed.
- C. If applicable, once any seasonal and long lead items are completed, Closeout Inspection is held where Owner and Architect verify that The Work has been satisfactorily completed, and Owner, Architect and Contractor execute Closeout portion of the Project Closeout - Final Acceptance form.
- D. When Owner and Architect confirm that The Work is satisfactorily completed, Architect will authorize final payment.

## **PART 2 - PRODUCTS Not Used**

## **PART 3 - EXECUTION Not Used**

**END OF SECTION**

**SECTION 01 7800****CLOSEOUT SUBMITTALS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But is Not Limited To:
  - 1. Administrative and procedural requirements for Closeout Submittals.

**1.2 GENERAL**

- A. Workmanship bonds, final certifications, equipment check-out sheets, and similar documents.
- B. Releases enabling Owner unrestricted use of The Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
- C. Project photographs, damage or settlement survey, and similar record information required by Contract Documents.

**1.3 OPERATIONS AND MAINTENANCE DATA**

- A. Operations And Maintenance Manual(s) that include:
  - 1. Certifications required by Contract Documents.
  - 2. Copies of warranties required by Contract Documents.
  - 3. Copy of complete Project Manual including Addenda, Modifications as defined in General Conditions, and other interpretations issued during construction.
    - a. Mark these documents to show variations in actual Work performed in comparison with text of specifications and Modifications. Show substitutions, selection of options, and similar information, particularly on elements that are concealed or cannot otherwise be readily discerned later by direct observation.
    - b. Note related record drawing information and Product Data.
  - 4. Copy of Soils Report.
  - 5. Operations and maintenance submittals required by Contract Documents.
  - 6. Site Management Plan (SMP):
    - a. Maintenance recommendations for Site Management Plan (SMP) required by Contract Documents.
    - b. Recommended procedures to be established by Owner for maintenance of landscape work for one (1) full year after contract maintenance period ends required by Contract Documents.
  - 7. Testing and Inspection Reports required by Contract Documents.

**1.4 WARRANTIES**

- A. When written guarantees beyond one (1) year after substantial completion are required by Contract Documents, secure such guarantees and warranties properly addressed and signed in favor of Owner. Include these documents in Operations & Maintenance Manual(s) specified above.
- B. Delivery of guarantees and warranties will not relieve Contractor from obligations assumed under other provisions of Contract Documents.

**1.5 PROJECT RECORD DOCUMENTS**

- A. Do not use record documents for construction purposes. Protect from deterioration and loss in secure, fire-resistive location. Provide access to record documents for Architect's reference during normal working hours.
- B. Maintain clean, undamaged set of Drawings. Mark set to show actual installation where installation varies from the Work as originally shown. 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 Owner, but was not shown on Drawings.
  - 3. Note related Change Order numbers where applicable.

**1.6 SPARE PARTS**

- A. Provide items that are indicated in individual Sections.

**1.7 EXTRA STOCK MATERIALS**

- A. Provide items that are indicated in individual Sections.

**PART 2 - PRODUCTS Not Used****PART 3 - EXECUTION Not Used**

**END OF SECTION**



**SECTION 02 4113****SELECTIVE SITE DEMOLITION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Demolish and remove portions of existing site facilities as described in Contract Documents.
- B. Related Requirements:
  - 1. New and replacement work specified in appropriate specification Sections.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Scheduling:
  - 1. Include on Construction Schedule specified in Section 01 3200 detailed sequence of individual site demolition operations.

**1.3 SUBMITTALS**

- A. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Record Documentation:
      - 1) Identify abandoned utility and service lines and capping locations on record drawings.

**PART 2 - PRODUCTS: Not Used****PART 3 - EXECUTION****3.1 PREPARATION**

- A. Notify corporations, companies, individuals, and local authorities owning conduits running to property.
  - 1. Protect and maintain conduits, drains, sewers, pipes, and wires that are to remain on the property.
  - 2. Arrange for removal of wires running to and on property. Remove pipes and sewers in accordance with instructions of above owners.

**3.2 PERFORMANCE**

- A. Execute work in orderly and careful manner, with due consideration for neighbors and the public.
- B. Carefully remove, disassemble, or dismantle as required, and store in approved location on site, existing items to be reused in completed work. Coordinate with Owner for equipment and materials to be removed by Owner.
- C. Concrete And Paving Removal:
  - 1. Saw cut joints between material to be removed and material to remain to full depth.
  - 2. Hand-excavate trench **12 inches** wide and **16 inches** deep along concrete or paving to be removed. Cut roots encountered with saw, axe, or pruner. Do not cut roots with excavating

equipment. Remove roots under concrete and paving to be replaced down to **12 inches** below finish grade.

### **3.3 CLEANING**

- A. Keep streets and roads reasonably clean, and sweep daily.
- B. Sprinkle demolition rubbish and debris as necessary to lay dust.
- C. Promptly remove demolition materials, rubbish, and debris from property.

**END OF SECTION**

**SECTION 02 4119****SELECTIVE STRUCTURE DEMOLITION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Demolition and removal of selected portions of building or structure.
  - 2. Salvage of existing items to be reused or recycled.
- B. Related Requirements:
  - 1. Section 26 0501: 'Common Electrical Requirements' for salvage of existing electrical items to be reused or recycled removed by Owner.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. National Fire Protection Association / American National Standards Institute:
    - a. NFPA 241, 'Standard for Safeguarding Construction, Alteration, and Demolition Operations', 2013 Edition.
  - 2. American Society of Safety Engineers:
    - a. ASSE A10.6-2006, 'Safety Requirements for Demolition Operations'.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Storage or sale of removed items or materials will not be permitted on-site.
- B. Pre-Installation Conference:
  - 1. Before beginning Selective Demolition work, in addition to requirements of Section 01 3100, meet on site to confirm work to be demolished, items to be salvaged or reused, and coordination with Owner.
- C. Scheduling:
  - 1. Indicate detailed sequence of selective demolition and removal work, with starting and ending dates for each activity, on Schedule specified in Section 01 3200.

**1.4 QUALITY ASSURANCE**

- A. Regulatory Agency Sustainability Approvals:
  - 1. Comply with governing EPA notification regulations before beginning selective demolition.
  - 2. Comply with hauling and disposal regulations of authorities having jurisdiction.
  - 3. Standards: Comply with ANSI A10.6 and NFPA 241.

**1.5 FIELD CONDITIONS**

- A. Existing Conditions:
  - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

**PART 2 - PRODUCTS: Not Used****PART 3 - EXECUTION****3.1 EXAMINATION****A. Verification Of Conditions:**

1. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
  - a. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

**B. Evaluation And Assessment:**

1. Hazardous Materials:
  - a. It is not expected that hazardous materials will be encountered in the Work. Identified hazardous materials will be removed by Owner before start of the Work.
  - b. If materials suspected of containing hazardous materials are encountered, do not disturb and immediately notify Architect.
2. Inventory and record condition of items to be removed and reinstalled and items to be removed and salvaged.
3. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure nature and extent of conflict. Promptly submit written report to Architect.
4. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

**3.2 PREPARATION****A. Temporary Facilities:**

1. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
2. Maintain fire-protection facilities in service during selective demolition operations.

**B. Temporary Shoring:**

1. Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
2. Strengthen or add new supports when required during progress of selective demolition.

**C. Utility Services:**

1. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
2. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
  - a. Arrange to shut off indicated utilities with utility companies.
  - b. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.

**3.3 SELECTIVE DEMOLITION****A. General:**

1. Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

2. Demolish and remove existing construction only to extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
  - a. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
  - b. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  - c. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
  - d. Maintain adequate ventilation when using cutting torches.
  - e. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  - f. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
  - g. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  - h. Dispose of demolished items and materials promptly.
- B. Selective Demolition Procedures For Specific Materials:
  1. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.
  2. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
  3. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- C. Removed and Salvaged Items:
  1. Relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.
    - a. Clean salvaged items as directed by Owner.
    - b. Pack or crate items after cleaning. Identify contents of containers.
    - c. Store items in a secure area until delivery to Owner.
    - d. Transport items to Owner's storage area designated by Owner.
    - e. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
  1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
  2. Pack or crate items after cleaning and repairing. Identify contents of containers.
  3. Protect items from damage during transport and storage.
  4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain:
  1. Protect construction indicated to remain against damage and soiling during selective demolition.
  2. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

**3.4 CLEANING**

- A. General:
  - 1. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations.
  - 2. Return adjacent areas to condition existing before selective demolition operations began.
- B. Waste Management:
  - 1. Disposal of Demolished Materials:
    - a. Remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill. Do not burn demolished materials.
      - 1) Do not allow demolished materials to accumulate on-site.
      - 2) Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
      - 3) Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

**END OF SECTION**

**SECTION 03 1113****STRUCTURAL CAST-IN-PLACE CONCRETE FORMING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Design, construction, and safety of formwork.
  - 2. Furnish and install required formwork ready for placing of concrete.
  - 3. Strip and dispose of formwork.
- B. Related Requirements:
  - 1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
  - 2. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
  - 3. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
  - 4. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
  - 5. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection and testing laboratory services for materials, products, and construction methods.
  - 6. Section 01 7800: 'Closeout Submittals'.
  - 7. Section 03 3111: 'Cast-In-Place Structural Concrete' for:
    - a. Tolerances for placing structural concrete.
    - b. Pre-installation conference held jointly with other concrete related sections.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. Council of American Structural Engineers. CASE Form 101: *Statement of Special Inspections*. Washington, DC: CASE, 2001. (c/o American Council of Engineering Companies, 1015 15<sup>th</sup> St., NW, Washington, DC 20005; 202-347-7474; [www.acec.org](http://www.acec.org)).
- B. Definitions (Following are specifically referenced for testing):
  - 1. Accreditation: Process in which certification of competency, authority, or credibility is presented. Verify that laboratories have an appropriate quality management system and can properly perform certain test methods (e.g., ANSI, ASTM, and ISO test methods) and calibration parameters according to their scopes of accreditation.
  - 2. Approved: To authorize, endorse, validate, confirm, or agree to.
  - 3. Field Quality Control: Testing, Inspections, Special Testing and Special Inspections to assure compliance to Contract Documents.
  - 4. Inspection/Special Inspection: Inspection of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards:
    - a. Inspection: Not required by code provisions but may be required by Contract Documents.
    - b. Special Inspection: Required by code provisions and by Contract Documents.
    - c. Inspection-Continuous: Full-time observation of the Work requiring inspection by approved inspector who is present in area where the Work is being performed.
    - d. Inspection-Periodic: Part-time or intermittent observation of the Work requiring inspection by approved inspector who is present in area where the Work has been or is being performed and at completion of the Work.
  - 5. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform particular construction operation, including installation, erection, application, and similar operations.

- a. Using term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades people of corresponding generic name.
  6. Observation: Visual observation of building / site elements or structural system by registered design professional for general conformance to approved construction documents at significant construction stages and at completion. Observation does not include or waive responsibility for performing inspections or special inspections.
  7. Owner's Representative: Owner's Designated Representative (Project Manager or Facilities Manager) who will have express authority to bind Owner with respect to all matters requiring Owner's approval or authorization.
  8. Preconstruction Testing: Tests and inspections that are performed specifically for Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
  9. Product Testing: Tests and inspections that are performed by testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
  10. Quality Assurance: Testing, Inspections, Special Testing and Special Inspections provided for by Owner.
  11. Quality Control: Testing, Inspections, Special Testing and Special Inspections provided for by Contractor.
  12. Service Provider: Agency or firm qualified to perform required tests and inspections.
  13. Source Quality Control Testing: Tests and inspections that are performed at source, i.e., plant, mill, factory, or shop.
  14. Special Inspection: See Inspection.
  15. Special Inspector: Certified individual or firm that implements special inspection program for project.
  16. Special Test: See Test.
  17. Test/Special Test: Field or laboratory tests to determine characteristics and quality of building materials and workmanship.
    - a. Test: Not required by code provisions but may be required by Contract Documents.
    - b. Special Test: Required by code provisions and by Contract Documents.
  18. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
  19. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
  20. Verification: Act of reviewing, inspecting, testing, etc. to establish and document that product, service, or system meets regulatory, standard, or specification requirements.
- C. Reference Standards:
1. American Concrete Institute:
    - a. ACI 318-14, 'Building Code Requirements for Structural Concrete and Commentary'.
  2. ASTM International (Following are specifically referenced for Testing Agencies):
    - a. ASTM D1751-04 (2013), 'Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)'.
    - b. ASTM E329-14a: 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing'.
  3. International Code Council (IBC):
    - a. IBC Chapter 17, 'Structural Tests and Special Inspections'.

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
1. Participate in pre-installation conference as specified in Section 03 3111.
  2. In addition to agenda items specified in Section 01 3100 and 31 3111, review following:
    - a. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
      - 1) Review frequency of testing and inspections.



- B. Scheduling:
  - 1. Notify Testing Agency and Architect as directed in Section 03 3053 and Section 03 3111.

## 1.4 SUBMITTALS

- A. Informational Submittals:
  - 1. Manufacturer Instructions:
    - a. Printed application instructions for form release agents.
- B. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Record Documentation:
      - 1) Testing and Inspection Reports:
        - a) Testing Agency Inspecting Reports of concrete formwork.

## 1.5 QUALITY ASSURANCE

- A. Testing and Inspection:
  - 1. Owner will provide Testing and Inspection for inspection of concrete formwork:
    - a. Owner will employ testing agencies to perform inspection of concrete formwork as specified in Field Quality Control in Part 3 of this specification.
      - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
      - 2) See Section 01 1200: 'Multiple Contract Summary'.
    - b. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control.
      - 1) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.

## PART 2 - PRODUCTS

### 2.1 COMPONENTS

- A. Forms: Wood, metal, or plastic as arranged by Contractor:
  - 1. Forming material shall be compatible with specified form release agents and with finish requirements for concrete to be left exposed or to receive a smooth rubbed finish.

### 2.2 ACCESSORIES

- A. Form Release Agents:
  - 1. Unexposed Surfaces Only: Contractor's option.
- B. Expansion / Contraction Joints:
  - 1. **1/2 inch** thick.
  - 2. Manufactured commercial fiber type:
    - a. Meet requirements of ASTM D1751.
    - b. Type Two Acceptable Products:
      - 1) Conflex by Knight-Celotex, Northfield, IL [www.aknightcompany.com](http://www.aknightcompany.com).
      - 2) Sealtight by W R Meadows Inc, Hampshire, IL [www.wrmeadows.com](http://www.wrmeadows.com).
      - 3) Equal as approved by Architect before installation. See Section 01 6200.
- 3. Recycled Vinyl:
  - a. Light gray color.
  - b. Type Two Acceptable Products:
    - 1) Proflex by Oscoda Plastics Inc, Oscoda, MI [www.oscodaplastics.com](http://www.oscodaplastics.com).
    - 2) Equal as approved by Architect before Installation. See Section 01 6200.

**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Forms:
  - 1. Assemble forms so forms are sufficiently tight to prevent leakage.
  - 2. Properly brace and tie forms.
  - 3. Provide temporary cleanouts at base of tall forms to facilitate cleaning and inspection.
  - 4. Make proper form adjustments before, during, and after concreting.
  - 5. Use new forms, or used forms that have been cleaned of loose concrete and other debris from previous concreting and repaired to proper condition. Use APA Plyform B-B Class I, or APA HDO Plyform B-B Class I, on exposed to view concrete that do not receive a smooth rubbed finish.
  - 6. Use metal cold joint forms when unable to place concrete for footings, foundations, and slabs in continuous pours.
- B. Accessories:
  - 1. General:
    - a. Provide for installation of inserts, templates, fastening devices, sleeves, and other accessories to be set in concrete before placing.
    - b. Position anchor bolts for hold-down anchors and columns and securely tie in place before placing concrete.
  - 2. Expansion Joints:
    - a. Install at joints between floor slab and foundation wall where shown on Drawings.
- C. Form Removal:
  - 1. Removal of forms can usually be accomplished in twelve (12) to twenty four (24) hours.
  - 2. If temperature is below **50 deg F** or if concrete (stairs, beams, etc) depends on forms for structural support, leave forms intact for sufficient period for concrete to reach adequate strength.
  - 3. For exposed to view surfaces that receive a smooth rubbed finish, remove forms while concrete is still "green".
  - 4. Metal bars or prys should not be used. Use wood wedges, tapping gradually when necessary.

**3.2 FIELD QUALITY CONTROL**

- A. Field Tests And Inspections:
  - 1. General:
    - a. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
    - b. Quality Control is sole responsibility of Contractor as specified in Section 01 4523 'Testing And Inspection Services'.
  - 2. Concrete Formwork:
    - a. Inspections are not required and will be performed at discretion of Architect.
    - b. Inspections, if performed, will include following:
      - 1) Concrete Formwork:
        - a) Certified Inspector shall inspect forms for general location, configuration, camber, shoring, sealing of form joints, correct forming material, concrete accessories, and form tie locations.
  - 3. Concrete Formwork (Concrete Retaining Walls):
    - a. Inspections are required.
    - b. Inspections will include following:
      - 1) Periodic inspect of formwork for shape, location and dimensions of concrete member being formed.
      - a) Certified Inspector shall inspect forms for general location, configuration, camber, shoring, sealing of form joints, correct forming material, concrete accessories, and form tie locations.

**END OF SECTION**

**SECTION 03 1511****CONCRETE ANCHORS AND INSERTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Cast-in anchors for concrete.
  - 2. Headed concrete anchor studs for concrete.
  - 3. Deformed bar anchors for concrete.
  - 4. Adhesive anchors and inserts for concrete.
  - 5. Drilled-in mechanical anchors for concrete.
  - 6. Screw anchors for concrete.
  - 7. Concrete anchors and inserts not specified elsewhere.
- B. Related Requirements:
  - 1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
  - 2. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
  - 3. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
  - 4. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
  - 5. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
  - 6. Section 01 7800: 'Closeout Submittals'.
  - 7. Section 03 3111: 'Cast-In-Place Structural Concrete' for installation of cast-in-place anchors and inserts.
  - 8. Section 06 1100: 'Wood Framing' for installation of drilled in anchors.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. Council of American Structural Engineers. CASE Form 101: *Statement of Special Inspections*. Washington, DC: CASE, 2001. (c/o American Council of Engineering Companies, 1015 15<sup>th</sup> St., NW, Washington, DC 20005; 202-347-7474; [www.acec.org](http://www.acec.org)).
- B. Definitions (Following are specifically referenced for testing):
  - 1. Accreditation: Process in which certification of competency, authority, or credibility is presented. Verify that laboratories have an appropriate quality management system and can properly perform certain test methods (e.g., ANSI, ASTM, and ISO test methods) and calibration parameters according to their scopes of accreditation.
  - 2. Approved: To authorize, endorse, validate, confirm, or agree to.
  - 3. Field Quality Control: Testing, Inspections, Special Testing and Special Inspections to assure compliance to Contract Documents.
  - 4. Inspection/Special Inspection: Inspection of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards:
    - a. Inspection: Not required by code provisions but may be required by Contract Documents.
    - b. Special Inspection: Required by code provisions and by Contract Documents.
    - c. Inspection-Continuous: Full-time observation of the Work requiring inspection by approved inspector who is present in area where the Work is being performed.
    - d. Inspection-Periodic: Part-time or intermittent observation of the Work requiring inspection by approved inspector who is present in area where the Work has been or is being performed and at completion of the Work.

5. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform particular construction operation, including installation, erection, application, and similar operations.
  6. Observation: Visual observation of building / site elements or structural system by registered design professional for general conformance to approved construction documents at significant construction stages and at completion. Observation does not include or waive responsibility for performing inspections or special inspections.
  7. Owner's Representative: Owner's Designated Representative (Project Manager or Facilities Manager) who will have express authority to bind Owner with respect to all matters requiring Owner's approval or authorization.
  8. Preconstruction Testing: Tests and inspections that are performed specifically for Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
  9. Product Testing: Tests and inspections that are performed by testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
  10. Quality Assurance: Testing, Inspections, Special Testing and Special Inspections provided for by Owner.
  11. Quality Control: Testing, Inspections, Special Testing and Special Inspections provided for by Contractor.
  12. Service Provider: Agency or firm qualified to perform required tests and inspections.
  13. Source Quality Control Testing: Tests and inspections that are performed at source, i.e., plant, mill, factory, or shop.
  14. Special Inspection: See Inspection.
  15. Special Inspector: Certified individual or firm that implements special inspection program for project.
  16. Special Test: See Test.
  17. Test/Special Test: Field or laboratory tests to determine characteristics and quality of building materials and workmanship.
    - a. Test: Not required by code provisions but may be required by Contract Documents.
    - b. Special Test: Required by code provisions and by Contract Documents.
  18. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
  19. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
  20. Verification: Act of reviewing, inspecting, testing, etc. to establish and document that product, service, or system meets regulatory, standard, or specification requirements.
- C. Reference Standards:
1. American Concrete Institute:
    - a. ACI 355.4-11, 'Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary'.
    - b. ACI 355.4M-11, 'Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary (Metric)'.
    - c. ACI 548.12-12, 'Specification for Bonding Hardened Concrete and Steel to Hardened Concrete with an Epoxy Adhesive'.
  2. ASTM International:
    - a. ASTM A1064/A1064M-14, 'Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete'.
  3. ASTM International (Following are specifically referenced for Testing Agencies):
    - a. ASTM C1077-15, 'Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation'.
    - b. ASTM D3666-13, 'Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials'.
    - c. ASTM D3740-12a, 'Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction'.
    - d. ASTM E329-14a: 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing'.

- e. ASTM E488-10, 'Standard Test Methods for Strength of Anchors in Concrete Elements'.
- f. ASTM E543-15, 'Standard Specification for Agencies Performing Nondestructive Testing'.
- g. ASTM E1212-12, 'Standard Practice for Quality Management Systems for Nondestructive Testing Agencies'.
- h. ASTM F1554-07a, 'Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength'.
- 4. International Code Council (IBC):
  - a. IBC Chapter 17, 'Structural Tests and Special Inspections'.
  - b. ICC-ES Reports: 'ES Acceptance Criteria - Concrete Anchor Compendium':
    - 1) AC193, 'Acceptance Criteria For Mechanical Anchors in Concrete Elements' (approved June 2012).
    - 2) AC308 'Acceptance Criteria For Post-Installed Adhesive Anchors In Concrete Elements' (approved May 2014).
  - c. ICC/ESR-1056, 'Titen HD Screw Anchors' (reissued February 1, 2014).
  - d. ICC/ESR-1967, 'Hilti HIT HY 150 Max Adhesive Anchoring Systems' (reissued January 1, 2013).

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Scheduling:
  - 1. Inspection shall be performed according to Manufacturer's submitted ICC ES Evaluation Report.
  - 2. Notify Testing Agency and Architect one week before installing anchors so testing may be scheduled.

### 1.4 SUBMITTALS

- A. Action Submittals:
  - 1. Product Data:
    - a. Manufacturer's product literature for each item.
- B. Informational Submittals:
  - 1. Test And Evaluation Reports:
    - a. ICC ES Evaluation Report indicating conformance with current applicable ICC ES Acceptance Criteria.
  - 2. Manufacturer's Instructions:
    - a. Manufacturer's published installation recommendations for each item.

### 1.5 SUBMITTALS

- A. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Record Documentation:
      - 1) Testing and Inspection Reports:
        - a) Testing Agency testing and inspecting reports of Drilled-In Mechanical Anchors / Adhesive Anchors / Screw Anchors and / or Headed Concrete Anchor Studs / Deformed Bar Anchors.

### 1.6 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Manufacturer:
    - a. Having sufficient capacity to produce and deliver required materials without causing delay in work.
  - 2. Installer:

- a. Acceptable to Manufacturer, experienced in performing work of this section and has specialized in installation of work similar to that required for this project.
- B. Testing and Inspection.
  1. Owner will provide Testing and Inspection for Drilled-In Mechanical Anchors / Adhesive Anchors / Screw Anchors and / or Headed Concrete Anchor Studs / Deformed Bar Anchors.
    - a. Owner will employ testing agencies to perform testing and inspection for drilled-in mechanical anchors / adhesive anchors / screw anchors and / or headed concrete anchor studs / deformed bar anchors as specified in Field Quality Control in Part 3 of this specification.
      - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
      - 2) See Section 01 1200: 'Multiple Contract Summary'.
    - b. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control.
      - 1) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
  1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
  1. Store materials protected from exposure to harmful weather conditions and as directed by Manufacturer.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Manufactured Units:
  1. General:
    - a. Use hot-dipped galvanized or stainless steel with matching nuts and washers in exterior and moist interior applications unless indicated otherwise on Contract Drawings.
    - b. Install anchor bolts used to attach wood sill plates to foundation with **1/4 inch** by **3 inch** x **3 inch** minimum adjustable plate washers and standard cut washers between wood sill plates and nuts.
    - c. Nut: Conform to requirements of ASTM A563, Grade A, Hex.
  2. Threaded rod for adhesive anchors and cast-in anchors:
    - a. Conform to requirements of ASTM A307, Grade A or ASTM F1554.
  3. Anchor Bolts:
    - a. J-Bolts:
      - 1) Non-headed type threaded **2 inches** minimum conforming to requirements of ASTM F1554, Grade A.
      - 2) Anchor hook to project **2 inches** minimum including bolt diameter.
    - b. Headed Bolts:
      - 1) Headed type threaded **2 inches** minimum conforming to requirements of ASTM F1554, Grade A.
  4. Deformed Bar Anchors:
    - a. Manufactured in accordance with requirements of ASTM A1064/A1064M.
    - b. Tensile Strength: **80,000 psi** minimum.
    - c. Yield Strength: **70,000 psi** minimum.
  5. Rebar:

- a. Composed of deformed carbon steel meeting requirements of ASTM A706/A706M, Grade 60.
6. Adhesive Anchors:
  - a. Cartridge Injection Adhesive Anchors.
  - b. Products shall have current ICC ES Evaluation report conforming to current ICC ES Acceptance Criteria AC308 for concrete.
  - c. Rod diameter and embedment length as indicated on Drawings.
  - d. Type Two Acceptable Products:
    - 1) HIT-HY200 Epoxy Adhesive by Hilti Fastening Systems, Tulsa, OK [www.us.hilti.com](http://www.us.hilti.com).
    - 2) PE1000+ by Powers Fasteners Inc., Brewster NY [www.powers.com](http://www.powers.com).
    - 3) SET-XP Epoxy by Simpson Strong-Tie Co., Pleasanton, CA [www.simpsonanchors.com](http://www.simpsonanchors.com).
    - 4) HIT-HY70 by Hilti Fastening Systems, Tulsa, OK [www.us.hilti.com](http://www.us.hilti.com).
    - 5) Equal as approved by Architect before installation. See Section 01 6200.
7. Drilled-In Mechanical Anchors (Expansion Bolts):
  - a. Products shall have current ICC ES Evaluation report conforming to current ICC ES Acceptance Criteria AC193 for concrete.
  - b. Type Two Acceptable Products:
    - 1) KWIK Bolt TZ Expansion Anchor by Hilti Fastening Systems, Tulsa, OK [www.us.hilti.com](http://www.us.hilti.com).
    - 2) KWIK-HUS EZ-I Internally Threaded Screw Anchor by Hilti Fastening Systems, Tulsa, OK [www.us.hilti.com](http://www.us.hilti.com).
    - 3) HSL-3 Heavy Duty Expansion Anchor by Hilti Fastening Systems, Tulsa, OK [www.us.hilti.com](http://www.us.hilti.com).
    - 4) HDA Undercut Anchor by Hilti Fastening Systems, Tulsa, OK [www.us.hilti.com](http://www.us.hilti.com).
    - 5) Power-Stud +SD1 by Powers Fasteners Inc., Brewster NY [www.powers.com](http://www.powers.com).
    - 6) Strong-Bolt by Simpson Strong-Tie Co., Pleasanton, CA [www.simpsonanchors.com](http://www.simpsonanchors.com).
    - 7) Equal as approved by Architect before installation. See Section 01 6200.
8. Screw Anchors:
  - a. Provide anchors with length identification markings conforming to ICC ES AC 193 for concrete.
  - b. Type Two Acceptable Products:
    - 1) Wedge-Bolt+ by Powers Fasteners Inc., Brewster NY [www.powers.com](http://www.powers.com).
    - 2) Titen HD Screws by Simpson Strong Tie Co, Dublin, CA [www.strongtie.com](http://www.strongtie.com).
    - 3) Equals as approved by Architect through shop drawing submittal before installation. See Section 01 6200.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification Of Conditions:
  1. Embedded Items:
    - a. Identify position of reinforcing steel and other embedded items before drilling holes for anchors:
      - 1) Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items.
      - 2) Take precautions as necessary to avoid damaging pre-stressing tendons, electrical and telecommunications conduit, and gas lines.
    - b. Notify Engineer if reinforcing steel or other embedded items are encountered during drilling.
  2. Base Material Strength:
    - a. Unless otherwise specified, do not drill holes in concrete until concrete has achieved full design strength.

### 3.2 PREPARATION

- A. Surface Preparation:
  - 1. Clean surfaces prior to installation.
  - 2. Prepare surface in accordance with Manufacturer's written recommendations.

### 3.3 INSTALLATION

- A. Drilled-In Anchors:
  - 1. General:
    - a. Drill holes with rotary impact hammer drills using carbide-tipped bits or core drills using diamond core bits.
    - b. Unless otherwise shown on Drawings, drill holes perpendicular to concrete surface.
    - c. Where anchors are to be installed in cored holes, use core bits with matched tolerances specified by Manufacturer. Cores holes may only be used if acceptable to Manufacturer.
    - d. Perform anchor installation in accordance with Manufacturer's published instructions.
  - 2. Adhesive Anchors:
    - a. Clean holes in accordance with Manufacturer's published instructions before installation of adhesive:
      - 1) Follow Manufacturer's recommendations to ensure proper mixing of adhesive components.
    - b. Adhesive:
      - 1) Inject adhesive into holes proceeding from bottom of hole and progressing toward surface so as to avoid introduction of air pockets into adhesive.
      - 2) Inject sufficient adhesive into hole to ensure that annular gap is filled to surface.
      - 3) Remove excess adhesive from surface.
    - c. Shim anchors with suitable device to center anchor in hole. Do not disturb or load anchors before Manufacturer's specified cure time has elapsed.
    - d. Temperature:
      - 1) Observe Manufacturer's recommendations with respect to installation temperatures for adhesive anchors.
      - 2) Base material temperatures must be maintained above minimum temperatures allowed by Manufacturer for full required epoxy cure time.
  - 3. Drilled-in Mechanical Anchors (Expansion Bolts):
    - a. Protect threads from damage during anchor installation.
    - b. Set anchors to Manufacturer's recommended torque, using a torque wrench. Following attainment of 10 percent of specified torque, 100 percent of specified torque shall be reached within 7 or fewer complete turns of nut. If specified torque is not achieved within required number of turns, remove and replace anchor, unless otherwise directed by Architect.
  - 4. Screw Anchors:
    - a. Protect threads from damage during anchor installation.
    - b. Set anchors to Manufacturer's recommended torque, using a torque wrench.

### 3.4 FIELD QUALITY CONTROL

- A. Field Tests and Inspections:
  - 1. General:
    - a. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
    - b. Quality Control is sole responsibility of Contractor as specified in Section 01 4523 'Testing And Inspection Services'.
  - 2. Drill-In Mechanical Anchors / Adhesive Anchors / Screw Anchors:
    - a. Certified Inspector from Testing Agency shall verify procedures used for installation of all concrete anchors and monitor their installation for compliance with Manufacturer's requirements.



- b. Inspections:
    - 1) Inspections shall include required verification and inspection of anchors as referenced in IBC Table 1704.4 and in accordance with ACI 318 and applicable ASTM material standards. Periodic and continuous inspections include:
      - a) Inspection of bolts to be installed in concrete prior to and during placement of concrete (continuous).
      - b) Inspection of anchors installed in hardened concrete (periodic).
  - c. Testing:
    - 1) Ten percent (10%) of each type and size of drilled-in anchor shall be proof loaded by Testing Agency's testing laboratory or as directed by Architect. Adhesive anchors will not be torque tested unless otherwise directed by Architect. If more than 10 percent of tested anchors fail to achieve specified torque or proof load within limits defined on Drawings, all anchors of same diameter and type as failed anchors shall be tested at Contractors expense, unless otherwise instructed by Architect.
      - a) Torque will be applied with calibrated torque wrench.
      - b) Proof loads will be applied with calibrated hydraulic ram. Displacement of adhesive anchors at proof load shall not exceed  $D/10$ , where D is nominal anchor diameter.
- B. Non-Conforming Work:
- 1. Remove and replace misplaced or malfunctioning anchors.
  - 2. Fill empty anchor holes and patch failed anchor locations with high-strength, non-shrink, non-metallic grout acceptable to Architect.
  - 3. Anchors that fail to meet proof load or installation torque requirements will be regarded as malfunctioning.
  - 4. Repair damage to adjacent materials caused by product installation.

### 3.5 CLEANING

- A. Waste Management:
- 1. Disposal of rubbish, debris, and packaging materials.

### 3.6 PROTECTION

- A. General:
- 1. Protect installed products from damage during construction.

**END OF SECTION**

**BLANK PAGE**

**SECTION 03 2100****REINFORCEMENT BARS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install concrete reinforcement bars as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
  - 2. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
  - 3. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
  - 4. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
  - 5. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
  - 6. Section 01 7800: 'Closeout Submittals'.
  - 7. Section 03 1113: 'Structural Cast-In-Place Concrete Forming'.
  - 8. Section 03 2116: 'Epoxy-Coated Reinforcement Bars'.
  - 9. Section 03 3111: 'Cast-In-Place Structural Concrete' for:
    - a. Reinforcement installed in concrete.
    - b. Pre-installation conference held jointly with other concrete related sections.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. Council of American Structural Engineers. CASE Form 101: *Statement of Special Inspections*. Washington, DC: CASE, 2001. (c/o American Council of Engineering Companies, 1015 15<sup>th</sup> St., NW, Washington, DC 20005; 202-347-7474; [www.acec.org](http://www.acec.org)).
  - 2. Concrete Reinforcing Steel Institute (CRSI):
    - a. CRSI, 'Manual of Standard Practice' (2009 or latest edition available).
- B. Definitions (Following are specifically referenced for testing):
  - 1. Accreditation: Process in which certification of competency, authority, or credibility is presented. Verify that laboratories have an appropriate quality management system and can properly perform certain test methods (e.g., ANSI, ASTM, and ISO test methods) and calibration parameters according to their scopes of accreditation.
  - 2. Field Quality Control: Testing, Inspections, Special Testing and Special Inspections to assure compliance to Contract Documents.
  - 3. Inspection/Special Inspection: Inspection of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards:
    - a. Inspection: Not required by code provisions but may be required by Contract Documents.
    - b. Special Inspection: Required by code provisions and by Contract Documents.
    - c. Inspection-Continuous: Full-time observation of the Work requiring inspection by approved inspector who is present in area where the Work is being performed.
    - d. Inspection-Periodic: Part-time or intermittent observation of the Work requiring inspection by approved inspector who is present in area where the Work has been or is being performed and at completion of the Work.
  - 4. Observation: Visual observation of building / site elements or structural system by registered design professional for general conformance to approved construction documents at significant

- construction stages and at completion. Observation does not include or waive responsibility for performing inspections or special inspections.
5. Preconstruction Testing: Tests and inspections that are performed specifically for Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
  6. Product Testing: Tests and inspections that are performed by testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
  7. Quality Assurance: Testing, Inspections, Special Testing and Special Inspections provided for by Owner.
  8. Quality Control: Testing, Inspections, Special Testing and Special Inspections provided for by Contractor.
  9. Service Provider: Agency or firm qualified to perform required tests and inspections.
  10. Source Quality Control Testing: Tests and inspections that are performed at source, i.e., plant, mill, factory, or shop.
  11. Special Inspection: See Inspection.
  12. Special Inspector: Certified individual or firm that implements special inspection program for project.
  13. Special Test: See Test.
  14. Test/Special Test: Field or laboratory tests to determine characteristics and quality of building materials and workmanship.
    - a. Test: Not required by code provisions but may be required by Contract Documents.
    - b. Special Test: Required by code provisions and by Contract Documents.
  15. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
  16. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
  17. Verification: Act of reviewing, inspecting, testing, etc. to establish and document that product, service, or system meets regulatory, standard, or specification requirements.
- C. Reference Standards:
1. American Concrete Institute:
    - a. ACI 117-10: 'Specifications for Tolerances for Concrete Construction and Materials and Commentary'.
    - b. ACI 117M-10: 'Specifications for Tolerances for Concrete Construction and Materials and Commentary (Metric)'.
    - c. ACI 318-14, 'Building Code Requirements for Structural Concrete and Commentary'.
  2. ASTM International (Following are specifically referenced for reinforcement bars testing):
    - a. ASTM A615/A615M-14, 'Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement'.
  3. ASTM International (Following are specifically referenced for Testing Agencies):
    - a. ASTM E329-14a: 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing'.
    - b. ASTM E543-13, 'Standard Specification for Agencies Performing Nondestructive Testing'.
    - c. ASTM E1212-12, 'Standard Practice for Quality Management Systems for Nondestructive Testing Agencies'.

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
1. Participate in pre-installation conference as specified in Section 03 3111.
  2. In addition to agenda items specified in Section 01 3100, and Section 03 3111, review following:
    - a. Installation scheduling and reinforcing placement.
    - b. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
      - 1) Review frequency of testing and inspections.
- B. Scheduling:
1. Notify Testing Agency and Architect as directed in Section 03 3053 and Section 03 3111.

**1.4 SUBMITTALS**

- A. Action Submittals:
  - 1. Shop Drawings:
    - a. Reinforcing placement drawings.
- B. Informational Submittals:
  - 1. Certificates:
    - a. Mill certificates for mill tests for reinforcing in accordance with ASTM A615/A615M.
- C. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Record Documentation:
      - 1) Testing and Inspection Reports:
        - a) Testing Agency Inspection Reports of reinforcement bars.

**1.5 QUALITY ASSURANCE**

- A. Regulatory Agency Sustainability Approvals:
  - 1. Comply with provisions of following codes and standards except where more stringent requirements are shown or specified:
    - a. ACI 318, 'Building Code Requirements for Structural Concrete and Commentary'.
    - b. Concrete Reinforcing Steel Institute (CRSI) 'Manual of Standard Practice'.
- B. Qualifications:
  - 1. Throughout progress of the work of this section, provide at least one (1) person who shall be thoroughly familiar with Construction Documents and other applicable specified requirements, completely trained and experienced in necessary skills, and who shall be present at site and shall direct all work performed under this Section:
    - a. In actual installation of the work of this Section, use adequate numbers of skilled workmen to ensure installation in strict accordance with approved design.
    - b. In acceptance or rejection of work performed under this Section, no allowance will be made for lack of skill on part of workmen.
- C. Testing and Inspection:
  - 1. Owner will provide Testing and Inspection for inspection of reinforcement bars:
    - a. Owner will employ testing agencies to perform testing and inspection on reinforcement bars as specified in Field Quality Control in Part 3 of this specification.
      - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
      - 2) See Section 01 1200: 'Multiple Contract Summary'.
    - b. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control.
      - 1) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery And Acceptance Requirements:
  - 1. Deliver bars separated by size and tagged with manufacturer's heat or test identification number.
  - 2. Reinforcement bars shall be free of heavy rust scales and flakes, or other coating at time of delivery and placing.
- B. Storage And Handling Requirements:
  - 1. Properly protect rebar on site after delivery.

**PART 2 - PRODUCTS****2.1 MATERIAL****A. Reinforcement Bars:**

1. Bars shall have grade identification marks and conform to ASTM A615/A615M:
  - a. Grade 60 minimum, except dowels that are to be field bent, Grade 40 minimum.
2. Bars shall be deformed type.
3. Bars shall be free of heavy rust scales and flakes, or other bond-reducing coatings.

**2.2 ACCESSORIES****A. Bar Supports:**

1. Concrete masonry units or bricks are not acceptable.
2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class 1) or stainless steel protected (CSRI, Class 2).
3. Type Two Acceptable Products:
  - a. Concrete 'dobies' or blocks wired to reinforcing.
  - b. Manufactured chairs with **4 sq inch** bearing surface on sub-grade, or other feature to prevent chair from being pushed into sub-grade or damaging vapor retarder under slabs on grade.
  - c. Equals as approved by Architect before installation. See Section 01 6200.

**2.3 FABRICATION**

- A. Fabricate reinforcement bars according to the Concrete Reinforcing Steel Institute (CRSI) 'Manual of Standard Practice' and details on Contract Documents.**

**PART 3 - EXECUTION****3.1 INSTALLATION****A. General:**

1. Avoid cutting or puncturing vapor retarder during reinforcement placement and concrete operations.
2. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
3. Blowtorch shall not be used to facilitate field cutting or bending or any other reinforcing work.
4. Reinforcement shall not be bent after partially embedded in hardened concrete.

**B. Placing Reinforcement:**

1. Comply with Concrete Reinforcing Steel Institute (CRSI) 'Manual of Standard Practice' recommended practice for 'Placing Reinforcing Bars' for details and methods of reinforcement placement and supports. and as herein specified.
2. Accurately position, support, and secure reinforcement against displacement by formwork, construction, or concrete placement operations:
  - a. Locate and support reinforcing by chairs, runners, bolsters, bar supports, spacers, or hangers, as required as recommended by 'ACI Detailing Manual, latest edition, except slab on grade work.
  - b. Support bars in slabs on grade and footings with specified bar supports around perimeter and at **4-1/2 feet** on center each way maximum to maintain specified concrete cover.
  - c. Install bar supports at bar intersections.
3. Bend bars cold.

4. Dowel vertical reinforcement for formed concrete columns or walls out of footing or structure below with rebar of same size and spacing required above.
5. Securely anchor and tie reinforcement bars and dowels before placing concrete. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

C. Splices:

1. Non-Concrete Structural System:
  - a. Avoid splices of reinforcement bars at points of maximum stress. Lap bars 60 bar diameters minimum unless dimensioned otherwise on Drawings. Run reinforcement bars continuous through cold joints.
2. Concrete Structural System:
  - a. In beams, slabs, and walls, avoid splices of reinforcement bars at points of maximum stress.
  - b. Lap bars as follows:
    - 1) Compression Splices: 45 bar diameters minimum.
    - 2) Tension Splices: In accordance with ACI Class B requirements.
    - 3) No splice shall be less than **20 inches**
    - 4) For epoxy coated rebar, increase lap-splice lengths by 1.5 times those listed above.
  - c. In columns, splices in vertical bars are permitted only at floor levels or points of lateral support and shall consist of 45 bar diameter laps.
  - d. Run reinforcement bars continuous through cold joints.

D. Tolerances:

1. Provide following minimum concrete cover for reinforcement as per ACI 318. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations:
  - a. Concrete not exposed to weather or in contact with ground:
    - 1) Slabs, walls, and joists:
      - a) No. 14 and No. 18 bars: **1-1/2 inches**
      - b) No. 11 bars and smaller: **3/4 inches**
    - 2) Beams and Columns:
      - a) Primary reinforcement, ties, stirrups and spirals: **1-1/2 inches**
    - 3) Shells, folded plate members:
      - a) No. 6 bars and larger: **3/4 inch**
      - b) No. 5 bar, W31 or D31 wire, and smaller: **1/2 inch**

### 3.2 FIELD QUALITY CONTROL

A. Field Tests And Inspections:

1. General:
  - a. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
  - b. Quality Control is sole responsibility of Contractor as specified in Section 01 4523 'Testing And Inspection Services'.
2. Reinforcement Bars:
  - a. Testing Agency shall provide inspection for Reinforcement Bars. See Section 03 3111 for Testing and Inspection requirements.

**END OF SECTION**

**BLANK PAGE**



**SECTION 03 3111****CAST-IN-PLACE STRUCTURAL CONCRETE****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install concrete work as described in Contract Documents including:
    - a. Quality of concrete used on Project but furnished under other Sections.
    - b. Concrete mix information and use admixtures.
    - c. Field Quality Control Testing and Inspection requirements for concrete.
    - d. Pre-installation conference held jointly with other concrete related sections.
    - e. Sealants and curing compounds used with concrete.
    - f. Compact aggregate base for miscellaneous cast-in-place concrete.
    - g. Miscellaneous cast-in-place concrete and equipment pads.
- B. Products Installed But Not Furnished Under This Section:
  - 1. Concrete accessories.
  - 2. Inserts, bolts, boxes, templates, and fastening devices for other work, including those for bases only for Mechanical and Electrical.
  - 3. Membrane Concrete Curing.
- C. Related Requirements:
  - 1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
  - 2. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
  - 3. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
  - 4. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
  - 5. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
  - 6. Section 01 7800: 'Closeout Submittals'.
  - 7. Section 03 1113: 'Structural Cast-In-Place Concrete Forming'.
  - 8. Section 03 1511: 'Concrete Anchors and Inserts'.
  - 9. Section 03 2100: 'Reinforcement Bars'.
  - 10. Section 03 2116: 'Epoxy-Coated Reinforcement Steel Bars'.
  - 11. Section 03 3923: 'Membrane Concrete Curing' for quality of curing materials used.
  - 12. Section 05 1223: 'Structural Steel For Buildings' for :
    - a. Furnishing of pipe for pipe bollards.
  - 13. Section 07 9213: 'Elastomeric Joint Sealant' for quality of sealants.
  - 14. Section 31 0501: 'Common Earthwork Requirements' for:
    - a. General procedures and requirements for earthwork.
    - b. Pre-installation conference held jointly with other common earthwork related sections.
  - 15. Section 31 1123: 'Aggregate Base' for aggregate base under miscellaneous cast-in-place concrete and exterior slabs, under interior slabs-on-grade concrete, and asphalt paving.
  - 16. Section 31 2213: 'Rough Grading' for rough grading and preparation of natural soil subgrades below fill and aggregate base materials.
  - 17. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
  - 18. Section 31 2323: 'Fill' for compaction procedures and tolerances.
  - 19. Divisions 22, 23, And 26: Mechanical and electrical devices including boxes, conduits, pipes, hangers, inserts, and other work to be embedded in concrete work before placing.
  - 20. Furnishing of items to be embedded in concrete specified in Section involved.
- D. Related Requirements:
  - 1. Section 01 0000: 'General Requirements':

- a. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
- b. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
- c. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
- d. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
- e. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
- f. Section 01 7800: 'Closeout Submittals'.
2. Section 03 1113: 'Structural Cast-In-Place Concrete Forming'.
3. Section 03 1511: 'Concrete Anchors and Inserts'.
4. Section 03 2100: 'Reinforcement Bars'.
5. Section 03 2116: 'Epoxy-Coated Reinforcement Steel Bars'.
6. Section 03 3923: 'Membrane Concrete Curing' for quality of curing materials used.
7. Section 07 9213: 'Elastomeric Joint Sealant' for quality of sealants.
8. Section 10 2239: 'Folding Panel Partitions' for floor guide track.
9. Section 31 0501: 'Common Earthwork Requirements' for:
  - a. General procedures and requirements for earthwork.
  - b. Pre-installation conference held jointly with other common earthwork related sections.
10. Section 31 1123: 'Aggregate Base' for aggregate base under miscellaneous cast-in-place concrete and exterior slabs, under interior slabs-on-grade concrete, and asphalt paving.
11. Section 31 2213: 'Rough Grading' for grading and preparation of natural soil subgrades below fill and aggregate base materials.
12. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
13. Section 31 2323: 'Fill' for compaction procedures and tolerances.
14. Section 32 9121: 'Topsoil Grading' for grading of subgrade below topsoil.
15. Divisions 22, 23, And 26: Mechanical and electrical devices including boxes, conduits, pipes, hangers, inserts, and other work to be embedded in concrete work before placing.
16. Furnishing of items to be embedded in concrete specified in Section involved.

## 1.2 REFERENCES

### A. Association Publications:

1. American Concrete Institute, Farmington Hills, MI [www.concrete.org](http://www.concrete.org). Abstracts of ACI Periodicals and Publications.
  - a. ACI 214.3R-88(97), *'Recommended Practice for Evaluation of Strength Test Results of Concrete'*.
  - b. ACI 224R-01, *'Control of Cracking in Concrete Structures'*.
  - c. ACI 224.1R-07, *'Causes, Evaluation, and Repair of Cracks in Concrete Structures'*.
  - d. ACI 224.2R-92(R2004): *'Cracking of Concrete Members in Direct Tension'*.
  - e. ACI 224.3R-95(R2013), *'Joints in Concrete Construction'*.
  - f. ACI 224.4R-13, *'Guide to Design Detailing to Mitigate Cracking'*.
  - g. ACI 302.1R-04: *'Guide for Concrete Floor and Slab Construction'*.
  - h. ACI 302.2R-06, *'Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials'*.
  - i. ACI 304R-00, *'Guide for Measuring, Mixing, Transporting and Placing Concrete'*.
  - j. ACI 304.6R-09, *'Guide for the Measure of Volumetric-Measuring & Continuous-Mixing Concrete Equipment'*.
  - k. ACI 305R-10, *'Guide to Hot Weather Concreting'*.
  - l. ACI 306R-10, *'Guide to Cold Weather Concreting'*.
  - m. ACI 309.1R-08, *'Report on Behavior of Fresh Concrete During Vibration'*.
  - n. ACI 311.4R-05, *'Guide for Concrete Inspection'*.
  - o. ACI 347-04, *'Guide to Formwork for Concrete'*.
  - p. Certifications:
    - 1) ACI CP-1(13), *'Technical Workbook for ACI Certification of Concrete Field Testing Technician-Grade 1'*.
    - 2) ACI CP-10(10), *'Craftsman Workbook for ACI Certification of Concrete Flatwork Technician/Finisher'*.

- 3) ACI CP-19(13), *Technical Workbook for ACI Certification of Concrete Strength Testing Technician*.
2. Council of American Structural Engineers. CASE Form 101: *Statement of Special Inspections*. Washington, DC: CASE, 2001. (c/o American Council of Engineering Companies, 1015 15<sup>th</sup> St., NW, Washington, DC 20005; 202-347-7474; [www.acec.org](http://www.acec.org)).
- B. Definitions (Following are specifically referenced for testing):
  1. Accreditation: Process in which certification of competency, authority, or credibility is presented. Verify that laboratories have an appropriate quality management system and can properly perform certain test methods (e.g., ANSI, ASTM, and ISO test methods) and calibration parameters according to their scopes of accreditation.
  2. Approved: To authorize, endorse, validate, confirm, or agree to.
  3. Cementitious Materials: Portland cement alone or in combination with one or more of following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.
  4. Field Quality Control: Testing, Inspections, Special Testing and Special Inspections to assure compliance to Contract Documents.
  5. Floor Flatness (FF): Rate of change in elevation of floor over a **12 inches** section.
  6. Floor Levelness (FL): Measures difference in elevation between two points which are **10 feet** apart.
  7. Inspection/Special Inspection: Inspection of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards:
    - a. Inspection: Not required by code provisions but may be required by Contract Documents.
    - b. Special Inspection: Required by code provisions and by Contract Documents.
    - c. Inspection-Continuous: Full-time observation of the Work requiring inspection by approved inspector who is present in area where the Work is being performed.
    - d. Inspection-Periodic: Part-time or intermittent observation of the Work requiring inspection by approved inspector who is present in area where the Work has been or is being performed and at completion of the Work.
  8. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform particular construction operation, including installation, erection, application, and similar operations.
  9. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation. They are not samples. Approved mockups establish standard by which the Work will be judged.
  10. Observation: Visual observation of building / site elements or structural system by registered design professional for general conformance to approved construction documents at significant construction stages and at completion. Observation does not include or waive responsibility for performing inspections or special inspections.
  11. Owner's Representative: Owner's Designated Representative (Project Manager or Facilities Manager) who will have express authority to bind Owner with respect to all matters requiring Owner's approval or authorization.
  12. Preconstruction Testing: Tests and inspections that are performed specifically for Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
  13. Product Testing: Tests and inspections that are performed by testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
  14. Quality Assurance: Testing, Inspections, Special Testing and Special Inspections provided for by Owner.
  15. Quality Control: Testing, Inspections, Special Testing and Special Inspections provided for by Contractor.
  16. Service Provider: Agency or firm qualified to perform required tests and inspections.
  17. Source Quality Control Testing: Tests and inspections that are performed at source, i.e., plant, mill, factory, or shop.
  18. Special Inspection: See Inspection.

19. Special Inspector: Certified individual or firm that implements special inspection program for project.
20. Special Test: See Test.
21. Test/Special Test: Field or laboratory tests to determine characteristics and quality of building materials and workmanship.
  - a. Test: Not required by code provisions but may be required by Contract Documents.
  - b. Special Test: Required by code provisions and by Contract Documents.
22. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
23. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
24. Verification: Act of reviewing, inspecting, testing, etc. to establish and document that product, service, or system meets regulatory, standard, or specification requirements.

C. Reference Standards:

1. American Association of State and Highway Transportation Officials:
  - a. AASHTO M 213-01 (2015), 'Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)' (ASTM Designation D1751).
  - b. AASHTO T 318-02(2011), 'Standard Method of Test for Water Content of Freshly Mixed Concrete Using Microwave Oven Drying'.
2. American Concrete Institute:
  - a. ACI 117-10: 'Specifications for Tolerances for Concrete Construction and Materials and Commentary'.
  - b. ACI 117M-10: 'Specifications for Tolerances for Concrete Construction and Materials and Commentary (Metric)'.
  - c. ACI 211.1-91(R2009), 'Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete'.
  - d. ACI 301-10, 'Specification for Structural Concrete for Buildings'.
  - e. ACI 301M-10, 'Specification for Structural Concrete (Metric)'.
  - f. ACI 305.1-14, 'Specification for Hot Weather Concreting'.
  - g. ACI 306.1-90 (Reapproved R2002), 'Standard Specification for Cold Weather Concreting'.
  - h. ACI 308.1-11, 'Standard Specification for Curing Concrete'.
  - i. ACI 308.1M-11, 'Standard Specification for Curing Concrete'.
  - j. ACI 318-14, 'Building Code Requirements for Structural Concrete and Commentary'.
3. ASTM International:
  - a. ASTM A615/A615M-15a, 'Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement'.
  - b. ASTM A706/A706M-14, 'Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement'.
  - c. ASTM C31/C31M-15, 'Standard Practice for Making and Curing Concrete Test Specimens in the Field'.
  - d. ASTM C33/C33M-13, 'Standard Specification for Concrete Aggregates'.
  - e. ASTM C39/C39M-15a, 'Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens'.
  - f. ASTM C42/C42M-13, 'Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete'.
  - g. ASTM C94/C94M-15, 'Standard Specification for Ready-Mixed Concrete'.
  - h. ASTM C138/C138M-14, 'Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete'.
  - i. ASTM C140/C140M-15, 'Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units'.
  - j. ASTM C143/C143M-15, 'Standard Test Method for Slump of Hydraulic-Cement Concrete'.
  - k. ASTM C150/C150M-15, 'Standard Specification for Portland Cement'.
  - l. ASTM C171-07, 'Standard Specification for Sheet Materials for Curing Concrete'.
  - m. ASTM C172/C172M-14a, 'Standard Practice for Sampling Freshly Mixed Concrete'.
  - n. ASTM C173/C173M-14, 'Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method'.
  - o. ASTM C192/C192M-15, 'Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory'.

- p. ASTM C231/C231M-14, 'Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method'.
- q. ASTM C260/C260M-10a, 'Standard Specification for Air-Entraining Admixtures for Concrete'.
- r. ASTM C330/C330M-14, 'Standard Specification for Lightweight Aggregates for Structural Concrete'.
- s. ASTM C494/C494M-15, 'Standard Specification for Chemical Admixtures for Concrete'.
- t. ASTM C496/C496M-11, 'Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens'.
- u. ASTM C567/C567M-14, 'Standard Test Method for Determining Density of Structural Lightweight Concrete'.
- v. ASTM C595/C595M-15e, 'Standard Specification for Blended Hydraulic Cements'.
- w. ASTM C597-09, 'Standard Test Method for Pulse Velocity Through Concrete'.
- x. ASTM C618-12a, 'Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete'.
- y. ASTM C803/C803M-03(2010), 'Standard Test Method for Penetration Resistance of Hardened Concrete'.
- z. ASTM C805/C805M-13a, 'Standard Test Method for Rebound Number of Hardened Concrete'.
- aa. ASTM C989/C989M-14, 'Standard Specification for Slag Cement for use in Concrete and Mortars'.
- bb. ASTM C1077-15, 'Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation'.
- cc. ASTM C1157/C1157M-11, 'Standard Performance Specification for Hydraulic Cement'.
- dd. ASTM C1688/C1688M-14a, 'Standard Test Method for Density and Void Content of Freshly Mixed Pervious Concrete'.
- ee. ASTM D1751-04(2013), 'Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)'.
- 4. Corps of Engineers:
  - a. CRD-C 508 - Preformed Expansion Joint Filler for Concrete Paving and Structural Construction.
- 5. International Code Council (IBC):
  - a. IBC Chapter 17, 'Structural Tests and Special Inspections'.

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
  - 1. Participate in pre-installation conference as specified in Section 01 3100 and held jointly with following sections:
    - a. Section 03 1113: 'Structural Cast-In-Place Concrete Forming'.
    - b. Section 03 2100: 'Reinforcement Bars'.
    - c. Section 03 2116: 'Epoxy-Coated Reinforcement Steel Bars'.
    - d. Section 26 0526: 'Grounding And Bonding For Electrical Systems'.
    - e. Section 33 1119: 'Fire Suppression Utility Distribution Piping'.
  - 2. Schedule pre-installation conference prior to placing of footings, installation of foundation forms and reinforcing steel, and installation of anchors, dowels, inserts, and block outs in foundation walls and slabs:
  - 3. In addition to agenda items specified in Section 01 3100, review following:
    - a. Review installation scheduling, coordination, placement of interior concrete, and placement of items installed in and under floor slab.
    - b. Review concrete installation scheduling, coordination and placement of exterior concrete.
    - c. Review 'Verification Of Conditions' requirements.
    - d. Review requirements for preparation of subgrade.
    - e. Review aggregate base requirements.
    - f. Review formwork requirements.
    - g. Review approved mix design requirements and use of admixtures.
    - h. Review reinforcing steel submittals.

- i. Review placement, finishing, and curing of concrete including cold and hot weather requirements.
  - j. Review joint layout plan for control and expansion joints fillers for sidewalks, curbs, and gutters:
    - 1) Review jointing requirements.
    - 2) Joint layout for concrete paving is specified in Section 32 1313.
  - k. Review smooth rubbed concrete finish procedures and requirements (applied immediately after removing concrete formwork while concrete is 'green').
  - l. Review concrete slab tolerances and corrective measures if tolerances not met.
  - m. Review safety issues.
  - n. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
    - 1) Review frequency of testing and inspections.
- B. Scheduling:
- 1. Notify Testing Agency and Architect twenty four (24) hours minimum before placing concrete.

#### 1.4 SUBMITTALS

- A. Action Submittals:
- 1. Joint layout plan for control and expansion joints for sidewalks, curbs, and gutters for written approval before starting work on this Section.
  - 2. Shop Drawings:
    - a. Show dimensioned locations of anchor bolts for hold-down anchors and columns.
    - b. Show reinforcement and all necessary bending diagrams and reinforcing steel list, and construction joint locations.
    - c. Provide bar schedules and bending details.
    - d. Reinforced concrete walls shall be shown in scale elevation (scale at least one quarter inch to one foot). Details shall be in accordance with ACI rules.
    - e. Show all formwork for concrete surfaces which are to remain exposed in the finished work.
- B. Informational Submittals:
- 1. Certificates:
    - a. Installers:
      - 1) Certification for National Ready Mixed Concrete Association (NRMCA).
      - 2) Certification for ACI-certified Flatwork Finishers and Technicians.
  - 2. Design Data:
    - a. Mix Design:
      - 1) Furnish proposed mix design to Architect for review prior to commencement of Work.
        - a) Include density (unit weight) and void content determined per ASTM C1688/C1688M for fresh mixed properties and per ASTM C140/C140M for hardened concrete properties.
        - b) Mix design shall show proposed admixture, amount, usage instructions, and justification for proposed use.
    - b. Ready-Mix Supplier:
      - 1) Require mix plant to furnish delivery ticket for each batch of concrete. Keep delivery tickets at job-site for use of Owner or his representatives. Tickets shall show following:
        - a) Name of ready-mix batch plant.
        - b) Serial number of ticket.
        - c) Date and truck number.
        - d) Name of Contractor.
        - e) Name and location of Project.
        - f) Specific class or designation of concrete conforming to that used in Contract Documents.
        - g) Amount of concrete.
        - h) Amount and type of cement.
        - i) Total water content allowed by mix design.
        - j) Amount of water added at plant.
        - k) Sizes and weights of sand and aggregate.

- l) Time loaded.
- m) Type, name, manufacturer, and amount of admixtures used.
- n) Design Data.
- 2) Provide certificates with supporting testing reports verifying compliance with Contract Document requirements and that materials provided are from single source for following:
  - a) Cement.
  - b) Aggregate.
  - c) Fly Ash.
- 3. Source Quality Control Submittals:
  - a. Concrete mix design: Submit mix designs to meet following requirements:
    - 1) Proportions:
      - a) Mix Type A:
        - (1) **3000 psi** minimum at twenty eight (28) days.
        - (2) Water / Cementitious Material: 0.45 to 0.50 by weight.
      - b) Mix Type C:
        - (1) **3500 psi** minimum at twenty eight (28) days.
        - (2) Water / Cementitious Material: 0.45 maximum by weight.
        - (3) Drying shrinkage of concrete mix is to be limited to 0.032 percent at twenty eight (28) days when tested per ASTM C157. Use **1 gal** of shrinkage reducing admixture per **1 cu yd** of concrete.
      - c) Mix Type E:
        - (1) **4000 psi** minimum at twenty eight (28) days.
        - (2) Water / Cementitious Material: 0.45 maximum by weight.
        - (3) For concrete paving, use mix design based upon use of **1-1/2 inches** coarse aggregate (about 15 percent).
      - d) Mix Type G - Self-Consolidating Concrete (SCC). Contractor's option to use this mix type:
        - (1) Self-consolidating concrete may be used for all architectural concrete, heavily reinforced concrete, concrete for structural repairs, and other members as described in contract documents.
        - (2) All self-consolidating concrete shall contain high-range water-reducing admixture and viscosity-modifying admixture where required.
        - (3) Minimum flow of **20 inches – 30 inches** or as required by successful test placement.
        - (4) Workability, pumpability, finishability, and setting time of mix design shall be verified with successful test placement onsite.
        - (5) Viscosity Modifying Admixture (VMA) shall be used to optimize viscosity of Self-Consolidating Concrete (SCC) at dosage rates per manufacturer's recommendation.
      - e) Air Entrainment: Six (6) percent, plus or minus 1-1/2 percent for exterior concrete and foundation walls exposed to freeze/thaw cycles.
      - f) Do not add water any time during mixing cycle above amount required to meet specified water / cement ratio. No reduction in amount of cementitious material is allowed.
    - 2) Slump:
      - a) **4 inch** slump maximum before addition of high range water reducer.
      - b) **8 inch** slump maximum with use of high range water reducer.
      - c) Slump not required for Mix Type F.
    - 3) Admixtures:
      - a) Mix design shall show proposed admixture, amount, usage instructions, and justification for proposed use. Do not use any admixture without Architect's written approval.
      - b) Mineral: An amount of specified Class F (or Class C where Class F is not available) fly ash not to exceed ten (10) percent of weight of cement may be substituted for cement. If substituted, consider fly ash with cement in determining amount of water necessary to provide specified water / cement ratio.
      - c) Chemical: Specified accelerator or retarder may be used if necessary to meet environmental conditions.

- d) Chemical: Special additives to promote rapid drying concrete may be used in interior concrete slabs on grade if necessary to meet construction schedules.

C. Closeout Submittals:

- 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
  - a. Record Documentation:
    - 1) Pour Reports:
      - a) Provide report that records following information:
      - b) Date and time of start of pour, Date and time of end of pour, and Date and time of end of finishing procedures.
      - c) Temperature at start of pour, Temperature at end of Pour, and Maximum temperature during performance of finishing procedures.
      - d) Wind speed at start of pour, Wind speed at end of pour, and Maximum wind speed during performance of finishing procedures.
      - e) Humidity at start of pour, Humidity at end of pour, and High and low humidity during performance of finishing procedures.
      - f) Cloud cover at start of pour, Cloud cover at end of pour, and High and low cloud cover during performance of finishing procedures.
      - g) Screeding method and equipment used.
      - h) Saw cut method and equipment used.
    - 2) Testing and Inspection Reports:
      - a) Testing Agency Testing and Inspecting Reports of concrete.

## 1.5 QUALITY ASSURANCE

- A. Qualifications: Requirements of Section 01 4301 applies, but is not limited to following:
  - 1. Installers and Installation Supervisor:
    - a. ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
  - 2. Ready-Mix Supplier:
    - a. Comply with ASTM C94/C94M requirements and be certified according to NRMCA's 'Certification of Ready Mixed Concrete Production Facilities'.
  - 3. Testing Agencies:
    - a. Independent agency qualified according to ASTM C1077 and ASTM E329.
      - 1) Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technicians, Grade I according to ACI CP-1 or equivalent certification program.
      - 2) Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be ACI-certified Concrete Laboratory Testing Technician - Grade II.
- B. Testing and Inspection:
  - 1. Owner will provide Testing and Inspection on concrete:
    - a. Owner will employ testing agencies to perform testing and inspection on concrete as specified in Field Quality Control in Part 3 of this specification.
      - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
      - 2) See Section 01 1200: 'Multiple Contract Summary'.
    - b. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control.
      - 1) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:



1. Expansion Joint Filler Material:
  - a. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage And Handling Requirements:
  1. Expansion Joint Filler Material:
    - a. Store materials in a clean, dry area in accordance with manufacturer's instructions.
    - b. Protect materials during handling and application to prevent damage.

## 1.7 FIELD CONDITIONS

- A. Ambient Conditions:
  1. For Cold Weather and Hot Weather Limitations, see Preparation in Part 3 of this specification.

## PART 2 - PRODUCTS

### 2.1 SYSTEM

- A. Performance:
  1. Design Criteria: Conform to requirements of ASTM C94/C94M unless specified otherwise:
    - a. Floor Slab for interior concrete slabs.
      - 1) Class 1 Floor:
        - a) Anticipated type of traffic: exposed surface – foot traffic.
        - b) Special considerations: Uniform finish, nonslip aggregate in specific areas, curing.
        - c) Final finish: Normal steel-troweled finish, nonslip finish where required.
    2. Capacities:
      - a. For testing purposes, following concrete strengths are required:
        - 1) At 7 days: 70 percent minimum of 28 day strengths.
        - 2) At 28 days: 100 percent minimum of 28 day strengths.
- B. Materials:
  1. Aggregates:
    - a. General:
      - 1) Submit a letter on quarry's letterhead that certifies all aggregate for concrete complies with the requirements of this section. Material certificates which are submitted shall be signed by both the materials producer and the contractor, certifying that materials comply with or exceed requirements specified herein to the Architect, Civil and Structural Engineering Consultant and the Independent Testing Laboratory for review and approval.
      - 2) Aggregates for all concrete shall come from a quarry that is DOT approved and meets or exceeds durability Class I aggregate. The quarry shall submit a letter to Engineer that certifies that all aggregate complies with DOT requirements for durability. Aggregate not meeting DOT durability requirements shall not be used.
    - b. Coarse:
      - 1) Meet requirements of ASTM C33/C33M or nonconforming aggregate that by test or actual service produces concrete of required strength and conforms to local governing codes.
      - 2) Aggregate shall be uniformly graded by weight as follows:

- a) Table Two: Flat Work, Size No. 67.

Sieve	Percent Passing
One Inch	100
3/4 Inch	90 - 100
3/8 Inch	20 - 55
No. 4	0 - 10
No. 8	0 - 5

- b) Table Three: All Other, Size No. 57.

Sieve	Percent Passing
1-1/2 Inch	100
One Inch	95 - 100
1/2 Inch	25 - 60
No. 4	0 - 10
No. 8	0 - 5

## c. Fine:

- 1) Meet requirements of ASTM C33/C33M.
- 2) Aggregate shall be uniformly graded by weight as follows:

## a) Table Four:

Sieve	Percent Passing
3/8 Inch	100
No. 4	95 - 100
No. 8	80 - 100
No. 16	50 - 85
No. 30	25 - 60
No. 50	10 - 30
No. 100	2 - 10

## 2. Water: Clear, apparently clean, and potable.

## 3. Admixtures And Miscellaneous:

## a. Mineral:

- 1) Fly Ash: Meet requirements of ASTM C618, Class F (or Class C where Class F is not available) and with loss on ignition (LOI) of three (3) percent maximum.

## b. Chemical:

- 1) No admixture shall contain calcium chloride nor shall calcium chloride be used as an admixture. All chemical admixtures used shall be from same manufacturer and compatible with each other.
- 2) Air Entraining Admixture:
  - a) Meet requirements of ASTM C260/C260M.
  - b) Type Two Acceptable Products:
    - (1) MasterAir VR 10 (formally MB-VR), Master AE 90 (formally MB-AE) or MasterAir AE 400 (formally EverAir Plus) by BASF.
    - (2) Air Mix 200 Series or AEA-92 Series by Euclid.
    - (3) Air Plus or Super Air Plus by Fritz-Pak.
    - (4) Sika Air by Sika.
    - (5) Daravair or Darex Series AEA by W R Grace.
    - (6) Equal as approved by Architect before use. See Section 01 6200.
- 3) Water Reducing Admixture:
  - a) Meet requirements of ASTM C494/C494M, Type A and containing not more than 0.05 percent chloride ions.
  - b) Type Two Acceptable Products:
    - (1) MasterPozzoloth (formerly Pozzoloth) Series by BASF.
    - (2) Eucon WR 75 or Eucon 91 by Euclid.
    - (3) FR-2 or FR-3 by Fritz-Pak.
    - (4) Plastocrete 160 by Sika.
    - (5) Daracem, WRDA, or MIRA Series by W R Grace.
    - (6) Equal as approved by Architect before use. See Section 01 6200.
- 4) Water Reducing, Retarding Admixture:
  - a) Meet requirements of ASTM C494/C494M, Type D and contain not more than 0.05 percent chloride ions.
  - b) Type Two Acceptable Products:
    - (1) MasterPozzoloth (formerly Pozzoloth) Series by BASF.
    - (2) Eucon Retarder 75 by Euclid.
    - (3) FR-1 or Modified FR-1 by Fritz-Pak.
    - (4) Plastiment by Sika.
    - (5) Daratard Series or Recover by W R Grace.
    - (6) Equal as approved by Architect before use. See Section 01 6200.

- 5) High Range Water Reducing Admixture (Superplasticizer):
  - a) Meet requirements of ASTM C494/C494M, Type F or G and containing not more than 0.05 percent chloride ions.
  - b) Type Two Acceptable Products:
    - (1) MasterRheobuild 1000 (formerly Rheobuild 1000) or MasterGlenium (formerly Glenium) Series by BASF.
    - (2) Eucon 37 or Eucon 537 by Euclid.
    - (3) Supercizer 1 through 7 by Fritz-Pak.
    - (4) Sikament 300 by Sika.
    - (5) Daracem or ADVA Series by W R Grace.
    - (6) Equal as approved by Architect before use. See Section 01 6200.
- 6) Non-Chloride, Non-Corrosive Accelerating Admixture:
  - a) Meet requirements of ASTM C494/C494M, Type C or E and containing not more than 0.05 percent chloride ions.
  - b) Type Two Acceptable Products:
    - (1) MasterSet AC 534 (formerly Pozzolith NC 534) or MasterSet AC 122 (formerly Pozzolith122HE) or MasterSet FP 20 (formerly Pozzutec 20+) by BASF.
    - (2) Accelguard 80 by Euclid.
    - (3) Daraset, Polarset or Lubricon by W R Grace.
    - (4) Equal as approved by Architect before use. See Section 01 6200.
- 7) Corrosion Inhibiting Admixture:
  - a) Liquid admixture to inhibit corrosion of steel reinforcement in concrete by introducing proper amount of anodic inhibitor. Admixture shall contain thirty (30) percent calcium nitrite solution and shall be used where called for in specifications or on drawings.
  - b) Type Two Acceptable Products:
    - (1) Eucon CIA by Euclid.
    - (2) DCI or DCI-S by W R Grace.
    - (3) Equal as approved by Architect before use. See Section 01 6200.
- 8) Alkali-Silica Reactivity Inhibiting Admixture:
  - a) Specially formulated lithium nitrate admixture for prevention of alkali-silica reactivity (ASR) in concrete. Admixture must have test data indicating conformance to ASTM C1293.
  - b) Type Two Acceptable Products:
    - (1) Eucon Integral ARC by Euclid.
    - (2) RASIR by W R Grace.
    - (3) Equal as approved by Architect before use. See Section 01 6200.
- 9) Viscosity Modifying Admixture (VMA):
  - a) Liquid admixture used to optimize viscosity of Self-Consolidating Concrete (SCC). Subject to compliance with requirements, provide following at dosage rates per manufacturer's recommendation.
  - b) Type Two Acceptable Products:
    - (1) Viscrol by Euclid.
    - (2) VMAR3 by W R Grace.
    - (3) Equal as approved by Architect before use. See Section 01 6200.
- 10) Shrinkage Reducing Admixture (SRA):
  - a) Liquid admixture specifically designed to reduce drying shrinkage and potential for cracking.
  - b) Type Two Acceptable Products:
    - (1) Eucon SRA by Euclid.
    - (2) Eclipse 4500 (exterior concrete) by W R Grace.
    - (3) Eclipse Floor 200 (interior concrete) by W R Grace.
    - (4) Equal as approved by Architect before use. See Section 01 6200.
- 11) Rapid Drying Admixture in Interior Concrete Slabs on Grade:
  - a) Admixture specifically designed to promote rapid drying of concrete.
  - b) Type Two Acceptable Products:
    - (1) Concure Systems Admixture by Consure Systems.
    - (2) Aridus Admixture by US Concrete.
    - (3) Equal as approved by Architect before use. See Section 01 6200.

## 2.2 ACCESSORIES

- A. Formwork:
  - 1. Meet requirements specified in Section 03 1113:
- B. Bonding Agents:
  - 1. Type Two Acceptable Products:
    - a. Acrylic Additive by Bonsal American.
    - b. Day Chem Ad Bond (J-40) by Dayton Superior.
    - c. Flex-Con by Euclid Chemical Co.
    - d. Larsen Weldcrete by Larsen Products Corp.
    - e. Everbond by L & M Construction Chemicals.
    - f. MasterEmaco A 660 (formally Acryl 60) by BASF.
    - g. U S Spec Multicoat by U S Mix Products.
    - h. Intralok by W R Meadows.
    - i. Equal as approved by Architect before use. See Section 01 6200.
- C. Evaporation Retardant:
  - 1. Type Two Acceptable Products:
    - a. MasterKure ER 50 (Formerly Confilm) by BASF.
    - b. Sure Film J-74 by Dayton Superior.
    - c. Eucobar By Euclid Chemical Co.
    - d. E-Con by L & M Construction Chemicals.
    - e. Pro Film by Unitex.
    - f. U S Spec Monofilm ER by U S Mix Products.
    - g. Equal as approved by Architect before use. See Section 01 6200.
- D. Expansion Joint Filler:
  - 1. Expansion Joint Filler Material:
    - a. Design Criteria:
      - 1) Resilient, flexible, non-extruding, expansion-contraction joint filler meeting requirements of ASTM D1751 and AASHTO M-213.
      - 2) **1/2 inch** thick.
      - 3) Resilience:
        - a) When compressed to half of original thickness, recover to minimum of seventy (70) percent of original thickness.
    - b. Type Two Acceptable Products:
      - 1) Fiber Expansion Joint by W R Meadows, Hampshire, IL [www.wrmeadows.com](http://www.wrmeadows.com).
      - 2) Equal as approved by Architect before installation. See Section 01 6200.
- E. Finishing Material (Exposed Vertical Faces of Foundation and Retaining Walls):
  - 1. Finishing Material available in multiple concrete shades to closely match concrete surface.
  - 2. Type Two Acceptable Products:
    - a. Mixture of 1 part cement (using same cement as used in concrete foundations), 1 part sand with 95 percent passing #50 sieve.
    - b. RapidSet WunderFixx by CTS Cement Manufacturing Corporation, Cypress, CA [www.rapidset.com](http://www.rapidset.com).
    - c. Equal as approved by Architect before installation. See Section 01 6200.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification Of Conditions:
  - 1. Concrete Forms:
    - a. Verify dimensions and spot elevations for locations of forms for concrete footings, stem walls, building slabs, curbs, gutters, walkways, and drainage systems are correct before concrete is placed.
      - 1) Notify Architect of incorrect dimensions or spot elevations in writing.

- 2) Do not place concrete until corrections are made and verified.

### 3.2 PREPARATION

#### A. Concrete Mixing:

1. General:
  - a. All concrete shall be machine mixed.
  - b. Water gauge shall be provided to deliver exact predetermined amount of water for each batch.
  - c. Reliable system must be employed to insure that no less than predetermined amount of cement goes into each batch.
  - d. Re-tempering partly set concrete will not be permitted.
2. Transit Mix: Mix:
  - a. Transit mix concrete may be used provided it conforms to Specifications and tests herein described and ASTM C94/C94M.
  - b. Central plant producing concrete and equipment transporting it are suitable for production and transportation of controlled concrete and plant is currently approved by local state DOT.
  - c. Maximum elapsed time between time of introduction of water and placing shall be one (1) hour.
  - d. Minimum time of mixing shall be one (1) minute per cubic yard after all material, including water, has been placed in drum, and drum shall be reversed for an additional two (2) minutes.
  - e. Mixing water shall be added only in presence of Inspecting Engineer or inspector employed by Testing Agency.
  - f. Trucks shall not be overloaded in excess of rated capacity as recommended by manufacturer.
3. Cold Weather Concreting Procedures:
  - a. See ACI 306.1 'Standard Specification for Cold Weather Concreting' for additional requirements.
  - b. General Requirements:
    - 1) Materials and equipment required for heating and protection of concrete shall be approved and available at Project site before beginning cold weather concreting.
      - a) Heating devices used to maintain specified temperatures shall have baffle plate above, of sufficient size, and sand bed below, in order to distribute heat.
      - b) Heating devices shall be so operated that temperature of air immediately below slab forms shall not exceed **100 deg F**. Provide sufficient and suitable thermometers to verify compliance.
    - 2) Forms, reinforcement, metallic embedments, and fillers shall be free from snow, ice, and frost. Surfaces that will be in contact with newly placed concrete, including sub-grade materials, shall be **35 deg F** minimum at time of concrete placement.
    - 3) Thaw sub-grade **6 inches** deep minimum before beginning concrete placement. If necessary, re-compact thawed material.
    - 4) Use no frozen materials or materials containing ice.
    - 5) No salt or other chemical may be used for such protection.
    - 6) Only specified non-corrosive non-chloride accelerator shall be used. Calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.
  - c. Requirements When Average twenty four (24) Hour Temperature, midnight to midnight, Is Below **40 deg F**:
    - 1) Temperature of concrete as placed and maintained shall be **55 deg F** minimum and **75 deg F** maximum.
    - 2) Heat concrete for seventy two (72) hours minimum after placing if regular cement is used; for 48 hours if high early strength cement is used; or longer if determined necessary by Architect.
      - a) During this period, maintain concrete surface temperature between **55 and 75 deg F**.
    - 3) Vent flue gases from combustion heating units to outside of enclosure to prevent carbonation of concrete surface.

- 4) Prevent concrete from drying during heating period. Maintain housing, insulation, covering, and other protection twenty four (24) hours after heat is discontinued.
- 5) After heating period, if temperature falls below **32 deg F** , protect concrete from freezing until strength of **2000 psi** minimum is achieved.
  - a) Protect flatwork exposed to melting snow or rain during day and freezing during night from freezing until strength of **3500 psi** minimum is achieved.
- d. Requirements When Average twenty four (24) Hour Temperature, midnight to midnight, Is Above **40 deg F** , but when temperature falls below **32 deg F** :
  - 1) Protect concrete from freezing for seventy two (72) hours after placing, or until strength of **2000 psi** is achieved, whichever is longer.
  - 2) Protect flatwork exposed to melting snow or rain during day and freezing during night from freezing until strength of **3500 psi** ( minimum is achieved.
- e. Protect soil supporting concrete footings from freezing under any circumstances.
4. Hot Weather Concreting Procedures:
  - a. See ACI 305.1 'Specification for Hot Weather Concreting' for additional requirements.
  - b. Maximum concrete temperature allowed is **90 deg F** in hot weather.
  - c. Cool aggregate and subgrades by sprinkling.
  - d. Avoid cement over **140 deg F**.
  - e. Use cold mixing water or ice.
  - f. Use fog spray or evaporation retardant to lessen rapid evaporation from concrete surface.
- B. Surface Preparation:
  1. Earthwork Preparation:
    - a. Aggregate base and subgrade:
      - 1) Prepare aggregate base as specified in Section 31 1123.
      - 2) Prepare natural soil subgrade as specified in Section 31 2213.
      - 3) Prepare fill subgrade as specified in Section 31 2323.
  2. Inserts, bolts, boxes, templates, pipes, conduits, and other accessories required by Divisions 22, 23, and 26 shall be installed and inspected before placing concrete.:
  3. Install inserts, bolts, boxes, templates, pipes, conduits, and other accessories furnished under other Sections to be installed as part of work of this Section:
    - a. Tie anchor bolts for hold-down anchors and columns securely to reinforcing steel.
- C. Removal:
  1. Remove water and debris from space to be placed:

### 3.3 INSTALLATION

- A. Placing Concrete:
  1. General:
    - a. Place as soon after mixing as possible.
    - b. Deposit as nearly as possible in final position.
    - c. No concrete shall be deposited in water.
    - d. Placing of concrete shall be continuous until panel or section is complete.
    - e. In order to avoid overloading of forms and ties, observe following rate of filling for various air temperatures:
      - 1) Table Six: Placing Rate.

Temperature	Rate of Fill per Hour
40 deg F	2 feet
50 deg F	3 feet
60 deg F	4 feet
70 deg F	5 feet

- f. Compact concrete in forms by vibrating and other means where required.
  - 1) Thoroughly consolidate concrete around reinforcing bars (Consolidation not required in concrete around reinforcing bars with Mix Type G).
  - 2) Use and type of vibrators shall conform to ACI 309.

- g. Form vertical surfaces full depth. Do not allow concrete to flow out from under forms in any degree into landscaped areas.
- h. Consolidate concrete thoroughly.
- i. Do not embed aluminum in concrete.
- j. Do not use contaminated, deteriorated, or re-tempered concrete.
- k. Avoid accumulation of hardened concrete.
- 2. Footings:
  - a. Bear **12 inches** minimum into undisturbed earth or on mechanically compacted engineered fill. Step footings at ratio of 1-1/2 horizontal to One vertical unless detailed otherwise. Exterior wall footing shall bear 30" minimum below finish grades.
  - b. Level top of finish footing and leave rough.
  - c. Where joints are required, bulkhead, key horizontally, and dowel with two No. 5 reinforcing bars, **48 inches** long.
- 3. Foundations And Walls: Leave steel projecting where required for floor tie.
- 4. Exterior Slabs:
  - a. Dusting with cement not permitted.
  - b. For continuous placing and where shown on Drawings, saw cut **one inch** deep control joints before shrinkage occurs (**2 inches** at **6 inch** slabs)
- 5. Miscellaneous Concrete Elements:
  - a. Equipment Bases: Coordinate with appropriate Sections for locations and dimensions.
  - b. Light Pole Bases, Mow Strips, and Aprons:
    - 1) Install bond breaker consisting of three (3) layers of **30 lb** roofing felt between pole base and adjoining sidewalk, mow strip and building foundations, and aprons and building foundations.
  - c. Mow Strips and Aprons:
    - 1) Aggregate base not necessary under mow strips and aprons.
    - 2) Form and cast mow strips in place.
    - 3) Set top of mow strip above finish grade as follows:
      - a) Sodded Areas: **2 inches** below.
      - b) Seeded Areas: **One inch** below.
      - c) Ground Cover Areas: **2 inches** below.
      - d) Trees and Shrub Areas (not individual trees): **4 inches** below.
    - 4) Compact topsoil underneath mow strips and aprons to density of undisturbed earth.
  - d. Pipe Bollards:
    - 1) Install plumb and fill with concrete.
  - e. Sidewalks, Exterior Stairs, And Landings:
    - 1) Slope with cross slope of **1/8 to 1/4 inch per ft** (one to two percent) in direction of intended drainage.
    - 2) Slope away from building **1/8 to 1/4 inch per ft** (one to two percent) minimum.
    - 3) Do not dust with cement.
    - 4) Concrete walks shall be screeded to bring surface to grades and lines as indicated. Surface shall be floated with wood float with no coarse aggregate showing and then given broom finish before concrete sets.
- 6. Joints:
  - a. Control Joints (Contraction Joints):
    - 1) Form control joints with early-entry, dry-cut saws as soon as final trowel operations are complete and joints can be cut without raveling.
    - 2) Depth of control joints shall be approximately one quarter of concrete slab thickness, but not less than **one inch**.
    - 3) Control joints to be hand tooled in sidewalks, curbs and gutters, mow strips, and aprons.
    - 4) Spacing On Center (+/-):

Sidewalks	<b>4 feet to 6 feet</b>
Curbs and Gutters	<b>10 feet</b>
Mow Strips	<b>3 feet to 5 feet</b>
Flat Drainage Structures	<b>10 feet</b>
Retaining Walls w/guardrails	<b>Align with posts</b>
Retaining Walls w/chain link fencing	<b>Align with posts</b>



- b. Expansion Joints (Isolation Joints):
- 1) Expansion joints in Concrete Paving are specified in Section 32 1313.
  - 2) Install so top of expansion joint material is **1/4 inch** below finished surface of concrete.
  - 3) No expansion joint required between curbs and sidewalks parallel to curb.
  - 4) Provide expansion joints at ends of exterior site concrete elements that are perpendicular to and terminate at curbs, building foundations or other concrete elements (i.e. sidewalks, mow strips, aprons).
  - 5) Provide expansion joints between sidewalks that are parallel, and adjacent, to storage building or main building.
  - 6) Provide expansion joints around perimeter of concrete slab on grade at mechanical enclosure, around perimeter of slab on grade at dumpster enclosure and at top and bottom of exterior stairs.
  - 7) Spacing On Center (+/-):
- |                                      |                            |
|--------------------------------------|----------------------------|
| Sidewalks, Curbs and Gutters         | <b>40 feet to 100 feet</b> |
| Mow Strips and Aprons                | <b>20 feet to 40 feet</b>  |
| Flat Drainage Structures             | <b>50 feet</b>             |
| Retaining Walls w/guardrails         | <b>36 feet</b>             |
| Retaining Walls w/chain link fencing | <b>50 feet</b>             |
- 8) Seal expansion joints as specified in Section 07 9213 for following areas:
    - a) Between entryway slabs and building foundations.
    - b) Between sidewalks and building foundations.
    - c) Within curbs and gutters.
    - d) Within flat drainage structures and at joints between flat drainage structures and other concrete elements.
  - 9) Expansion joints are not required to be sealed for following areas:
    - a) Within aprons and where apron abuts sidewalks.
    - b) Within mow strips and where mow strip abuts building foundation and sidewalks.
    - c) Within sidewalks.
7. Bonding Fresh And Hardened Concrete:
- a. Re-tighten forms.
  - b. Roughen surfaces.
  - c. Clean off foreign matter and laitance.
  - d. Wet but do not saturate.
  - e. Slush with neat cement grout or apply bonding agent.
  - f. Proceed with placing new concrete.
8. Anchor Bolts:
- a. Place anchor bolts not tied to reinforcing steel immediately following leveling of concrete. Reconsolidate concrete around bolt immediately after placing bolt.
  - b. Do not disturb bolts during finishing process.

B. Finishing:

1. Interior Concrete Flatwork:
  - a. Rough:
  - b. Screed concrete.
  - c. Float Finish:
    - 1) Float as soon after screeding as possible.
    - 2) Consolidate surface with power-driven floats with exception of areas inaccessible to power-driven floats, which may be hand-floated.
    - 3) Re-straighten, cutting down high spots and filling low spots.
    - 4) Repeat float passes and re-straightening until surface has uniform, smooth, granular texture.
  - d. Trowel Finish:
    - 1) Steel trowel slab after concrete has set enough to avoid bringing water and fines to surface.
    - 2) Perform troweling with power-driven trowels with exception of areas inaccessible to power-driven trowels, which may be hand-troweled.



- 3) Continue troweling passes and re-straightening with **10 foot** highway straightedge until surface is free of trowel marks and uniform in texture and appearance.
  - 4) Apply burnished, burned-out trowel finish.
  2. Exterior Concrete Flatwork:
    - a. Curb, Gutter Sidewalks, Mow Strips, Flat Drainage Structures, Stairs, And Miscellaneous:
      - 1) After completion of floating, performed immediately after screeding and when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:
        - a) Provide fine hair finish where grades are less than 6 percent **1-1/4 inch**.
        - b) Provide rough hair finish where grades exceed 6 percent **1-1/4 inch**.
        - c) Broom finish, by drawing broom across concrete surface, perpendicular to line of traffic. Repeat operation if required to provide fine line texture acceptable to Architect. At curb and gutter, apply broom finish longitudinal to curb and gutter flowline.
        - d) On inclined slab surfaces, provide coarse, non-slip finish by scoring surface with stiff-bristled broom, perpendicular to line of traffic. At curb and gutter, apply broom finish longitudinal to curb and gutter flowline.
        - e) Do not remove forms for twenty four (24) hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Architect.
        - f) Round edges exposed to public view to **1/2 inch** radius, including edges formed by expansion joints.
        - g) Remove edger marks.
  3. Vertical Surfaces (Exposed To View Vertical Surfaces, Exposed Retaining Walls, Exposed Foundation Walls, Concrete Piers, and etc.):
    - a. General:
      - 1) Finishing Material to fill and smooth interior and exterior concrete surface defects such as spalls, gouges, cracks, dents, chips, bug holes, stone pockets, honeycombs, voids and other defective areas.
      - 2) Chamfer lines shall be finished.
    - b. Surface Preparation:
      - 1) Formwork shall be stripped from concrete while concrete is still 'green'.
      - 2) Concrete surface to be finished immediately after formwork has been removed.
        - a) Immediately after removing forms, remove joints, marks, bellies, projections, loose materials and other irregularities, and cut back metal ties from surfaces to be exposed.
        - b) Repair defective areas and voids or stone pockets with Finishing Material and smooth to even surface matching surrounding undamaged area.
    - c. Smooth Rubbed Finish:
      - 1) Thoroughly wet with water, apply Finishing Material in thin layer, rub in circular motion to smooth uniform finish.
      - 2) Entire surface shall be protected from rapid drying for not less than three (3) days.
      - 3) Surfaces shall be cleaned of drip marks and discolorations.
      - 4) Concrete surface shall be left with clean, neat, uniform finish, free from form markings and shall be uniform in color and texture.
- C. Curing:
1. Membrane Concrete Curing:
    - a. As specified in Section 09 3923 'Membrane Concrete Curing'.
    - b. Follow Manufacturer's written instructions of preparation, application rates, placement, and cleanup.
      - 1) Apply as soon as troweling on interior concrete is complete.
      - 2) Apply as soon as brooming or finishing of exterior concrete is complete.
      - 3) Spraying application is required.
      - 4) Do not dilute or thin product.
      - 5) Do not apply when temperature of concrete is less than **40 deg F** Apply uniformly without puddles or ponding.
      - 6) Do not apply before bleed water has dissipated.
      - 7) Do not apply over standing water.

## D. Tolerances:

1. Tolerances shall conform to requirements of ACI 117 or CSA A23.1, except where specified differently:
  - a. Floor test surfaces shall be measured and reported within seventy two (72) hours after completion of slab concrete finishing operations and before removal of any supporting shores to eliminate any curling effect F-numbers.
2. Local Flatness / Levelness of Interior Slabs:
  - a. Carpet and Tile Areas:
    - 1) Specified Overall Value of  $F_F45 / F_L35$  and Minimum Local Value of  $F_F30 / F_L20$  when tested in accordance with ASTM E1155.
  - b. Table Five: Maximum Variation Tolerances.

Thickness, standard	plus 3/8 inch, minus 1/4 inch
Thickness, footings	minus 0 inch
Plan, 0 - 20 feet	1/2 inch
Plan, 40 feet or greater	3/4 inch
Plan, footings	plus 1/2 inch
Eccentricity, footings	2 inch max standard, 1/2 inch at masonry
Openings, size	minus 1/4 inch, plus One inch
Openings, location	plus / minus 1/2 inch at center
Plumb	1/2 inch max
Consecutive Steps, treads	1/4 inch
Consecutive Steps, risers	1/8 inch
Flight of Stairs, treads	1/4 inch in total run
Flight of Stairs, risers	1/8 inch in total height

- c. Remedy For Out-of-Tolerance Building Slabs (Carpet Areas):
  - 1) Sections of slabs to be covered by carpet, which do not meet specified tolerances but are within ten (10) percent of specified tolerances, may be corrected by grinding or filling, at Owner's option.
  - 2) Remove and replace sections of slabs measuring outside specified correctable tolerances.
3. Local Flatness / Levelness of Interior Slabs (Wood Floor Areas):
  - a. Specified Overall Value of  $F_F50 / F_L33$  and Minimum Local Value of  $F_F30 / F_L20$  when tested in accordance with ASTM E1155.
  - b. Remedy For Out-of-Tolerance Building Slabs (Wood Floor Areas):
    - 1) Sections of slabs to be covered by wood flooring, which do not meet specified tolerances but are within ten (10) percent of specified tolerances, may be corrected by grinding or filling, at Owner's option.
    - 2) Remove and replace sections of slabs measuring outside specified correctable tolerances.

**3.4 FIELD QUALITY CONTROL**

## A. Field Tests And Inspections:

1. General:
  - a. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
  - b. Quality Control is sole responsibility of Contractor as specified in Section 01 4523 'Testing And Inspection Services'.
2. Reinforcement Bars and Bolts:
  - a. Testing Agency shall provide inspections will include following:
    - 1) Bolts:
      - a) Inspection of bolts to be installed in concrete prior to and during placement of concrete.
      - b) Periodic inspection of anchors installed in hardened concrete.
    - 2) Reinforcement Bars:

- a) Periodic inspection of reinforcement bars and placement prior to concrete placement to verify grade, size, cover, spacing, and position of reinforcing.
  - b) Inspect that all reinforcement bars are be positively identified as to heat number and mill analysis.
  - c) Confirm surface of reinforcing bars is free of form release oil or other deleterious substances.
3. Concrete:
- a. Testing Agency shall provide testing and inspection for concrete as per ASTM C1077.
  - b. Testing Agency will sample and test for quality control during placement of concrete as directed by Architect.
  - c. Testing and inspections, if performed, will include following:
    - 1) Periodic inspection verifying use of required design mix.
    - 2) Inspection at time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine temperature of concrete.
    - 3) Inspection of concrete and shotcrete placement for proper application techniques.
    - 4) Periodic inspection for maintenance of specified curing temperature and techniques.
    - 5) Periodic inspect of formwork for shape, location and dimensions of concrete member being formed:
      - a) Certified Inspector shall inspect forms for general location, configuration, camber, shoring, sealing of form joints, correct forming material, concrete accessories, and form tie locations.
    - 6) Concrete floor flatness and floor levelness or interior slabs as per ASTM E1155.
    - 7) Concrete moisture and alkalinity testing. See Section 09 0503 Flooring Substrate Preparation.
  - d. Testing Agency will sample and test during placement of concrete as directed by Architect and may include following:
    - 1) Sampling Fresh Concrete: ASTM C172/C172M, except modified for slump to comply with ASTM C94/C94M:
      - a) Slump: ASTM C143/C143M, Test each time set of compressive specimens are made.
      - b) Air Content: ASTM C173/C173M, volumetric method for lightweight or normal weight concrete: ASTM C231/C231M, pressure method for normal weight concrete each time set of compression test specimens are made.
      - c) Concrete Temperature: Test each time set of compressive specimens are made.
      - d) Unit Weight: ASTM C567/C567M, Test each time set of compressive specimens are made.
  - e. Compression Test Specimen: ASTM C31/C31M, one (1) set of four (4) standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
  - f. Compressive Strength Tests: ASTM C39/C39M:
    - 1) Obtain one (1) composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd , but less than 50 cu. yd plus one (1) set for each additional 50 cu. yd or fraction thereof.
    - 2) One (1) specimen tested at at seven (7) days, two (2) specimens tested at twenty eight (28) days, and one (1) specimen retained in reserve for later testing if required.
    - 3) If strength of field-cured cylinders is less than eighty five (85) percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing in-place concrete.
    - 4) Strength level of concrete will be considered satisfactory if averages of sets of three (3) consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than 500 psi.
- B. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
1. Correct any work found defective or not complying with contract document requirements at no additional cost to the Owner.

### 3.5 FIELD QUALITY CONTROL

#### A. Field Tests And Inspections:

1. General:
  - a. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
  - b. Quality Control is sole responsibility of Contractor as specified in Section 01 4523 'Testing And Inspection Services'.
2. Concrete:
  - a. Testing Agency shall provide testing and inspection for concrete as per ASTM C1077.
  - b. Testing Agency will sample and test for quality control during placement of concrete as directed by Architect.
  - c. Testing and inspections, if performed, will include following:
    - 1) Periodic inspection verifying use of required design mix.
    - 2) Inspection at time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine temperature of concrete.
    - 3) Inspection of concrete and shotcrete placement for proper application techniques.
    - 4) Periodic inspection for maintenance of specified curing temperature and techniques.
    - 5) Periodic inspect of formwork for shape, location and dimensions of concrete member being formed:
      - a) Certified Inspector shall inspect forms for general location, configuration, camber, shoring, sealing of form joints, correct forming material, concrete accessories, and form tie locations.
    - 6) Concrete floor flatness and floor levelness or interior slabs as per ASTM E1155.
    - 7) Concrete moisture and alkalinity testing. See Section 09 0503 Flooring Substrate Preparation.
  - d. Testing Agency will sample and test during placement of concrete as directed by Architect and may include following:
    - 1) Sampling Fresh Concrete: ASTM C172/C172M, except modified for slump to comply with ASTM C94/C94M:
      - a) Slump: ASTM C143/C143M, test each time set of compressive specimens are made.
      - b) Air Content: ASTM C173/C173M, volumetric method for lightweight or normal weight concrete: ASTM C231/C231M, pressure method for normal weight concrete each time set of compression test specimens are made.
      - c) Concrete Temperature: Test each time set of compressive specimens are made.
      - d) Unit Weight: ASTM C567/C567M, Test each time set of compressive specimens are made.
  - e. Compression Test Specimen: ASTM C31/C31M; one (1) set of four (4) standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.
  - f. Compressive Strength Tests: ASTM C39/C39M: Provide six (6) random sets for site cast concrete (sidewalks, curbs, gutters, etc.), two (2) random sets for footings, two (2) random sets for foundation walls and two (2) random sets for interior concrete slabs on grade.
    - 1) One (1) specimen tested at seven (7) days, two (2) specimens tested at twenty eight (28) days, and one (1) specimen retained in reserve for later testing if required.
    - 2) If strength of field-cured cylinders is less than eighty five (85) percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing in-place concrete.
    - 3) Strength level of concrete will be considered satisfactory if averages of sets of three (3) consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than **500 psi**.
  - g. Compressive Strength Tests: ASTM C39/C39M: Provide three (3) random sets for site cast concrete (sidewalks, curbs, gutters, etc). Testing of concrete for Building is not required and will be performed at discretion of Architect:
    - 1) If sets are taken, one (1) specimen tested at seven (7) days, two (2) specimens tested at twenty eight (28) days, and one (1) specimen retained in reserve for later testing if required.

- 2) If strength of field-cured cylinders is less than eighty five (85) percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing in-place concrete.
  - 3) Strength level of concrete will be considered satisfactory if averages of sets of three (3) consecutive strength test results equal or exceed specified compressive strength, and no individual strength test result falls below specified compressive strength by more than **500 psi**.
3. Reinforcement Bars and Bolts:
- a. Inspection of Reinforcement Bars and Bolts is required for Project:
    - 1) Reinforcement Bars - Inspections will include following:
      - a) Periodic inspection of reinforcement bars and placement prior to concrete placement to verify grade, size, cover, spacing, and position of reinforcing.
      - b) Inspect that all reinforcement bars are be positively identified as to heat number and mill analysis.
      - c) Confirm surface of reinforcing bars is free of form release oil or other deleterious substances.
    - 2) Bolts - Inspections will include following:
      - a) Inspection of bolts to be installed in concrete prior to and during placement of concrete.
      - b) Periodic inspection of anchors installed in hardened concrete.
  - b. Cast-In-Place Concrete Retaining Walls:
    - 1) Reinforcement Bars - Inspections will include following:
      - a) Periodic inspection of reinforcement bars and placement prior to concrete placement to verify grade, size, cover, spacing, and position of reinforcing.
      - b) Inspect that all reinforcement bars are be positively identified as to heat number and mill analysis.
      - c) Confirm surface of reinforcing bars is free of form release oil or other deleterious substances.
    - 2) Bolts - Inspections will include following:
      - a) Inspection of bolts to be installed in concrete prior to and during placement of concrete.
      - b) Periodic inspection of anchors installed in hardened concrete.
- B. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
1. Correct any work found defective or not complying with contract document requirements at no additional cost to the Owner.

### 3.6 CLEANING

- A. General:
1. Curing:
    - a. Clean tools, equipment as directed by Manufacturer's instructions.

### 3.7 PROTECTION

- A. Concrete:
1. Protect concrete that has not received its initial set from precipitation to avoid excess water in mix and unsatisfactory surface finish.
  2. Do not allow materials resulting from construction activities, which will affect concrete or application of finish floor systems adversely, to come in contact with interior concrete slabs.
  3. Protect interior concrete floors from stains, paint, mortar and other construction activities.
- B. Curing:
1. Restrict foot or vehicle traffic as curing membrane dries as recommended be Manufacturer.

**END OF SECTION**

**BLANK PAGE**

**SECTION 03 3923****MEMBRANE CONCRETE CURING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Quality of membrane concrete curing as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 03 3053: 'Miscellaneous Cast-In-Place Concrete'.
  - 2. Section 03 3111: 'Cast-In-Place Structural Concrete' for application of membrane concrete curing.
  - 3. Section 03 3517: 'Concrete Sealer-Finishing' for application of concrete sealer.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Curing: Process by which hydraulic-cement concrete matures and develops hardened properties, over time, as result of continued hydration of cement in presence of sufficient water and heat. Also used to describe action taken to maintain moisture and temperature conditions in freshly placed concrete.
- B. Reference Standards:
  - 1. American Association of State and Highway Transportation Officials:
    - a. AASHTO M 148-05, 'Standard Specification for Liquid Membrane-Forming Compounds for Curing'.
  - 2. ASTM International:
    - a. ASTM C309-11, 'Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete'.

**1.3 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Manufacturer's product data.
    - b. Material Safety Data Sheets (MSDS).
- B. Informational Submittals:
  - 1. Manufacturer Instructions:
    - a. Printed installation instructions.

**1.4 QUALITY ASSURANCE**

- A. Regulatory Agency Sustainability Approvals:
  - 1. Comply with applicable VOC standards and other local requirements.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery And Acceptance Requirements:
  - 1. Materials shall be delivered in original, unopened packages with labels intact.

## B. Storage And Handling Requirements:

1. Follow Manufacturer's written instructions for handling and storage of product:
  - a. Store in unopened containers in clean, dry area between **35 deg F** and **110 deg F** (Keep from freezing) or as directed by Manufacturer's instruction.
2. Shelf Life: Do not use curing compound that is over one (1) year from manufacturer date.

**1.6 FIELD CONDITIONS**

## A. Ambient Conditions:

1. Do not apply curing compound when temperature of concrete is less than **40 deg F**.

**PART 2 - PRODUCTS****2.1 MATERIALS**

## A. Membrane Concrete Curing:

1. Description:
  - a. Clear water-based, ready-to use, dissipating membrane curing agent that cures freshly placed concrete, forming effective barrier against moisture loss from concrete surface.
2. Design Criteria:
  - a. VOC-compliant compound.
  - b. Meet requirements of ASTM C309 and AASHTO M 148, Type 1 or 1-D, Class B.
  - c. Interior concrete: containing no mineral spirits, naptha, or other components detrimental to finish flooring installation.
  - d. Maintain ninety five (95) percent of mix water present in concrete mass after application.
  - e. Gradually dissipate after twenty eight (28) days without leaving stain or discoloring concrete surface.
3. Horizontal and Vertical Cast-In-Place Structural Concrete:
  - a. Type One Acceptable Products.
    - 1) Exterior and Interior Concrete:
      - a) Clear Cure J7WB by Dayton Superior Corporation, Miamisburg. OH [www.daytonsuperior.com](http://www.daytonsuperior.com).
      - b) L&M Cure R by L&M Construction Chemicals, Inc. Omaha, NE [www.lmcc.com](http://www.lmcc.com).
      - c) Clear Water Resin by Right Point, Dekalb, IL [www.rightpointe.com](http://www.rightpointe.com).
      - d) 1100-Clear by W. R. Meadows, Inc. Hampshire, IL [www.wrmeadows.com](http://www.wrmeadows.com).
  - b. Equal product meeting design criteria requirements as approved by Architect/Owner's Representative before BID. See Section 01 6200.

**PART 3 - EXECUTION: Not Used****END OF SECTION**



**SECTION 03 6213****NON-METALLIC NON-SHRINK GROUTING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install structural grout as described in Contract Documents.
    - a. For securing anchor bolts and hardware in concrete.
    - b. For securing anchor bolts and hardware in masonry.
- B. Related Requirements:
  - 1. Section 04 0516: 'Masonry Grouting'.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. American Concrete Institute:
    - a. ACI 305R-10, 'Guide to Hot Weather Concreting'.
    - b. ACI 306R-10, 'Guide to Cold Weather Concreting'.
    - c. ACI 351.1R-12, 'Grouting Between Foundations and Bases for Support of Equipment and Machinery'.
- B. Reference Standards:
  - 1. ASTM International:
    - a. ASTM C33/C33M-13, 'Standard Specification for Concrete Aggregates'.
    - b. ASTM C78/C78M-10, 'Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)'.
    - c. ASTM C109/C109M-13, 'Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)'.
    - d. ASTM C191-13, 'Standard Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle'.
    - e. ASTM C230/C230M-14, 'Standard Specification for Flow Table for Use in Tests of Hydraulic Cement'.
    - f. ASTM C266-15, 'Standard Test Method for Time of Setting of Hydraulic-Cement Paste by Gillmore Needles'.
    - g. ASTM C293/C293M-10, 'Standard Test Method for Flexural Strength of Concrete (Using Simple Beam With Center-Point Loading)'.
    - h. ASTM C307-03(2012), 'Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing'.
    - i. ASTM C309-11, 'Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete'.
    - j. ASTM C348-14, 'Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars'.
    - k. ASTM C469/C469M-10, 'Standard Test Method for Static Modulus of Elasticity and Poisson's Ratio of Concrete in Compression'.
    - l. ASTM C496/C496M-14, 'Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens'.
    - m. ASTM C531-00(2005), 'Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes'.
    - n. ASTM C579-01(2012), 'Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes'.

- o. ASTM C580-02(2012), 'Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes'.
  - p. ASTM C666/C666M-15, 'Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing'.
  - q. ASTM C827/C827M-10, 'Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures'.
  - r. ASTM C882/C882M-13a, 'Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear'.
  - s. ASTM C939-10, 'Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method)'.
  - t. ASTM C940-10a, 'Standard Test Method for Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory'.
  - u. ASTM C942-15, 'Standard Test Method for Compressive Strength of Grouts for Preplaced-Aggregate Concrete in the Laboratory'.
  - v. ASTM C1090-10, 'Standard Test Method for Measuring Changes in Height of Cylindrical Specimens of Hydraulic-Cement Grout'.
  - w. ASTM C1107/C1107M-14a, 'Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)'.
  - x. ASTM C1202-12, 'Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration'.
  - y. ASTM E488/E488-15, 'Standard Test Methods for Strength of Anchors in Concrete Elements'.
2. United States Army Corps of Engineers (USACE):
- a. CRD C-621-93, 'Handbook for Concrete and Cement Standard Specification for Packaged, Dry, Hydraulic-Cement Grout (Nonshrink)'.

### 1.3 SUBMITTALS

- A. Action Submittals
- 1. Product Data:
    - a. Manufacturer's data sheets on each product to be used, including:
      - 1) Preparation instructions and recommendations.
      - 2) Storage and handling requirements and recommendations.
      - 3) Manufacturer's printed installation instructions for each product.

### 1.4 DELIVERY, STORAGE AND HANDLING

- A. Delivery And Acceptance Requirements:
- 1. Materials shall be delivered in original, unopened packages with labels intact clearly identifying product name and manufacturer until time of use.
- B. Storage And Handling Requirements:
- 1. Follow Manufacturer's recommendations including but not limited to following:
    - a. Store in clean, dry location.
    - b. Keep containers sealed until ready for use.
    - c. Store materials at room temperature before use.
  - 2. Protect materials during handling and placement to prevent damage or contamination.
    - a. Protect materials from freezing or overheating.
  - 3. Shelf Life: One (1) year minimum in original, unopened containers.

### 1.5 FIELD CONDITIONS

- A. Ambient Conditions:
- 1. General:
    - a. Do not place grout over frozen concrete.

2. Maintain environmental conditions and protect Work during and after installation to comply with referenced standards and Manufacturer's printed recommendations:
  - a. Do not install products under environmental conditions outside Manufacturer's recommendations.
3. Follow ACI requirements for cold and hot weather concreting or Manufacturer's written instructions, whichever is more stringent:
  - a. Cold Weather Limitations:
    - 1) Follow requirements of ACI 306R for cold weather concreting.
  - b. Hot Weather Limitations:
    - 1) Follow requirements of ACI 305R for hot weather concreting.
  - c. ACI 305R-10, 'Guide to Hot Weather Concreting'.
  - d. ACI 306R-10, 'Guide to Cold Weather Concreting'.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Design Criteria:
  1. Description:
    - a. Commercial non-shrink, non-metallic grout.
  2. Meet following requirements:
    - a. ASTM C1107/C1107M, Type B or Type C.
    - b. Corps and Engineers CRD C-621.
    - c. Compressive strength of **6000 psi** minimum.
- B. Type Two Acceptable Products:
  1. Masterflow 928 by BASF Systems, Shakopee, MN or BASF Canada, Mississauga, ON [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com).
  2. ProSpec F77 by Bonsal American, Inc., Charlotte, NC [www.bonsal.com](http://www.bonsal.com).
  3. Advantage 1107 Grout by Dayton Superior Corporation, Oregon, IL [www.daytonsuperiorchemical.com](http://www.daytonsuperiorchemical.com).
  4. NS Grout by Euclid Chemical Company, Cleveland, OH [www.euclidchemical.com](http://www.euclidchemical.com).
  5. Five Star Grout by Five Star Products Inc, Fairfield, CT [www.fivestarproducts.com](http://www.fivestarproducts.com).
  6. Duragrout by L&M Construction Chemicals Inc., Omaha, NE [www.lmcc.com](http://www.lmcc.com).
  7. Planigrout 712 by MAPEI Corporation, Deerfield Beach, FL [www.mapei.US](http://www.mapei.US) or Mapei Inc., Laval, QC [www.mapei.com/CA](http://www.mapei.com/CA).
  8. SikaGrout 212 by Sika Corporation, Lyndhurst, NJ [www.usa.sika.com](http://www.usa.sika.com) or Sika Canada, Inc. Pointe-Claire, QC [www.can.sika.com](http://www.can.sika.com).
  9. MP Grout by US Mix Products Company, Denver, CO [www.usspec.com](http://www.usspec.com).
  10. Sealtight CG-86 Grout by W R Meadows, Hampshire, IL [www.meadows.com](http://www.meadows.com).
  11. Equal as approved by Architect before installation. See Section 01 6200.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification Of Conditions:
  1. Examine substrate and verify substrate is suitable for installation.
  2. Notify Architect of unsuitable conditions in writing.
    - a. Do not install board over unsuitable conditions.
    - b. Commencement of Work by installer is considered acceptance of substrate.

### 3.2 PREPARATION

- A. Surface Preparation:
  - 1. Prepare concrete surfaces in accordance with Manufacturer's written instructions:
  - 2. Remove all loose materials.
  - 3. Clean surface of any substance that could interfere with bond on material including dirt, paint, tar, asphalt, wax, oil, grease, latex compounds, form release agents, laitance, loose toppings, foreign substances and any other residues.
  - 4. Saturate area to be grouted with water in accordance with Manufacturer's written instructions.

### 3.3 APPLICATION

- A. General:
  - 1. Follow Manufacturer's recommended thickness.
- B. Mixing:
  - 1. Mix grout in accordance with Manufacturer's written instructions.
  - 2. Add mix water in amount in accordance with Manufacturer's written instructions to provide required placing consistency.
  - 3. Do not add water in amount that will cause bleeding or segregation of mixed grout.
  - 4. Do not add any sand, cement, admixtures, or fluidifiers to grout.
- C. Placement:
  - 1. Place grout in accordance with Manufacturer's written instruction including but not limited to the following:
    - a. Proper curing is required.
    - b. Use cold weather or hot weather grouting procedures in accordance with Manufacturer's written instructions, as temperature dictates:
      - 1) Do not use at temperatures that may cause premature freezing.
      - 2) Do not allow to freeze until 4000 psi is attained.
    - c. Employ cold weather or hot weather grouting practices as temperatures dictates.
  - 2. Completely eliminate air pockets and provide full contact between grout and item being grouted. Do not exceed Manufacturer's recommended thickness.
- D. Curing:
  - 1. Cure grout in accordance with Manufacturer's written instructions or ACI curing practices.
  - 2. Wet cure grout until forms are removed.
  - 3. Seal grout surfaces after forms are removed as recommended by Manufacturer.
- E. Keep grout surfaces wet after curing compound has dried for as long as recommended by Manufacture.

### 3.4 FIELD QUALITY CONTROL

- A. Field Inspections:
  - 1. Verify product has been installed as per Contract Documents and Manufacturer's written instructions.
- B. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
  - 1. Correct any work found defective or not complying with Contract Document requirements at no additional cost to the Owner.

### 3.5 CLEANING

- A. Use clean water.

- B. Clean tools and equipment with water before material hardens.

### 3.6 PROTECTION

- A. Follow Manufacturer's recommendation for protection when applying material.
- B. Protect placed grout from freezing until minimum strength of 4000 psi is reached.
- C. Protect placed grout from damage during construction.

**END OF SECTION**

**BLANK PAGE**

**SECTION 04 0513****CEMENT AND LIME MASONRY MORTARING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Quality of masonry mortar used on Project.
- B. Related Requirements:
  - 1. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
  - 2. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
  - 3. Sections Under 04 2000 Heading: Furnish and install mortar.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Mortar: Plastic mixture of cementitious materials, fine aggregate and water. See ASTM C270.
- B. Reference Standards:
  - 1. ASTM International:
    - a. ASTM C144-11, 'Standard Specification for Aggregate for Masonry Mortar'.
    - b. ASTM C150/C150M-12, 'Standard Specification for Portland Cement'.
    - c. ASTM C207-06(2011), 'Standard Specification for Hydrated Lime for Masonry Purposes'.
    - d. ASTM C270-14, 'Standard Specification for Mortar for Unit Masonry'.

**1.3 SUBMITTALS**

- A. Informational Submittals:
  - 1. Source Quality Control Submittals:
    - a. If pre-mixed wet mortar or pre-blended dry mortar mix are to be used, provide certification from Manufacturer or Supplier verifying that mixes meet specification requirements.
    - b. If site mixed / blended mortar is to be used, provide written description of proposed method of measuring and mixing of materials.

**PART 2 - PRODUCTS****2.1 SYSTEM**

- A. Performance:
  - 1. Minimum Compressive Strength at 28 Days:
    - a. Type N: 750 psi.
- B. Materials:
  - 1. Portland Cement:
    - a. Meet requirements of ASTM C150, Type II Low Alkali unless approved otherwise in writing by Architect.
  - 2. Hydrated Lime:
    - a. Meet requirements of ASTM C207, Type S.

3. Aggregate:
  - a. Standard Mortar:
    - 1) Natural or manufactured sand meeting requirements of ASTM C144 and following:
      - a) Fineness modulus: 1.6 to 2.5 percent
      - b) Water demand, ratio by weight: 0.65 percent maximum
      - c) Grading:

Sieve	Percent Passing	
	Natural Sand	Manufactured Sand
No. 4	100	100
No. 8	95 to 100	95 to 100
No. 16	70 to 100	70 to 100
No. 30	40 to 75	40 to 75
No. 50	10 to 35	20 to 40
No. 100	2 to 15	10 to 25
No. 200	none	0 to 10

4. Water:
    - a. Clean and free of acids, alkalis, and organic materials.
  5. Admixtures:
    - a. Use no admixtures, except for color pigments specified below, without Architect's written permission. Use of any admixture to meet cold weather requirements and admixtures that increase air entrainment are expressly forbidden under all circumstances.
  6. Mortar Color Pigment:
    - a. High purity, chemically inert, unfading, alkali-fast mineral oxides, finely ground and especially prepared for mortar.
    - b. Color Standard: As selected by Architect.
    - c. Type One Acceptable Products:
      - 1) True Tone Mortar Colors by Davis Colors, Los Angeles, CA [www.daviscolors.com](http://www.daviscolors.com).
      - 2) SGS Mortar Colors by Solomon Colors, Springfield, IL [www.solomoncolors.com](http://www.solomoncolors.com).
      - 3) Equal as approved by Architect before bidding. See Section 01 6200.
- C. Mixes:
1. General:
    - a. Heat water and sand to 140 deg F maximum if temperature is below 40 deg F.

### PART 3 - EXECUTION: Not Used

### END OF SECTION



**SECTION 04 0516****MASONRY GROUTING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Quality of masonry grout used on Project.
- B. Related Requirements:
  - 1. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
  - 2. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
  - 3. Sections under 04 2000 heading: Furnish and install masonry grout.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Grout: Mixture of cementitious material and aggregate to which sufficient water is added to produce pouring consistency without segregation of the constituents.
- B. Reference Standards:
  - 1. ASTM International:
    - a. ASTM C94/C94M-14, 'Standard Specification for Ready-Mixed Concrete'.
    - b. ASTM C150/C150M-12, 'Standard Specification for Portland Cement'.
    - c. ASTM C207-06(2011), 'Standard Specification for Hydrated Lime for Masonry Purposes'.
    - d. ASTM C404-11, 'Standard Specification for Aggregates for Masonry Grout'.
    - e. ASTM C476-10, 'Standard Specification for Grout for Masonry'.
    - f. ASTM C1019-13, 'Standard Test Method for Sampling and Testing Grout'.

**1.3 SUBMITTALS**

- A. Informational Submittals:
  - 1. Source Quality Control Submittals:
    - a. If pre-blended dry grout is to be used, provide certification from Manufacturer or Supplier verifying that mixes meet specification requirements.
    - b. If grout is to be mixed in field, provide written description of proposed procedure for measuring and mixing of materials.

**PART 2 - PRODUCTS****2.1 SYSTEM**

- A. Performance
  - 1. Minimum Compressive Strength for laboratory cured specimens at 28 Days:
    - a. **2000 psi.**
- B. Materials:
  - 1. Portland Cement:
    - a. Meet requirements of ASTM C150/C150M.
    - b. Use Type II Low Alkali in exterior walls and in walls subject to moisture, unless approved otherwise in writing by Architect.
  - 2. Hydrated Lime:
    - a. Meet requirements of ASTM C207, Type S.

3. Aggregate:
  - a. Meet requirements of ASTM C404, Table 1.

- 1) Grading Requirements for Fine Aggregate, Natural, Size 2.

Sieve	Percent Passing
No. 4	100
No. 8	95 - 100
No. 16	60 - 100
No. 30	35 - 70
No. 50	15 - 35
No. 100	2 - 15

- 2) Grading Requirements for Coarse Aggregate, Size 8.

Sieve	Percent Passing
1/2 Inch	100
3/8 Inch	85 - 100
No. 4	10 - 30
No. 8	0 - 10
No. 16	0 - 5

4. Water:
  - a. Clean and free of acids, alkalis, and organic materials.
5. Admixtures:
  - a. No additives are allowed which will increase air entrainment. Other additives may be used as approved in writing by Architect before use.

C. Mixes:

1. Procedure:
  - a. Use of pre-blended dry grout mix is allowed only with submission of certification that material specification requirements have been complied with.
  - b. Use method of measuring and mixing materials that will ensure consistently proportioned grout batches throughout installation of masonry work. No measuring of materials by 'shovels full' is permitted for field mixed grout.
  - c. Batch, mix, and deliver transit-mixed grout in accordance with requirements of ASTM C94/C94M.
2. Proportions by Volume:
  - a. Water: Enough to give creamy pouring consistency, usually slump of between 8 and 10.

Material	Fine Grout	Coarse Grout
Portland Cement	One cu ft	One cu ft
Hydrated Lime (optional)	1/10 cu ft	1/10 cu ft
Damp, Loose Sand	2-1/4 to 3 cu ft	2-1/4 to 3 cu ft
Pea Gravel	none	1 to 2 cu ft

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Use fine grout for cavities 2 inches and smaller in smallest dimension. Use coarse grout for cavities greater than 2 inches in smallest dimension.

**END OF SECTION**

**SECTION 04 0519****MASONRY ANCHORS AND INSERTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Cast-in anchors for masonry.
  - 2. Adhesive anchors and inserts for masonry.
  - 3. Drilled-in mechanical anchors for masonry.
  - 4. Screw anchors for masonry.
  - 5. Masonry anchors and inserts not specified elsewhere.
- B. Related Requirements:
  - 1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
  - 2. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
  - 3. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
  - 4. Section 01 4301: 'Quality Assurance – Qualifications' for minimum qualification levels required.
  - 5. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
  - 6. Section 01 7800: 'Closeout Submittals'.
  - 7. Section 03 3111: 'Normal-Weight Structural Concrete' for installation of cast-in-place anchors and inserts.
  - 8. Section 06 1100: 'Wood Framing' for installation of drilled in anchors.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. Council of American Structural Engineers. CASE Form 101: *Statement of Special Inspections*. Washington, DC: CASE, 2001. (c/o American Council of Engineering Companies, 1015 15<sup>th</sup> St., NW, Washington, DC 20005; 202-347-7474; [www.acec.org](http://www.acec.org)).
  - 2. International Code Council (IBC):
    - a. IBC Chapter 17, 'Structural Tests and Special Inspections'.
- B. Definitions (Following are specifically referenced for testing):
  - 1. Accreditation: Process in which certification of competency, authority, or credibility is presented. Verify that laboratories have an appropriate quality management system and can properly perform certain test methods (e.g., ANSI, ASTM, and ISO test methods) and calibration parameters according to their scopes of accreditation.
  - 2. Approved: To authorize, endorse, validate, confirm, or agree to.
  - 3. Field Quality Control: Testing, Inspections, Special Testing and Special Inspections to assure compliance to Contract Documents.
  - 4. Inspection/Special Inspection: Inspection of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards:
    - a. Inspection: Not required by code provisions but may be required by Contract Documents.
    - b. Special Inspection: Required by code provisions and by Contract Documents.
    - c. Inspection-Continuous: Full-time observation of the Work requiring inspection by approved inspector who is present in area where the Work is being performed.

- d. Inspection-Periodic: Part-time or intermittent observation of the Work requiring inspection by approved inspector who is present in area where the Work has been or is being performed and at completion of the Work.
  5. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform particular construction operation, including installation, erection, application, and similar operations.
  6. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation. They are not samples. Approved mockups establish standard by which the Work will be judged.
  7. Observation: Visual observation of building / site elements or structural system by registered design professional for general conformance to approved construction documents at significant construction stages and at completion. Observation does not include or waive responsibility for performing inspections or special inspections.
  8. Owner's Representative: Owner's Designated Representative (Project Manager or Facilities Manager) who will have express authority to bind Owner with respect to all matters requiring Owner's approval or authorization.
  9. Preconstruction Testing: Tests and inspections that are performed specifically for Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
  10. Product Testing: Tests and inspections that are performed by testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
  11. Quality Assurance: Testing, Inspections, Special Testing and Special Inspections provided for by Owner.
  12. Quality Control: Testing, Inspections, Special Testing and Special Inspections provided for by Contractor.
  13. Service Provider: Agency or firm qualified to perform required tests and inspections.
  14. Source Quality Control Testing: Tests and inspections that are performed at source, i.e., plant, mill, factory, or shop.
  15. Special Inspection: See Inspection.
  16. Special Inspector: Certified individual or firm that implements special inspection program for project.
  17. Special Test: See Test.
  18. Test/Special Test: Field or laboratory tests to determine characteristics and quality of building materials and workmanship.
    - a. Test: Not required by code provisions but may be required by Contract Documents.
    - b. Special Test: Required by code provisions and by Contract Documents.
  19. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
  20. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
  21. Verification: Act of reviewing, inspecting, testing, etc. to establish and document that product, service, or system meets regulatory, standard, or specification requirements.
- C. Reference Standards:
1. American Concrete Institute:
    - a. ACI 355.4-11, 'Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary'.
    - b. ACI 355.4M-11, 'Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary (Metric)'.
    - c. ACI 548.12-12, 'Specification for Bonding Hardened Concrete and Steel to Hardened Concrete with an Epoxy Adhesive'.
  2. ASTM International:
    - a. ASTM A307-14, 'Standard Specification for Carbon Steel Bolts and Studs, 60000 psi Tensile Strength'.

- b. ASTM A325-14, 'Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength'.
  - c. ASTM A490-12, 'Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength'.
  - d. ASTM A490M-12, 'Standard Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints [Metric]'.
  - e. ASTM A563-07a(2014), 'Standard Specification for Carbon and Alloy Steel Nuts'.
  - f. ASTM F1554-07a, 'Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength'.
3. ASTM International (Following are specifically referenced for Testing Agencies):
- a. ASTM C1077-14, 'Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation'.
  - b. ASTM D3666-13, 'Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials'.
  - c. ASTM D3740-12a, 'Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction'.
  - d. ASTM E329-14a, 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing'.
  - e. ASTM E543-13, 'Standard Specification for Agencies Performing Nondestructive Testing'.
  - f. ASTM E1212-12, 'Standard Practice for Quality Management Systems for Nondestructive Testing Agencies'.
4. International Code Council (IBC):
- a. Chapter 17, 'Structural Tests and Special Inspections' (2012 or latest edition available).
  - b. Chapter 21, 'Masonry' for materials, design, construction and quality of masonry (2012 or latest edition available).
  - c. ES Acceptance Criteria: 'Concrete Anchor Compendium':
    - 1) AC01, 'Acceptance Criteria For Expansion Anchors in Masonry Elements' (Approved May 2012).
    - 2) AC58, 'Acceptance Criteria For Adhesive Anchors in Concrete and Masonry Elements' (June 2012).
    - 3) AC106, 'Acceptance Criteria For Predrilled Fasteners (Screw Anchors) in Masonry' (Approved May 2012).
    - 4) AC193, 'Acceptance Criteria For Mechanical Anchors in Concrete Elements' (approved June 2012).
    - 5) AC308 'Acceptance Criteria For Post-Installed Adhesive Anchors In Concrete Elements' (approved June 2013).
  - d. ICC/ESR-1056, 'Titen HD Screw Anchors' (reissued February 1, 2014).
  - e. ICC/ESR-1385, 'KWIK Bolt 3 Masonry Anchor' (reissued February 1, 2014).
  - f. ICC/ESR-1396, 'Wedge-All Anchors' (reissued March 1, 2014).
  - g. ICC/ESR-1772, 'SET Adhesive Anchor Systems' (reissued November 1, 2013).
  - h. ICC/ESR-2682, 'Hilti HIT HY 70 Adhesive Anchoring Systems' (reissued June, 2014).
  - i. ICC/ESR-2369, 'HUS-H Concrete Masonry Screw Anchors' (May 1, 2010).
5. Masonry Standards Joint Committee (MSJC) - The Masonry Society (TMS) / American Concrete Institute (ACI) / American Society of Civil Engineers (SEI/ASCE):
- a. TMS 402-11/ACI 530-11/ASCE 5-11, 'Building Code Requirements and Specification for Masonry Structures and Commentary'.
  - b. TMS 602-11/ACI 530.1-11/ASCE 6-11, 'Specification for Masonry Structures and Commentary'.

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference: In addition to agenda items specified in Section 01 3100, review following:
- 1. Coordinate pre-installation conference in conjunction with all other Division 04 Specifications in this Project that require pre-installation conferences.

2. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
  - a. Review frequency of testing and inspections.

B. Scheduling:

1. Inspection shall be performed according to Manufacturer's submitted ICC ES Evaluation Report.
2. Notify Testing Agency and Architect one week before installing anchors so testing may be scheduled.

#### 1.4 SUBMITTALS

A. Action Submittals:

1. Product Data:
  - a. Manufacturer's product literature for each item.

B. Informational Submittals:

1. Test And Evaluation Reports:
  - a. ICC ES Evaluation Report indicating conformance with current applicable ICC ES Acceptance Criteria.
2. Manufacturer's Instructions:
  - a. Manufacturer's published installation recommendations for each item.

C. Closeout Submittals:

1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
  - a. Record Documentation:
    - 1) Testing and Inspection Reports:
      - a) Testing Agency Inspecting Reports of Drilled-In Mechanical Anchors / Adhesive Anchors / Screw Anchors.

#### 1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer:
  - a. Having sufficient capacity to produce and deliver required materials with out causing delay in work.
2. Installer:
  - a. Acceptable to Manufacturer, experienced in performing work of this section and has specialized in installation of work similar to that required for this project.

B. Testing and Inspection.

1. Owner will provide Testing and Inspection for Drilled-In Mechanical Anchors / Adhesive Anchors / Screw Anchors:
  - a. Owner will employ testing agencies to perform testing and inspection on drilled-in mechanical anchors / adhesive anchors / screw anchors as specified in Field Quality Control in Part 3 of this specification.
    - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
    - 2) See Section 01 1200: 'Multiple Contract Summary'.
  - b. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control.
    - 1) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
  - 1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
  - 1. Store materials protected from exposure to harmful weather conditions and as directed by manufacturer.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Manufactured Units:
  - 1. General:
    - a. Use hot-dipped galvanized or stainless steel with matching nuts and washers in exterior and moist interior applications unless indicated otherwise on Drawings.
    - b. Nut: Conform to requirements of ASTM A563, Grade A, Hex.
  - 2. Threaded rod for adhesive anchors and cast-in anchors: Conform to requirements of ASTM A307, Grade A or ASTM F1554.
  - 3. Anchor Bolts:
    - a. J-Bolts:
      - 1) Non-headed type threaded **2 inches** minimum conforming to requirements of ASTM F1554, Grade A.
      - 2) Anchor hook to project **2 inches** minimum including bolt diameter.
    - b. Headed Bolts:
      - 1) Headed type threaded **2 inches** minimum conforming to requirements of ASTM F1554, Grade A.
  - 4. Adhesive Anchors:
    - a. Cartridge Injection Adhesive Anchors.
    - b. Products shall have current ICC ES Evaluation report conforming to current ICC ES Acceptance Criteria ICC ES AC 58 for masonry.
    - c. Rod diameter and embedment length as indicated on Drawings.
    - d. Type Two Acceptable Products:
      - 1) HIT-HY 70 by Hilti Fastening Systems, Tulsa, OK; [www.us.hilti.com](http://www.us.hilti.com).
      - 2) SET Epoxy by Simpson Strong-Tie Co., Pleasanton, CA [www.simpsonanchors.com](http://www.simpsonanchors.com).
      - 3) Equal as approved by Architect before installation. See Section 01 6200.
  - 5. Drilled-In Mechanical Anchors (Expansion Bolts):
    - a. Products shall have current ICC ES Evaluation report conforming to current ICC ES Acceptance Criteria ICC ES AC 01 for masonry.
    - b. Type Two Acceptable Products:
      - 1) Kwik Bolt 3 by Hilti Fastening Systems, Tulsa, OK [www.us.hilti.com](http://www.us.hilti.com).
      - 2) Wedge-All by Simpson Strong-Tie Co., Pleasanton, CA [www.simpsonanchors.com](http://www.simpsonanchors.com).
      - 3) Equal as approved by Architect before installation. See Section 01 6200.
  - 6. Screw Anchors:
    - a. Provide anchors with length identification markings conforming to ICC ES AC 106 for masonry.
    - b. Type Two Acceptable Products:
      - 1) Titen HD by Simpson Strong Tie Co, Dublin, CA [www.strongtie.com](http://www.strongtie.com).
      - 2) HUS-H Screws by Hilt Fastening Systems, Tulsa, OK [www.us.hilti.com](http://www.us.hilti.com).
      - 3) Equals as approved by Architect through shop drawing submittal before installation. See Section 01 6200.

**PART 3 - EXECUTION****3.1 EXAMINATION**

- A. Verification of Conditions:
  - 1. Embedded Items:
    - a. Identify position of reinforcing steel and other embedded items before drilling holes for anchors. Exercise care in coring or drilling to avoid damaging existing reinforcing or embedded items. Take precautions as necessary to avoid damaging pre-stressing tendons, electrical and telecommunications conduit, and gas lines.
    - b. Notify Engineer if reinforcing steel or other embedded items are encountered during drilling.
  - 2. Base Material Strength: Unless otherwise specified, do not drill holes in masonry until mortar, or grout has achieved full design strength.

**3.2 PREPARATION**

- A. Surface Preparation:
  - 1. Clean surfaces prior to installation.
  - 2. Prepare surface in accordance with Manufacturers written recommendations.

**3.3 INSTALLATION**

- A. Drilled-In Anchors:
  - 1. General:
    - a. Drill holes with rotary impact hammer drills using carbide-tipped bits or core drills using diamond core bits.
    - b. Unless otherwise shown on Drawings, drill holes perpendicular to masonry surface.
    - c. Where anchors are to be installed in cored holes, use core bits with matched tolerances specified by Manufacturer. Cores holes may only be used if acceptable to Manufacturer.
    - d. Perform anchor installation in accordance with Manufacturer's published instructions.
  - 2. Adhesive Anchors:
    - a. Clean holes in accordance with Manufacturer's published instructions before installation of adhesive. Follow Manufacturer's recommendations to ensure proper mixing of adhesive components.
    - b. Inject adhesive into holes proceeding from bottom of hole and progressing toward surface so as to avoid introduction of air pockets into adhesive. Inject sufficient adhesive into hole to ensure that annular gap is filled to surface.
    - c. Remove excess adhesive from surface.
    - d. Shim anchors with suitable device to center anchor in hole. Do not disturb or load anchors before Manufacturer's specified cure time has elapsed.
    - e. Observe Manufacturer's recommendations with respect to installation temperatures for adhesive anchors. Base material temperatures must be maintained above minimum temperatures allowed by Manufacturer for full required epoxy cure time.
  - 3. Drilled-in Mechanical Anchors (Expansion Bolts):
    - a. Protect threads from damage during anchor installation.
    - b. Set anchors to manufacturer's recommended torque, using torque wrench. Following attainment of 10 percent of specified torque, 100 percent of specified torque shall be reached within 7 or fewer complete turns of nut. If specified torque is not achieved within required number of turns, remove and replace anchor, unless otherwise directed by Architect.
  - 4. Screw Anchors:
    - a. Protect threads from damage during anchor installation.
    - b. Set anchors to manufacturer's recommended torque, using torque wrench.



### 3.4 FIELD QUALITY CONTROL

#### A. Field Tests and Inspections:

1. General:
  - a. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
  - b. Quality Control is sole responsibility of Contractor as specified in Section 01 4523 'Testing And Inspection Services'.
2. Drill-In Mechanical Anchors / Adhesive Anchors / Screw Anchors:
  - a. Certified Inspector from Testing Agency shall verify procedures used for installation of all concrete anchors and monitor their installation for compliance with manufacturer's requirements.
  - b. Testing: Ten (10) percent of each type and size of drilled-in anchor shall be proof loaded by Testing Agency's testing laboratory or as directed by Architect. Adhesive anchors will not be torque tested unless otherwise directed by Architect. If more than ten (10) percent of tested anchors fail to achieve specified torque or proof load within limits defined on Drawings, all anchors of same diameter and type as failed anchors shall be tested at Contractors expense, unless otherwise instructed by Architect.
    - 1) Torque will be applied with calibrated torque wrench.
    - 2) Proof loads will be applied with calibrated hydraulic ram. Displacement of adhesive anchors at proof load shall not exceed  $D/10$ , where D is nominal anchor diameter.

#### B. Non-Conforming Work:

1. Remove and replace misplaced or malfunctioning anchors.
2. Fill empty anchor holes and patch failed anchor locations with high-strength, non-shrink, non-metallic grout acceptable to Architect.
3. Anchors that fail to meet proof load or installation torque requirements will be regarded as malfunctioning.
4. Repair damage to adjacent materials caused by product installation.

### 3.5 CLEANING

#### A. Waste Management:

1. Disposal of rubbish, debris, and packaging materials.

### 3.6 PROTECTION

#### A. General:

1. Protect installed products from damage during construction.

### END OF SECTION

**BLANK PAGE**

**SECTION 04 0520****MASONRY REINFORCING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Masonry horizontal joint reinforcing.
  - 2. Steel reinforcing bars.
- B. Related Requirements:
  - 1. Sections under 04 2000 heading: Installation.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. ASTM International:
    - a. ASTM A153/A153M-09, 'Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware'.
    - b. ASTM A615/A615M-14, 'Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement'.
    - c. ASTM A641/A641M-09a, 'Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire'.
    - d. ASTM A1064/A1064M-13, 'Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete'.
    - e. ASTM D1784-11, 'Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds'.
    - f. ASTM D2240-05(2010), 'Standard Test Method for Rubber Property-Durometer Hardness'.
  - 2. Masonry Standards Joint Committee (MSJC) - The Masonry Society (TMS) / American Concrete Institute (ACI) / American Society of Civil Engineers (SEI/ASCE):
    - a. TMS 402-13/ACI 530-13/ASCE 5-13, 'Building Code Requirements and Specification for Masonry Structures and Commentary'.
    - b. TMS 602-13/ACI 530.1-13/ASCE 6-13, 'Specification for Masonry Structures and Commentary'.

**1.3 SUBMITTALS**

- A. Informational Submittals:
  - 1. Certificates:
    - a. Mill certificate.
  - 2. Fabricator Instructions:
    - a. Reinforcing bar placement drawings.

**1.4 DELIVERY, HANDLING, AND STORAGE**

- A. Delivery And Acceptance Requirements:
  - 1. Steel reinforcing bars shall be free of heavy rust scales and flakes, and other bond-reducing coatings at time of delivery and placing.
  - 2. Separate steel reinforcing bars by size and tag with manufacturer's heat or test identification number.
  - 3. Tag continuous joint reinforcing with Manufacturer's name, wire size, and ASTM / CSA specification.
- B. Storage And Handling Requirements:
  - 1. Properly protect reinforcing on site after delivery.

**PART 2 - PRODUCTS****2.1 SYSTEMS****A. Materials:****1. Design Criteria:**

- a. Steel reinforcing bars shall have grade identification marks and meet requirements of ASTM A615/A615M, Grade 60 minimum. All but No. 2 bars shall be deformed type.
- b. Continuous Joint Reinforcing:
  - 1) Conform to ASTM A1064/A1064M. Exterior wall reinforcing shall be galvanized to meet requirements of ASTM A153/A153M, Class B-2. Interior wall reinforcing shall be galvanized to meet requirements of ASTM A1064/A1064M, Class A.
  - 2) Size: **2 inches** less than nominal thickness of wall.
  - 3) Rod Size:
    - a) Side rods: **9 gauge**
    - b) Cross rods: **9 gauge**
  - 4) Corners And Tee Sections: Prefabricated of material and design similar to main reinforcement.
- c. Multi-Wythe Masonry:
  - 1) Seismic Design Category C:
    - a) Design Criteria:
      - (1) Comply with Seismic Zone Conformance of IBC, TMS 402-11/ACI 530-11/ASCE 5-11, and ASTM A951/A951M.
      - (2) Seismiclip: Impact –resistant as per ASTM D1784 and ASTM D2240.
      - (3) Cold-drawn steel conforming to ASTM A1064/A1064M.
      - (4) Finish: Hot-dipped galvanized as per ASTM A153/A153M **1.5 oz/ft .**
    - b) Class One Quality Standards:
      - (1) Where wythes do not course out (ladder style adjustable-wire reinforcement with seismic hook):
        - (a) No. 170 Lox-All Truss Adjustable Eye-Wire with S.I.S. (SHD) by Hohmann & Barnard.
      - (2) Where wythes do course out out (ladder style adjustable-wire reinforcement with seismic hook):
        - (a) No. 270-SH Ladder by Hohmann & Barnard.
  - d. Single-Wythe Masonry
    - 1) Seismic Design Category. All seismic zones except where preferred grouted re-bars and bond beams are used:
      - a) Design Criteria:
        - (1) Comply with Seismic Zone Conformance of IBC, TMS 402-11/ACI 530-11/ASCE 5-11, and ASTM A951/A951M.
        - (2) Cold-drawn steel conforming to ASTM A1064/A1064M.
        - (3) Finish: Hot-dipped galvanized as per ASTM A153/A153M (**1.5 oz/ft .**
      - b) Class One Quality Standard:
        - (1) No. 120 Truss-Mesh by Hohmann & Barnard.
  - e. Acceptable Manufacturers:
    - 1) Heckman Building Products Inc, Chicago, IL [www.heckmannbuildingprods.com](http://www.heckmannbuildingprods.com).
    - 2) Hohmann & Barnard, Hauppauge, NY [www.h-b.com](http://www.h-b.com).
    - 3) Masonry Reinforcing Corporation of America, Charlotte, NC [www.wirebond.com](http://www.wirebond.com).
    - 4) Equal system as approved by Architect before use. See Section 01 6200.

**B. Fabrication:**

1. Fabricate and bend steel reinforcing bars according to 'ACI Detailing Manual' (2004 edition or latest available) and details on Drawings.

**PART 3 - EXECUTION****3.1 INSTALLATION****A. Interface With Other Work:**

1. Coordinate with Division 03 for placement of dowels out of foundations for masonry reinforcing.

**3.2 CLEANING**

## A. Waste Management:

1. Disposal of rubbish, debris, and packaging materials.

**END OF SECTION**

**BLANK PAGE**

**SECTION 04 0521****MASONRY VENEER TIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Ties for veneering masonry on framed walls.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. ASTM International:
    - a. ASTM A153/A153M-09, 'Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware'.
    - b. ASTM D412-06a(2013), 'Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension'.
    - c. ASTM E96/E96M-13, 'Standard Test Methods for Water Vapor Transmission of Materials'.

**1.3 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Manufacturer's product literature or cut sheet for each item showing compliance with design criteria requirements as specified.
- B. Informational Submittals:
  - 1. Test And Evaluation Reports:
    - a. Manufacturer's published test results showing performance characteristics.
  - 2. Manufacturer's Instructions:
    - a. Manufacturer's published installation recommendations for each item.

**PART 2 - PRODUCTS****2.1 MANUFACTURED UNITS**

- A. Manufacturers:
  - 1. Manufacturer Contact Information:
    - a. Dundee Manufacturing Company, Dundee MI [www.dundeeemfgco.com](http://www.dundeeemfgco.com).
    - b. Heckman Building Products Inc, Melrose Park, IL [www.heckmannbuildingprods.com](http://www.heckmannbuildingprods.com).
    - c. Hohmann & Barnard, Hauppauge, NY [www.h-b.com](http://www.h-b.com).
    - d. ITW Buildex, Div. of Illinois Tool Works, Itasca, IL [www.itwbuildex.com](http://www.itwbuildex.com).
    - e. Masonry Reinforcing Corporation of America, Charlotte, NC [www.wirebond.com](http://www.wirebond.com).
- B. Unit Masonry Over Framing:
  - 1. Brick Ties:
    - a. Design Criteria:
      - 1) Seismic Design Categories A, B, and C. Seismic ties are not required in Seismic Design Categories A, B and C.
    - b. Class One Quality Standard:
      - 1) 340-B Corrugated L-Anchor with Slot, 16 gage (0.0635 in), by Heckman:

- a) Finish: Hot dipped galvanized (ASTM A153/A153M, Class B-2).
  - 2) 345 Corrugated Buck Anchor, **16 gage (0.0635 in)**, by Hohmann & Barnard:
    - a) Finish: Hot dipped galvanized (ASTM A153/A153M, Class B-2)..
  - 3) Item GWT-722 **7 inch x 7/8 inch x 22 ga (0.0336 in)** corrugated wall tie by Dundee:
    - a) Attach to structure with Trugrip No. 1267053 (#9 x **2 inch** screw with hex head and neoprene washer) by ITW Buildex.
    - b) Finish: Hot dipped galvanized (ASTM A153/A153M, Class B-2).
  - 4) Equal. See Section 01 6200.
- C. Unit Masonry Over Framing And Exterior Rigid Insulation:
- 1. Brick Ties:
    - a. Design Criteria:
      - 1) Seismic Design Categories A, B, and C. Seismic ties are not required in Seismic Design Categories A, B and C.
      - 2) Accommodate **0 inch to 4 inch 0.00 inches** insulation thickness.
      - 3) Finish: Hot dipped galvanized (ASTM A153/A153M, Class B-2).
      - 4) Self-Sealing Tape: Seals around shaft of screw and legs of anchor at point of penetration.
    - b. Type Two Acceptable Products:
      - 1) HB-200 Veneer Anchor system, **14 ga (0.0785 in)**, by Hohmann & Barnard:
        - a) Tape: X-Seal by Hohmann & Barnard).
      - 2) DW-10 Anchor, **16 gage (0.0635 in)**, by Hohmann & Barnard:
        - a) Finish: Hot dipped galvanized (ASTM A153/A153M, Class B-2)..
      - 3) Equal as approved by Architect before installation. See Section 01 6200.
  - 2. Brick Ties:
    - a. Type Two Acceptable Products:
      - 1) 345 SV Seismic-Notch Veneer Anchor, by Hohmann & Barnard:
        - a) Comply with seismic codes requiring continuous wire to be an integral component of the anchor system in masonry veneer.
        - b) Finish: Hot dipped galvanized (ASTM A153/A153M, Class B-2).
      - 2) 360 L-Type Seismic Anchor, by Heckman Building Products Inc.
        - a) Finish: Hot dipped galvanized (ASTM A153/A153M, Class B-2).
      - 3) 364 SV Seismic-Notch Gripstray Anchor, by Hohmann & Barnard:
        - a) Comply with seismic codes requiring continuous wire to be an integral component of the anchor system in masonry veneer.
        - b) Finish: Hot dipped galvanized (ASTM A153/A153M, Class B-2).
      - 4) HB 200 Adjustable Veneer Anchor by Hohmann & Barnard:
        - a) Accommodate **0 inch to 4 inch 0.00 inches** insulation thickness.
        - b) HFinish: Hot dipped galvanized.
      - 5) Equal from Heckman or Hohmann & Barnard. See Section 01 6200.
  - 3. Fasteners:
    - a. Class Two Quality Standards. See Section 01 6200:
      - 1) Wood Framing: Non-corrosive wood screws of length, type, and quantity recommended by Manufacturer.
      - 2) Steel Framing: Non-corrosive screws of length, type, and quantity recommended by Manufacturer.

**PART 3 - EXECUTION: Not Used****END OF SECTION**



**SECTION 04 0523****MASONRY ACCESSORIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Drip edge/plate.
  - 2. Flexible flashing for brick sills.
  - 3. Flexible flashing for bottom of masonry veneer.
  - 4. Mortar guard.
  - 5. Termination bar.
  - 6. Weep vents.
  - 7. Vents (open head joints).
- B. Related Requirements:
  - 1. Sections under 04 2000 heading: Installation.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Cavity Wall Flashing: Same as flexible flashing.
  - 2. Flexible Flashing: Water-proof material typically used in cavity wall construction to contain and assist in proper water drainage that may penetrate wall system veneer. Other materials may be required to constitute the system.
  - 3. Foundation Flashing: Same as flexible flashing.
  - 4. Head And Sill Flashing: Same as flexible flashing.
  - 5. Stainless Steel: Stainless steels are alloys of iron to which at least 10 percent chromium has been added to increase corrosion resistance and will not rust when exposed to weather. To obtain greater corrosion resistance, more nickel and chromium are added to the alloy. Along with iron and chromium, all stainless steels contain some carbon to make it stronger.
    - a. Austenitic Stainless Steel: Most popular of the stainless steels because of their ductility, ease of working and good corrosion resistance. Widely known as the 300 series.
  - 6. Stainless Steel Alloys:
    - a. Type 304 (UNS S30400): Austenitic stainless steel with non-magnetic properties in annealed condition that provide good corrosion resistance to both chemical and atmospheric exposures, with high resistance to oxidations. Most common and widely used stainless steel.
  - 7. Through-Wall Flashing: Generally considered same as flexible flashing.
  - 8. Weep Hole: Opening placed in mortar joints of facing material at level of flashing, to permit escape of moisture.
  - 9. Weep Vent: Inserts placed in Weep Hole to screen insects from entering but allowing escape of moisture.
  - 10. Vents (Open Head Joints): Placed at top of drainage air space to help reduce moisture buildup in air space by promoting ventilation. Weep vents may be placed vents to screen insects from entering but allowing movement of air through weep holes.
- B. Reference Standards:
  - 1. ASTM International:
    - a. ASTM A153/A153M-09, 'Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware'.
    - b. ASTM A240/A240M-14, 'Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications'.
    - c. ASTM A580/A580M-13b, 'Standard Specification for Stainless Steel Wire'.
    - d. ASTM D903-98(2010), 'Standard Test Method for Peel or Stripping Strength of Adhesive Bonds'.

- e. ASTM D1056-14, 'Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber'.

### 1.3 SUBMITTALS

- A. Action Submittals:
  - 1. Product Data:
    - a. Manufacturer's product literature or cut sheet for each item showing compliance with design criteria requirements as specified.
- B. Informational Submittals:
  - 1. Test And Evaluation Reports:
    - a. Manufacturer's published test results showing performance characteristics.
  - 2. Manufacturer's Instructions:
    - a. Manufacturer's published installation recommendations for each item.
- C. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Warranty Documentation:
      - 1) Final, executed copy of Warranty.
    - b. Record Documentation:
      - 1) Manufacturers documentation:
        - a) Manufacturer's product literature for each item.

### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
  - 1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
  - 1. Store materials protected from exposure to harmful weather conditions and as directed by manufacturer.

### 1.5 WARRANTY

- A. Manufacturer's Standard Warranty for products provided.

## PART 2 - PRODUCTS

### 2.1 ACCESSORIES

- A. Manufacturers:
  - 1. Manufacturer Contact List:
    - a. Advanced Building Products Inc, Springvale, ME [www.advancedflashing.com](http://www.advancedflashing.com).
    - b. Hohmann & Barnard, Haupauge, NY [www.h-b.com](http://www.h-b.com).
    - c. Mortar Net USA Ltd, Burns Harbor, IN [www.mortarnet.com](http://www.mortarnet.com).
    - d. Sandell Manufacturing, Schenectady, NY [www.sandellmfg.com](http://www.sandellmfg.com).
    - e. Wire-Bond, Charlotte, NC [www.wirebond.com](http://www.wirebond.com).
    - f. York Manufacturing Inc, Sanford, ME [www.yorkflashings.com](http://www.yorkflashings.com).
- B. Materials:
  - 1. Flexible Flashing:
    - a. Design Criteria:
      - 1) General:
        - a) Compatible with sealants and other building components.
        - b) Do not use as an exposed flashing.
        - c) Drool: Membrane shall not 'drool' when exposed to UV or heat.

- 2) Required Components:
  - a) Drip Edge/Plate: Install with stainless steel drip edge/plate.
  - b) Mortar Guard: Install with mortar guard.
  - c) Termination Bar: Install termination bar.
  - d) Weep Vents: Requires weep vents.
- 3) Self adhering and self sealing membranes:
  - a) Ambient Conditions: Follow Manufacturer recommendations for storage and application.
  - b) Do not apply to moist or damp surfaces.
  - c) Meet testing requirements of ASTM D903 for peel or stripping strength of adhesive bonds.
- b. Asphalt-Free Copper Flashing:
  - 1) Description:
    - a) Non-asphaltic laminated flashing.
    - b) Copper bonded laminated with a non-asphaltic adhesive compound.
    - c) Size: **5 ounces** copper per **one sq ft** of material.
  - 2) Type One Acceptable Products:
    - a) Cop-R-Kraft Duplex by Advanced Building Products.
    - b) Copper-Tuff by Hohmann & Barnard.
    - c) Cop-R-Tex Duplex (for coping, door and window heads, roof flashing, curtain wall and flashing between new and old walls) by York.
    - d) Multi-Flash 500 by York.
    - e) Equals as approved by Architect before bidding. See Section 01 6200.
- c. Asphalt-Free Non-Copper Flashing:
  - 1) Description:
    - a) Self adhering and self sealing composite non-asphaltic waterproof polyethylene membrane.
  - 2) Design Criteria:
    - a) Self adhering and self sealing.
    - b) Width: Provide **18 inches** minimum width.
  - 3) Type One Acceptable Products:
    - a) Aquaflash Premium by Wire-Bond.
    - b) Flex-Flash Flashing by Hohmann & Barnard.
    - c) Textroflash Flashing by Hohmann & Barnard.
    - d) Equals as approved by Architect before bidding. See Section 01 6200.
- d. Preassembled Systems:
  - 1) Description:
    - a) Pre-assembled panels consist of flashing membrane, drainage mat with integrated weep tabs, termination bar, drip edge, inside/outside corner boots, and end dams for a complete system.
  - 2) Type One Acceptable Product:
    - a) Total Flash by Mortar Net.
    - b) Flash-Vent by York.
    - c) Equals as approved by Architect before bidding. See Section 01 6200.
2. Components:
  - a. Drip Edge/Plate:
    - 1) Design Criteria:
      - a) **26 ga (0.019)** stainless steel AISI Type 304 drip edge/plate flashing with drip edge hemmed back.
    - 2) Type One Acceptable Products:
      - a) No. 1007 Hemmed Drip-Edge Flashing by Heckmann.
      - b) Drip Plate by Hohmann & Barnard.
      - c) Sandell's Drip Edge by Sandell Construction Solutions.
      - d) No. 4156 Drip Edge Flashing by Wire-Bond.
      - e) Equals as approved by Architect before bidding. See Section 01 6200.
  - b. Mortar Guard:
    - 1) Description:
      - a) Allows passage of moisture from cavity to building exterior while restricting ingress of insects and other debris.
    - 2) Design Criteria:

- a) Allows moisture to quickly and easily exit the cavity.
      - b) Allows for proper air movement in and out of the cavity.
      - c) Will not oxidize, rot, promote mold or fungus growth, or react with common building materials.
    - 3) Dimensions:
      - a) Thickness as recommended by Manufacturer for air space.
    - 4) Category Four Approved Products. See Section 01 6200 for definition of Categories.
      - a) Mortar Trap by Hohmann & Barnard.
      - b) Mortar Net by Mortar Net.
  - c. Termination Bar:
    - 1) Design Criteria:
      - a) Rigid PVC or stainless steel bar with sealant catch lip.
    - 2) Class Two Quality Standard:
      - a) Equals meeting design criteria. See Section 01 6200.
  - d. Weep Vents:
    - 1) Description:
      - a) Allows passage of moisture from cavity to building exterior while restricting ingress of insects and other debris.
      - b) Dimensions:
        - (1) 3/8 inch wide x 2-1/2 inch deep x 3-3/8 inch long.
    - 2) Design Criteria:
      - a) Polypropylene tested to conform to ASTM standards.
      - b) Suitable for top of wall venting.
    - 3) Type One Acceptable Products:
      - a) Cell Vent:
        - (1) QV - Quadro-Vent by Hohmann & Barnard.
        - (2) No. 3601 Cell Vent by Wire-Bond.
      - b) Equals as approved by Architect before bidding. See Section 01 6200.
  - e. Vents (Open Head Joints):
    - 1) Description:
      - a) Vent inserted in weep hole at top of drainage air space in full height masonry veneer walls (not required in veneer wainscot walls or if air space vents into structure/roof above wall).
      - b) Vent allows passage of moisture from cavity to building exterior while restricting ingress of insects and other debris.
      - c) Dimensions:
        - (1) 3/8 inch wide x 2-1/2 inch deep x 3-3/8 inch long.
    - 2) Design Criteria:
      - a) Polypropylene tested to conform to ASTM standards.
      - b) Suitable for top of wall venting.
    - 3) Type One Acceptable Products:
      - a) Cell Vent:
        - (1) QV - Quadro-Vent by Hohmann & Barnard.
        - (2) No. 3601 Cell Vent by Wire-Bond.
      - b) Equals as approved by Architect before bidding. See Section 01 6200.
3. Control and Expansion Joints:
- a. Description:
    - 1) Closed Cell Neoprene Sponge without tear strip placed horizontally beneath relieving angle, or in vertical expansion joint to act as control joint.
  - b. Design Criteria:
    - 1) Meet requirements of ASTM D1056 Grade 2A1.
  - c. Type One Acceptable Products:
    - 1) NS Closed cell neoprene sponge by Hohmann & Barnard.
    - 2) Equals as approved by Architect.

**PART 3 - EXECUTION: Not Used****END OF SECTION**

**SECTION 04 2113****BRICK VENEER MASONRY****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install masonry units as veneer on framing as described in Contract Documents.
- B. Products Installed But Not Furnished Under This Section:
  - 1. Engraved Stone Panel Signage.
  - 2. Masonry Accessories:
    - a. Drip edge/plate.
    - b. Flexible flashing for brick sills.
    - c. Flexible flashing for bottom of masonry veneer.
    - d. Mortar guard.
    - e. Termination bar.
    - f. Weep vents.
  - 3. Masonry Veneer Ties.
  - 4. Metal Lintels.
  - 5. Reglets.
- C. Related Requirements:
  - 1. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
  - 2. Section 01 4301: 'Quality Assurance – Qualifications' for minimum qualification levels required.
  - 3. Sections Under 04 0000 Heading: 'Masonry':
    - a. Pre-installation conference held jointly with other masonry related sections.
  - 4. Section 04 0513: 'Cement and Lime Masonry Mortaring' for quality of mortar.
  - 5. Section 04 0521: 'Masonry Veneer Ties' for quality of masonry veneer ties.
  - 6. Section 04 0523: 'Masonry Accessories' for furnishing drip edge/plate, flexible flashing, mortar guard, termination bars and weep vents.
  - 7. Section 05 1223: 'Structural Steel Buildings' for metal lintels.
  - 8. Section 07 7126: 'Reglets'.
  - 9. Section 07 9213: 'Elastomeric Joint Sealants'.
  - 10. Section 10 1424: 'Engraved Stone Panel Signage'.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. American Concrete Institute:
    - a. ACI 530/530.1-13, 'Building Code Requirements and Specification for Masonry Structures and Related Commentaries'.
  - 2. The Brick Industry Association, Reston VA: 'Technical Notes on Brick Construction' (July 2012), [www.gobrick.com](http://www.gobrick.com).
    - a. Technical Notes on Brick Construction 1, 'Cold and Hot weather Construction' (June 2006).
    - b. Technical Notes on Brick Construction 3, 'Overview of Building Code Requirements for Masonry Structures (ACI 530-02/ASCE 5-02/TMS 402-02) and Specification for Masonry Structures (ACI 530.1-02/ASCE 6-02/TMS 602-02)'.
    - c. Technical Notes on Brick Construction 9A, 'Specifications for and Classification of Brick' (October 2007).
    - d. Technical Notes on Brick Construction 20, 'Cleaning Brickwork' (June 2006).
    - e. Technical Notes on Brick Construction 21C, 'Brick Masonry Cavity Walls - Construction' (October 1989).

- f. Technical Notes on Brick Construction 23, 'Stains - Identification and Prevention' (June 2006).
- g. Technical Notes on Brick Construction 23A, 'Efflorescence - Causes and Prevention' (June 2006).
- h. Technical Notes on Brick Construction 28, 'Anchored Brick Veneer, Wood Frame Construction' (August 2002).
- i. Technical Notes on Brick Construction 28A, 'Adding Brick Veneer to Existing Construction' (April 2008).
- j. Technical Notes on Brick Construction 30, 'Bonds and Patterns in Brickwork' (March 1999).
- k. Technical Notes on Brick Construction 46, 'Maintenance of Brick Masonry' (December 2005).

B. Definitions:

1. Brick Classifications:

- a. Grade, class, type, application and use:
    - 1) Criteria for these classifications may include exposure or use conditions; appearance items; physical properties needed for performance; tolerances on dimensions and distortion; chippage; and void area.
    - 2) Brick qualify for particular classification based on their properties after manufacturing. While most brick can be manufactured to attain all attributes desired, certain attributes may be dictated by production method, durability classification or appearance classification designated by user:
      - a) For example, molded brick cannot be made to meet classification for tightest dimensional tolerances since production method uses a higher percentage of water that may result in greater shrinkage.
      - b) Brick manufactured by extrusion process can be made to meet classification for light or loose dimensional tolerances.
  - b. Brick Color:
    - 1) There are no color-related tolerances in ASTM standards for brick. Standards are dictated by sample panel, mockups, or project specification.
  - c. Brick Grade: Designation for durability and exposure:
    - 1) Brick is subjected to environmental and service conditions that vary. Brick is specified for its specific durability based on severity of weather and exposure and physical properties. Following are brick grades classifications based on the Weathering Index:
      - a) SW: Severe weathering.
      - b) MW: Moderate weathering.
      - c) NW: Negligible or no weathering.
    - 2) Grade SW is stronger and more durable, and require less maintenance. Grade MW is less durable. Grade NW is least durable and should only be used for interior work.
  - d. Brick Type:
    - 1) Limits include tolerances on dimensions, distortion, out-of-square and chippage. Appearance classification is established on size and precision attained in manufacturing. Following are brick types:
      - a) Type FBX: Brick for general use in masonry where higher degree of precision and lower permissible variation in size than permitted for Type FBS is required:
        - (1) Type FBX maintains strict requirements on absorption, waste, chipping, cracks, dimensions and distortion (warpage). Type FBX allows very narrow color range, minimal size variations, and uniform in appearance).
      - b) Type FBS: Brick for general use in masonry:
        - (1) Type FBS offer wider range of color and size variations, but lack of production controls results in many odd color lots.
      - c) Type FBA: Brick for general use in masonry selected to produce characteristic architectural effects resulting from non-uniformity in size and texture of individual units:
        - (1) Type FBA is used for aesthetic qualities. FBA have no limits for size and color variations.
2. Cold Weather, as referred to in this Section, is four (4) hours with ambient temperature below **40 deg F** in twenty four (24) hour period.
3. Efflorescence: Deposit or encrustation of soluble salts, generally white and most commonly consisting of calcium sulfate that may form on surface of stone, brick, concrete, or mortar when

- moisture moves through and evaporates on masonry. Often caused by free alkalis leached from mortar, grout, adjacent concrete, or in clays. Test for efflorescence is described in ASTM C67 and CAN/CSA A82.
4. Facing Brick: Intended for use in both structural and nonstructural masonry, including veneer, where appearance is a requirement.
  5. Flexible Flashing: Water-proof material typically used in cavity wall construction to contain and assist in proper water drainage that may penetrate wall system veneer. Other materials may be required to constitute the system.
  6. Hot Weather, as referred to in this Section, is ambient air temperature above 100 deg F or ambient air temperature above 90 deg F with wind velocity 8 mph or greater.
  7. Mortar: Plastic mixture of cementitious materials, fine aggregate and water (See ASTM C270 or ASTM C476).
  8. Running Bond: Same as common bond, with continuous horizontal joints, but vertical joints are offset or in line. Bricks of each course are offset from the previous instead of being right on top of each other. If running bond is being used with modular brick, end of brick will be at mid-point of brick on course below. Running bond only requires minimal cutting at each end and will easily follow a gentle curve. Running bond method most used.
  9. Solid Brick: Solid masonry unit of clay or shale, usually formed into rectangular prism while plastic and burned or fired in a kiln. Solid brick can have core holes whose area is no more than twenty five 25 percent of total bed surface of brick.
  10. Veneer: Single wythe of masonry for facing purposes, not structurally bonded.
  11. Warpage: Distortion of surfaces or edges of an individual brick from a plane surface or from straight line.
  12. Weep Hole: Opening placed in mortar joints of facing material at level of flashing, to permit escape of moisture.
  13. Weep Vent: Inserts placed in Weep Hole to screen insects from entering but allowing escape of moisture.

C. Reference Standards:

1. ASTM International:
  - a. ASTM C62-13a, 'Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale)'.
  - b. ASTM C67-14, 'Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile'.
  - c. ASTM C150/C150M-12, 'Standard Specification for Portland Cement'.
  - d. ASTM C216-14, 'Standard Specification for Facing Brick (Solid Masonry Made from Clay or Shale)'.
  - e. ASTM C270-14, 'Standard Specification for Mortar for Unit Masonry'.
  - f. ASTM C476-10, 'Standard Specification for Grout for Masonry'.
  - g. ASTM C652-14, 'Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale)'.
  - h. ASTM C1232-12, 'Standard Terminology of Masonry'.
2. International Code Council (IBC):
  - a. Chapter 21, 'Masonry' for materials, design, construction and quality of masonry (2012 or latest edition available).
3. Masonry Standards Joint Committee (MSJC) - The Masonry Society (TMS) / American Concrete Institute (ACI) / American Society of Civil Engineers (SEI/ASCE):
  - a. TMS 402-13/ACI 530-13/ASCE 5-13, 'Building Code Requirements and Specification for Masonry Structures and Commentary'.
  - b. TMS 602-13/ACI 530.1-13/ASCE 6-13, 'Specification for Masonry Structures and Commentary'.

### 1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:

1. Participate in pre-installation conference held jointly with other Division 04 'Masonry' specifications in this Project that require pre-installation conferences:
2. Schedule pre-installation conference during construction of mockup panel.
3. In addition to agenda items specified in Section 01 3100, review following:



- a. Review storage and handling requirements.
- b. Review cold and hot weather procedure requirements.
- c. Review protection requirements.
- d. Review masonry cleaning requirements.
- e. Review clean up requirements.

#### 1.4 SUBMITTALS

- A. Action Submittals:
  - 1. Samples:
    - a. One (1) full size brick minimum, one (1) sample of each special shape, and physical samples which demonstrate full range of color and texture.
    - b. Type of veneer tie used.
- B. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Record Documentation:
      - 1) Manufacturers Documentation:
        - a) Brick Manufacturer's literature or cut sheet.
        - b) Brick color and type selection.

#### 1.5 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Installer: Requirements of Section 01 4301 applies, but not limited to following:
    - a. Minimum of five (5) years experience on successfully completed projects of similar nature.
  - 2.
- B. Mockups:
  - 1. Sample panel **4 feet** long by **3 feet** high of proposed color range, texture, bond, mortar, and workmanship. Include mock-up framing and sheathing to show wall construction to be used on Project, including:
    - a. Anchor and tie systems.
    - b. Any specialty details, such as reveals, soldier courses, window details and etc.
    - c. Brick expansion joints if required on Project.
    - d. Flexible flashing and required components at foundation.
    - e. Seismic reinforcing.
  - 2. Sample panel(s) shall be constructed using 'production run' material to be used on Project unless otherwise approved in writing by Architect and/or Owner.
  - 3. Sample panel(s) to be used as standard of comparison for masonry work built of same material.
  - 4. Sample panel(s) shall remain at jobsite until all masonry is completed.
  - 5. Do not start work of this Section until Architect has accepted sample panel(s).

#### 1.6 DELIVERY, HANDLING, AND STORAGE

- A. Delivery And Acceptance Requirements:
  - 1. Check, carefully unload, and deliver material to site in such manner as to avoid soiling, damaging, or chipping.
  - 2. Do not use damaged masonry units, damaged components of structure, or damaged packaged materials.
- B. Storage And Handling Requirements:
  - 1. Aggregate:
    - a. Store different aggregates separately.



- b. Store on high ground, or ideally, off ground to prevent contamination from dirt, organic materials and ground water, any of which may contribute to efflorescence and may be deleterious to mortar performance.
- c. Store under protective cover to avoid saturation and freezing in cold weather.
- 2. Cementitious material:
  - a. Do not use cementitious materials that have become contaminated.
  - b. Protect from precipitation and groundwater.
    - 1) Store materials on elevated platforms, under cover, and in dry location.
    - 2) Do not use cementitious materials that have become damp.
- 3. Masonry accessories:
  - a. Store masonry accessories clear of ground, including metal items, to prevent corrosion and contamination by dirt and ground water which may contain soluble salts and other matter which may contribute to efflorescence and staining.
  - b. Plastic and asphalt coated flashing material should not be stored in areas exposed to sunlight. During installation, flashing must be pliable so that no cracks occur at corners or bends.
  - c. Protect from damage until installation.
- 4. Masonry units:
  - a. Store material on planks clear of ground which may contain soluble salts and protect from damage, dirt, or disfigurement.
  - b. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof membrane, securely tied. If units become wet, do not install until they are dry.
- 5. Reinforcement:
  - a. Protect reinforcement, ties, and metal accessories from permanent distortions, elements and store off ground.

## 1.7 FIELD CONDITIONS

- A. Ambient Conditions:
  - 1. Cold Weather and Hot Weather Limitations:
    - a. Follow requirements of TMS 402/ACI 530/ASCE 5-11 and TMS 602/ACI 530.1/ASCE 6.

## PART 2 - PRODUCTS

### 2.1 SYSTEM

- A. Design Criteria:
  - 1. Face Brick: Meet requirements of ASTM C216 or CSA A82.
    - a. Brick Grade SW.
    - b. Brick Type: FBX.
    - c. Efflorescence:
      - 1) Provide brick that has been tested according to ASTM C67 and is rated 'Not Effloresced'.
    - d. Initial rate of absorption: Less than **30 sq. in** per minute when tested per ASTM C67.
    - e. Brick shall be free of defects, deficiencies, and surface treatments, including coatings that would interfere with proper setting of brick or significantly impair strength or performance of Work.
    - f. Face or faces that will be exposed in place shall be free of chips that exceed limits set in ASTM C216 of five (5) percent for FBX. Aggregate length of chips shall not exceed ten (10) percent.
    - g. Other than chips, face or faces shall be free of cracks or other imperfections detracting from appearance of designated sample when viewed from distance of **15 feet** away. Number of brick in delivery that are broken or otherwise fail to meet requirements for chippage and tolerances shall not exceed five (5) percent.

- h. Brick shall be free of defects, deficiencies, and surface treatments, including coatings that would interfere with proper setting of brick or significantly impair strength or performance of Work.
  - i. Face or faces that will be exposed in place shall be free of chips that exceed limits set in ASTM C216 of ten (10) percent for FBS and fifteen (15) percent for FBA. Aggregate length of chips shall not exceed ten (10) percent.
  - j. Other than chips, face or faces shall be free of cracks or other imperfections detracting from appearance of designated sample when viewed from distance of 20 feet away. Number of brick in delivery that are broken or otherwise fail to meet requirements for chippage and tolerances shall not exceed five (5) percent.
2. Brick shall be cleanable using standard method specified below when using specified mortar.

B. Materials:

- 1. Mortar: Type 'N' as specified in Section 04 0513.
- 2. Brick:
  - a. Brick shall be true to size and shape. No warped brick permitted. Brick for Project shall be fired in same run.
  - b. 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long modular brick.  
Type One Acceptable Manufacturers, Style, And Color:
    - 1) **ACME Brick, Glacier White, Modular Velour**
    - 2) Equal as approved by Architect before bidding. See Section 01 6200.

## 2.2 ACCESSORIES

A. Cleaning Compounds:

- 1. Use type of compound recommended by Brick Manufacturer based on minerals present in masonry units.
- 2. Type Two Acceptable Products:
  - a. 202 or 202V by Diedrich Technologies, Oak Creek, WI [www.diedrichtechnologies.com](http://www.diedrichtechnologies.com).
  - b. Surekleen No. 600 or Vana-Trol by ProSoCo Inc, Kansas City, KS [www.prosoco.com](http://www.prosoco.com).
  - c. Equal as approved by Architect before use. See Section 01 6200.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Verification Of Conditions:

- 1. Examine substrate and verify substrate is suitable for installation of masonry.
- 2. Notify Architect of unsuitable conditions in writing.
  - a. Do not install masonry over unsuitable conditions.
  - b. Commencement of Work by installer is considered acceptance of substrate.

### 3.2 PREPARATION

- A. Coordinate placement of reinforcement, anchors and accessories, flashings and weep holes and other moisture control products specified in other sections.

### 3.3 INSTALLATION

A. General:

- 1. Place masonry, mortar and grout in accordance with TMS 602/ACI 530.1/ASCE 6.
- 2. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

3. Follow recommendations to control efflorescence as outlined in Brick Industry Association Technical Notes on Brick Construction 23A, 'Efflorescence – Causes and Prevention'.
4. Masonry cutting:
  - a. Make cuts proper size to accommodate work of other trades.
  - b. Cut openings for electrical devices using cover plates no larger than can be covered by standard size plate.
  - c. Replace unit masonry in which larger than necessary openings are cut.
  - d. Do not patch openings with mortar or other material.
5. Built-In Work:
  - a. As work progresses, install masonry flashings and weep holes and other built-in work specified in other sections.

B. Special Techniques:

1. General:
  - a. Comply with cold-weather and hot weather requirements contained in TMS 402/ACI 530/ASCE 5-11 and TMS 602/ACI 530.1/ASCE 6.
  - b. Ideal mortar temperature is **70 deg F ± 10 deg F**. Mixing temperature should be maintained within **10 deg F** Cold weather:
    - 1) Do not lay masonry in Cold Weather unless authorized by Architect.
    - 2) Minimum temperature of units when laid: **20 deg F**.
    - 3) The following options may be used in cold weather construction:
      - a) Change to higher type of mortar required in ASTM C270 (Example: If ASTM type N mortar is specified for normal temperature, change to type S or type M.).
      - b) Increase the protection time where required for twenty four (24) hour to forty eight (48) hour with no change being made in the type of mortar.
      - c) Without changing the mortar type and maintaining twenty four (24) hour protection, replace Type I portland cement in the mortar with type III, ASTM C150/C150M.
      - d) Do not use frozen materials or materials mixed or coated with ice or frost. Keep materials free of ice and snow. Do not lay masonry on frozen material. Remove and replace unit masonry damaged by frost or by freezing conditions.
      - e) Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is **40 deg F** and higher and will remain so until masonry has dried, but not less than seven (7) days after completing cleaning.
  - c. Hot weather:
    - 1) During hot weather, shading masonry materials and equipment reduces mortar and grout temperatures. Scheduling construction to avoid hotter periods of day should be considered.
    - 2) To improve flexural bond strength, sand piles should be kept cool and in damp, loose condition by sprinkling and by covering with plastic sheet to limit evaporation.
2. Cold Weather Requirements. Implement approved cold weather procedures and comply with following:
  - a. Preparation requirements. Comply with following requirements prior to conducting masonry work:
    - 1) Do not lay masonry units having either temperature below **20 deg F** or containing frozen moisture, visible ice, or snow on their surface.
    - 2) Remove visible ice and snow from top surface of existing foundations and masonry to receive new construction. Heat these surfaces above freezing, using methods that do not result in damage.
  - b. Construction requirements. These requirements apply to work in progress and are based on ambient air temperature. Do not heat water or aggregates used in mortar or grout above **140 deg F**. Comply with following requirements when following ambient air temperatures exist:
    - 1) Air temperature **40 deg F** to **32 deg F** :
      - a) Heat sand or mixing water to produce mortar temperatures between **40 deg F** and **120 deg F** at time of mixing. Grout does not require heated materials, unless temperature of materials is below **32 deg F** :
    - 2) Air temperature below **32 deg F** to **25 deg F** :
      - a) Heat sand and mixing water to produce mortar temperatures between **40 deg F** and **120 deg F** at time of mixing.

- b) Maintain mortar temperature above freezing until used in masonry. Heat grout aggregates and mixing water to produce grout temperature between **70 deg F** and **120 deg F** at time of mixing. Maintain grout temperature above **70 deg F** at time of grout placement. Heat masonry units to minimum temperature of **40 deg F** before installing thin-bed mortar.
  - 3) Air temperatures below **25 deg F** to **20 deg F** Comply with the following:
    - a) Heat sand and mixing water to produce mortar temperatures between **40 deg F** and **120 deg F** at time of mixing.
    - b) Maintain mortar temperature above freezing until used in masonry. Heat grout aggregates and mixing water to produce grout temperature between **70 deg F** and **120 deg F** at time of mixing. Maintain grout temperature above **70 deg F** at time of grout placement. Heat masonry units to minimum temperature of **40 deg F** before installing thin-bed mortar.
    - c) Heat masonry surfaces under construction to **40 deg F** and use windbreaks or enclosures when wind is in excess of **15 mph**. Heat masonry to minimum of **40 deg F** prior to grouting.
  - 4) Air temperature below **20 deg F**. Comply with the following:
    - a) Heat sand and mixing water to produce mortar temperatures between **40 deg F** and **120 deg F** at time of mixing.
    - b) Maintain mortar temperature above freezing until used in masonry. Heat grout aggregates and mixing water to produce grout temperature between **70 deg F** and **120 deg F** at time of mixing. Maintain grout temperature above **70 deg F** at time of grout placement. Heat masonry units to minimum temperature of **40 deg F** before installing thin-bed mortar.
    - c) Heat masonry surfaces under construction to **40 deg F** and use windbreaks or enclosures when wind is in excess of **15 mph**. Heat masonry to minimum of **40 deg F** prior to grouting.
    - d) Provide enclosures and auxiliary heat to maintain air temperature above **32 deg F** within enclosure.
  - c. Protection: These requirements apply after masonry is place and are based on anticipated minimum daily temperature for grouted masonry and anticipated mean daily temperature for ungrouted masonry. Protect completed masonry in following manner:
    - 1) Maintain temperature of masonry units above **32 deg F** for first four (4) hours after thin-bed mortar application.
    - 2) Mean daily air temperature **40 deg F** to **25 deg F**:
      - a) Protect masonry from rain or snow for twenty four (24) hour by covering with weather-resistive membrane.
    - 3) Mean daily air temperature below **25 deg F** to **20 deg F**:
      - a) Completely cover masonry with insulating blankets or equal protection for twenty four (24) hours after completion of work. Extend time period to forty eight hours for grouted masonry, unless only cement in grout is Type III portland cement.
    - 4) Mean daily air temperature below **20 deg F** and below:
      - a) Maintain newly constructed masonry temperature above **32 deg F** for at least twenty four (24) hours after being completed by using heated enclosures, electric heating blankets, infared lamps, or other acceptable methods. Extend time period to forty eight (48) hours for grouted masonry, unless only cement in grout is Type III portland cement.
- 3. Hot Weather Requirements. Implement approved hot weather procedures and comply with following:
  - a. Preparation. Comply with following requirements prior to conducting masonry work:
    - 1) When ambient air temperature exceeds **100 deg F**, or exceeds **90 deg F** with wind velocity greater than **8 mph**:
      - a) Maintain sand piles in damp, loose condition.
      - b) Provide necessary conditions and equipment to produce mortar having a temperature below **120 deg F**
    - 2) When ambient temperature exceeds **115 deg F**, or exceeds **105 deg F** with wind velocity greater than **8 mph**, implement following requirements:
      - a) Maintain sand piles in damp, loose condition.
      - b) Provide necessary conditions and equipment to produce mortar having a temperature below **120 deg F**

- c) Shade materials and mixing equipment from direct sunlight.
  - b. Construction. While masonry work is in progress:
    - 1) When ambient air temperature exceeds **100 deg F**, or exceeds **90 deg F** with wind velocity greater than **8 mph**:
      - a) Maintain temperature of mortar and grout below **120 deg F**.
      - b) Flush mixer, mortar transport container, and mortar boards with cool water before they come into contact with mortar ingredients or mortar.
      - c) Maintain mortar consistency by retempering with cool water.
      - d) Use mortar with two (2) hours of initial mixing.
      - e) Spread thin-bed mortar no more than **4 feet** ahead of masonry units.
      - f) Set masonry units within one (1) minute after spreading thin-bed mortar.
    - 2) When ambient temperature exceeds **115 deg F**, or exceeds **105 deg F** with a wind velocity greater than **8 mph**, implement following requirements:
      - a) Maintain temperature of mortar and grout below **120 deg F**.
      - b) Flush mixer, mortar transport container, and mortar boards with cool water before they come into contact with mortar ingredients or mortar.
      - c) Maintain mortar consistency by retempering with cool water.
      - d) Use mortar with two (2) hours of initial mixing.
      - e) Spread thin-bed mortar no more than **4 feet** ahead of masonry units.
      - f) Set masonry units within one (1) minute after spreading thin-bed mortar.
      - g) Use cool mixing water for mortar and grout. Ice is permitted in mixing water prior to use. Do not permit ice in mixing water when added to other mortar or grout materials.
    - 3) Protection:
      - a) When ambient air temperature exceeds **100 deg F**, or exceeds **90 deg F** with wind velocity greater than **8 mph**:
        - (1) Fog spray newly constructed masonry until damp, at least three (3) times a day until masonry is three (3) days old.
  - 4. Repair brick units and repoint mortar joints only when air temperature is between **40 deg F** and **90 deg F** and is predicted to remain so for at least seven (7) days after completion of the Work unless otherwise indicated.
- C. Interface With Other Work:
- 1. Make cuts proper size to accommodate work of other trades. Cut openings for electrical devices using cover plates no larger than can be covered by standard size plate.
  - 2. Replace unit masonry in which larger than necessary openings are cut. Do not patch openings with mortar or other material.
- D. Tolerances:
- 1. Masonry shall be laid true to vertical and horizontal planes within **1/8 inch in 10 feet**, non-cumulative. Recess masonry where indicated.
  - 2. Maintain **3/8 inch** mortar joints throughout.
- E. Masonry Veneer Ties:
- 1. Free of material that may destroy bond.
  - 2. Install as detailed by screwing through sheathing into framing. Begin approximately **8 inches** from base of masonry and with maximum spacing of **16 inches** vertically and at each vertical stud horizontally. Install final row of ties within **8 inches** of top course of brick.
- F. Flashing:
- 1. General:
    - a. Install embedded flashing, metal drip edges, with weep holes and other components in masonry at lintels, ledges, floors, and other obstructions to downward flow of water in wall, and where indicated.
    - b. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
  - 2. Drip edge/plate: Install with sealant (or equal) between drip edge/plate and substrate.
  - 3. Flexible flashing:

- a. Install embedded flashing behind lower edge of air infiltration barrier.
  - b. Carry flashing vertically as detailed, but not less than **6 inch** above horizontal plane.
  - c. Lap flexible flashing minimum of **6 inch**
  - d. Seal all flashing laps with compatible lap cement.
  - e. Install flashing with sealant between flashing and drip edge/plate.
  - f. Do not stop flashing behind face of brickwork.
  - g. Place flashing at all points where air space is interrupted.
  - h. Extend head flashings no less than **6 inch** beyond edges of openings and turn up to form watertight pan, seal with mastic.
  - i. Extend sill flashings no less than **8 inch** minimum height to form watertight pan, seal with mastic.
  - j. All discontinuous flashing shall be turned up minimum **1 inch** into head joint a flashing ends to form an end dam.
  4. Termination bar: Install termination bar with sealant.
- G. Laying:
1. Layout:
    - a. Running bond except where noted otherwise. Select brick so there is uniform distribution of hues.
    - b. Use solid brick where brick coursing would otherwise show cores.
  2. Joints:
    - a. Do not tool until mortar has taken initial set.
    - b. Tool concave. When tooling joints, squeeze mortar back into joint.
    - c. Point holes in joints. Fill and tool properly.
  3. Use mortar within two (2) hours of initial mixing. Discard mortar that has begun to set.
  4. Wet each brick to saturation. Lay brick when surface is dry. Brick absorption when laid should not exceed **0.025 oz/sq inch** maximum.
  5. Set masonry units within one minute of spreading mortar. Shove brick into place in full mortar bed, do not lay.
  6. Completely fill horizontal and vertical joints. Do not furrow bed joints.
  7. Strike back-side joints on brick flush. Do not allow mortar build-up in cavity between masonry veneer and stud wall sheathing.
  8. Step back unfinished work for joining with new work. Use toothing only with Architect's approval.
- H. Weep Holes:
1. General:
    - a. Weep holes must be placed at base of cavity and at all other flashing levels providing means of draining away any moisture that may have found its way into cavity.
    - b. Weep holes must provide clear access to cavity and must be placed directly on flashing for proper drainage.
  2. Install weep vents in weep holes at **33 inches** on center maximum at bottom masonry course at foundation and above windows and doors.
- I. Vents (Open Head Joints):
1. Place vents at top of cavity air space of full height masonry walls.
  2. Install weep vents in weep holes at **33 inches** on center maximum and should be centered between weep holes at base of Masonry wall.
- J. Mortar Guard:
1. Place mortar guard continuously between brick and sheathing at bottom masonry course at foundation and above windows, and doors.

### 3.4 FIELD QUALITY CONTROL

- A. Non-Conforming Work:
1. Remove and replace defective material at Architect's direction and at no additional cost to Owner.



### 3.5 PROTECTION

- A. General:
  - 1. During construction, all walls should be kept dry by covering top of wall with a strong, water-resistant membrane at end of each day or shutdown period. Covering should overhang wall by at least **24 inches** on each side, and should be secured against wind.
  - 2. Covering should remain in place until top of cavity wall is completed or protected by adjacent materials.
  - 3. Protect masonry with covering during rainy weather.
- B. Freezing:
  - 1. In cold weather, all materials and walls should be properly protected against freezing including storing of materials, preparation of mortar, heating of masonry units, laying precautions, and protection of Work. Follow recommendations for cold weather of Masonry Standards Joint Committee (MSJC) - The Masonry Society (TMS) / American Concrete Institute (ACI) / American Society of Civil Engineers (SEI/ASCE) TMS 402/ACI 530/ASCE 5-11 and TMS 602/ACI 530.1/ASCE 6.
  - 2. Remove all masonry deemed frozen or damaged.
- C. Stain prevention: Prevent grout, mortar, and soil from staining face of masonry to be left exposed. Immediately remove mortar and soil that come in contact with such masonry.
  - 1. Prevent staining of brick as outlined in Brick Industry Association Technical Notes on Brick Construction 23, 'Stains - Identification and Prevention'.
  - 2. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
  - 3. Protect sills, ledges, and projections from mortar droppings.
  - 4. Protect surfaces of window and door frames, as well as similar products with pointed and integral finishes, from mortar droppings.
  - 5. Turn scaffold boards near wall on edge at end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

### 3.6 CLEANING

- A. General:
  - 1. Clean brick as outlined in Brick Industry Association Technical Notes on Brick Construction 20, 'Cleaning Brickwork'.
  - 2. After mortar has hardened, wet masonry and clean with specified cleaning compound. Use stiff fibered brush for application. Rinse masonry surfaces with water immediately after cleaning. Leave masonry clean, free of mortar daubs, and with tight mortar joints.
  - 3. Wash adjacent non-masonry surfaces. Use detergent and soft brushes or cloth.
  - 4. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash pavement surfaces to remove mortar, dust, dirt, and stains.
  - 5. For removal of efflorescence from face of existing masonry, follow recommendations as outlined in Brick Industry Association Technical Notes on Brick Construction 23A, 'Efflorescence – Causes and Prevention' and Brick Industry Association Technical Notes on Brick Construction 46, 'Maintenance of Brick Masonry'.
- B. Waste Management:
  - 1. Clean up masonry debris and remove from site.

**END OF SECTION**

**BLANK PAGE**



**SECTION 05 0503****SHOP-APPLIED METAL COATINGS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Quality of factory or shop-applied priming applied to steel supplied to Project without finish coat.
  - 2. Quality of and procedures for field touch-up and repair of factory-applied priming and galvanizing.
- B. Related Requirements:
  - 1. Section 05 4010: 'Cold-Formed Load-Bearing Metal Framing' for repair to galvanized coatings.
  - 2. Sections under 09 9000 heading: Finish painting.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. ASTM International:
    - a. ASTM A780/A780M-09(2015), 'Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings'.
    - b. ASTM B695-04(2009), 'Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel'.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference:
  - 1. Participate in pre-installation conference.
  - 2. In addition to requirements of Section 01 3100, review following:
    - a. Meet with Architect before commencing repair of galvanized surfaces to establish extent of repairs required and, if applicable, choice of methods to be used.

**1.4 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Product data and samples, if requested by Architect.

**PART 2 - PRODUCTS****2.1 FINISHES**

- A. Factory And Shop-Applied Primer:
  - 1. Compatible with and of equal or better quality than finish paint system to be applied by Sections under 09 9000 heading.
  - 2. Primer on unexposed, unfinished surfaces may be fabricator's standard shop coat.
- B. Repairs To Primed Surface:

- C. Unless otherwise specified, use primer which matches characteristics of original primer and is compatible with and of equal or better quality than finish paint system to be applied by Sections under 09 9000 heading.
- D. Material For Repairs Of Galvanized Surfaces:
  - 1. Non-Structural, Non-Load-Bearing Items Not Exposed To Weather:
    - a. Zinc-Rich Paints:
      - 1) Zinc-Dust Content: Dried film shall contain 94 percent minimum of zinc-dust by weight.
      - 2) Type One Acceptable Manufacturers:
        - a) Galvax by Alvin Products Inc, Everett, MA [www.alvinproducts.com](http://www.alvinproducts.com).
        - b) ZRC Galvilite by ZRC Worldwide, Marshfield, MA [www.zrcworldwide.com](http://www.zrcworldwide.com).
        - c) Equal as approved by Architect before bidding. See Section 01 6200.
  - 2. Structural, Load-Bearing Items And Items Exposed To Weather:
    - a. Zinc-Based Solders, Powder, Or Rod:
      - 1) Zinc-Cadmium solder with liquidus temperature range from 518 to 527 deg F, or
      - 2) Zinc-Tin-Lead alloy with liquidus temperature range from 446 to 500 deg F .
    - b. Sprayed Zinc: Wire, ribbon, or powdered zinc suitable for process.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Surface Preparation:
  - 1. General:
    - a. Clean, grind, or otherwise prepare welds in steel that is to be coated within limits acceptable to welder responsible for structural integrity.
    - b. Surfaces to be coated shall be clean, dry and free of oil, grease, and corrosion products.
  - 2. Preparation Of Primed, Ungalvanized Surfaces:
    - a. Clean welds and grind serious abrasions.
  - 3. Preparation Of Galvanized Surfaces:
    - a. Follow requirements of ASTM A780/A780M and following:
    - b. For Repair Using Zinc-Rich Paints:
      - 1) Blast clean surfaces to near-white metal, in accordance with SSPC-SP10 (1 to 2 mil anchor pattern), as minimum.
      - 2) Where circumstances do not allow blast cleaning, power disk sand to bright metal finish.
      - 3) Extend surface preparation into undamaged galvanized area.
      - 4) Remove flux residue and weld spatter from welded areas.
    - c. For Repair Using Zinc-Based Alloys:
      - 1) Clean surface to be reconditioned using wire brush, light grinding action, or mild blasting.
      - 2) Extend surface preparation into surrounding, undamaged galvanized areas.
      - 3) Remove flux residue and weld spatter from welded areas.
      - 4) Preheat cleaned area to at least 600 deg F.
        - a) Do not overheat surface beyond 750 deg F or allow surrounding galvanized coatings to be burned.
        - b) Wire brush surface during preheating.
    - d. For Repair Using Sprayed Zinc (Metallizing):
      - 1) Blast clean surfaces to near-white metal, in accordance with SSPC-SP5 as minimum.
      - 2) Extend surface preparation into undamaged galvanized area.
      - 3) Remove flux residue and weld spatter from welded areas.

### 3.2 REPAIR / RESTORATION

- A. Repairs To Primed, Ungalvanized Surfaces:

1. Thoroughly clean metal and give one (1) prime coat of specified material, well-worked into metal joints and open spaces. Match existing primed finish as required.
  - a. Do not apply primer at temperatures below 45 deg F.
  - b. Protect un-primed machine-finished surfaces against corrosion by priming.
- B. Repairs To Galvanized Surfaces:
  1. Non-Structural, Non-Load-Bearing Items Not Exposed To Weather:
    - a. Repair Using Zinc-Rich Paints: Spray- or brush-apply zinc-rich paint to prepared area. Apply paint in single application employing multiple spray passes to achieve dry film thickness of 2 mils.
  2. Structural, Load-Bearing Items And Items Exposed To Weather:
    - a. Repair Using Zinc-Based Alloys:
      - 1) Rub cleaned, pre-heated areas with repair stick to deposit evenly distributed layer of zinc alloy. If powdered zinc alloys are used, sprinkle powder on surface and spread out with spatula or similar tool.
      - 2) Remove flux residue by rinsing with water or wiping with damp cloth.
    - b. Repair Using Sprayed Zinc (Metallizing): Apply 2 mil minimum coating by means of metal-spraying pistols fed with either zinc wire or zinc powder in accordance with requirements of ASTM B695, Type I.
  3. All Items:
    - a. Apply repair materials immediately after surface preparation is complete.
    - b. Take thickness measurements, with either magnetic or electromagnetic gauge, to ensure applied coating is as specified or agreed to.

**END OF SECTION**

**BLANK PAGE**

**SECTION 05 0523****METAL FASTENING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Quality of structural metal-to-metal, wood-to-metal, and wood-to-wood bolts used on Project.
  - 2. Requirements and standards for site welded metal-to-metal connections.
- B. Related Requirements:
  - 1. Section 03 1511: Cast-in-place and drilled-in anchor bolts.
  - 2. Furnishing and installing of structural bolts specified under Section concerned.
  - 3. Performance of welding specified under Section concerned.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. American National Standards Institute / American Welding Society:
    - a. ANSI/AWS D1.1/D1.1M:2010, 'Structural Welding Code - Steel'.
    - b. ANSI/AWS D1.3/D1.3M:2010, 'Structural Welding Code - Sheet Steel'.
  - 2. ASTM International:
    - a. ASTM A36/A36M-08, 'Standard Specification for Carbon Structural Steel'.
    - b. ASTM A307-10, 'Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength'.
    - c. ASTM A325-10, 'Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength'.

**1.3 QUALITY ASSURANCE**

- A. Qualifications: Requirements of Section 01 4301 applies, but not limited to the following:
  - 1. Welders shall be certified 30 days minimum before beginning work on Project. If there is doubt as to proficiency of welder, Architect may require welder to take another test, at no expense to Owner. Certification shall be by Pittsburgh Laboratories or other authority approved by Architect.
- B. Certifications:
  - 1. Maintain welder's certifications on job-site.

**PART 2 - PRODUCTS****2.1 MANUFACTURED UNITS**

- A. Materials:
  - 1. Bolts And Threaded Fasteners:
    - a. Bolts: Conform to requirements of ASTM A307, Grade A.

**2.2 ACCESSORIES**

- A. Arc-Welding Electrodes: Type E70XX AWS Iron and Steel Arc-welding electrodes and meeting current AISC Specifications.

**PART 3 - EXECUTION****3.1 PERFORMANCE**

- A. Welding shall meet requirements of ANSI / AWS D1.1 and D1.3.
- B. Minimum weld sizes, unless detailed otherwise.
  - 1. Weld pipe columns to base plates and top plates with **1/4 inch** fillet weld all around.
  - 2. Weld glu-lam connection side plates to base plates with **1/4 inch** fillet weld all along outside edges.
  - 3. Weld stiffeners to pipe columns with **1/4 inch** fillet weld all around.

**END OF SECTION**

**SECTION 05 1223****STRUCTURAL STEEL FOR BUILDINGS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Miscellaneous structural steel.
  - 2. Lintels.
- B. Related Requirements:
  - 1. Sections under 04 2000 heading: Installation of lintels, channel frames, and miscellaneous structural steel.
  - 2. Section 05 0503: 'Shop-Applied Metal Coatings' for quality of priming.
  - 3. Section 05 0523: 'Metal Fastening' for quality of welding.
  - 4. Section 06 1100: 'Wood Framing' for installation of miscellaneous structural steel.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. American Society For Testing And Materials:
    - a. ASTM A36/A36M-14, 'Standard Specification for Carbon Structural Steel'.
    - b. ASTM A53/A53M-12, 'Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless'.
    - c. ASTM A500/A500M-13, 'Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes'.

**PART 2 - PRODUCTS****2.1 COMPONENTS**

- A. Materials:
  - 1. Structural Tubing: Meet requirements of ASTM A500/A500M, Grade B.
  - 2. Miscellaneous Steel:
    - a. Meet requirements of ASTM A36/A36M for the following:
      - 1) Lintels.
      - 2) Miscellaneous structural steel.
      - 3) Miscellaneous structural steel.
- B. Fabrication:
  - 1. After fabrication and before shop priming, hot-dip or mechanically galvanize lintels to be installed in following:
    - a. Exterior walls.
  - 2. Shop prime steel provided under this Section.
- C. Finishes:
  - 1. Shop Primer:
    - a. Concealed Steel: Fabricator's standard shop coat.
    - b. Exposed Steel To Receive Finish: Primer shall be acceptable to Finish Manufacturer.

**PART 3 - EXECUTION: Not Used**

**END OF SECTION**



**SECTION 05 5214****GALVANIZED STEEL PIPE AND TUBE RAILINGS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install galvanized steel pipe handrails as described in Contract Documents.
- B. Products Furnished But Not Installed Under This Section:
  - 1. Anchoring sleeves in concrete (if used).
- C. Related Requirements:
  - 1. Section 03 3111: 'Normal-Weight Structural Concrete' for installation of anchoring sleeves.
  - 2. Section 05 0503: 'Shop-Applied Metal Coatings' for quality of priming and repair of galvanizing.
  - 3. Section 05 0523: 'Metal Fastening' for quality of welding.
  - 4. Section 09 2216: 'Non-Structural Metal Framing' for blocking for handrail brackets installed on metal-framed walls.
  - 5. Finish painting:
    - a. Section 09 9113: 'Exterior Painted Galvanized Metal'.
    - b. Section 09 9124: 'Interior Painted Metal'.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Galvanized: To coat iron or steel with zinc for protection from rust and corrosion.
  - 2. Non-shrink Grout: Structural grout used for filling voids between elements that is formulated with cement, fine aggregates and admixtures. Admixtures are used to provide expansive properties of the material during curing. This expansion counteracts the natural tendency of cement grouts to shrink during curing.
- B. Reference Standards:
  - 1. ASTM International:
    - a. ASTM A53/A53M-12, 'Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless'.
    - b. ASTM A501/A501M-14, 'Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing'.
    - c. ASTM C1107/C1107M-14, 'Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)'.

**1.3 SUBMITTALS**

- A. Action Submittals:
  - 1. Shop Drawings: Show fabrication and installation of handrails and railings including floor plans, elevations, sections, details of components, and attachments to other elements of The Work.

**1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Storage And Handling Requirements:
  - 1. Store handrails and railing systems in clean, dry location, away from uncured concrete and masonry, and protected against damage.

2. Cover with waterproof paper, tarpaulin, or polyethylene sheeting. Allow for air circulation inside covering.

## PART 2 - PRODUCTS

### 2.1 ASSEMBLIES

#### A. Materials:

1. Handrails, Railings, And Balusters:
  - a. Galvanized steel pipe meeting requirements of ASTM A53/A53M or galvanized steel tubing meeting requirements of ASTM A501/A501M.
  - b. 1-1/2 inch outside diameter.
2. Sleeves:
  - a. 6 to 9 inches long with cross-section shape and dimension to allow 1/2 inch minimum of grout around perimeter of pipe or tube.
  - b. Provide with fully welded steel plate forming bottom closure.
3. Brackets, Flanges, Fittings, And Anchors:
  - a. Provide standard wall brackets, flanges, miscellaneous fittings, and anchors for connection of handrails and railings to other construction.
  - b. Provide inserts and other anchorage devices for connecting handrails and railing systems to concrete or masonry work.

#### B. Fabrication:

1. Preassemble railing systems in shop to greatest extent possible to minimize field splicing and assembly.
2. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
3. Grind smooth welded joints and buff welds to same appearance as remainder of railing. Repair galvanizing and cut pipe ends as specified in Section 05 0503.
4. Form curves by bending pipe in jigs to produce uniform curvature for each configuration required. Maintain cylindrical cross-section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.
5. Welded Connections:
  - a. Fabricate railing system and handrail connections by welding.
  - b. Weld corners and seams continuously to comply with following:
    - 1) Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
    - 2) At tee and cross intersections, notch ends of intersecting members to fit contour of pipe to which end is joined and weld all around.
    - 3) At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and so contours of welded surfaces match adjacent surfaces.
6. Return pipe ends of wall mounted handrails into wall.
7. Cap pipe ends of floor / ground mounted handrails and exterior handrails.
8. After fabrication, shop prime metal to be painted.

#### C. Finishes:

1. Factory-applied powder-coated finish. Color as selected by Architect from Manufacturer's standard colors.

### 2.2 ACCESSORIES

#### A. Rail Setting Grout:

1. Commercial nonshrink grout conforming to requirements of ASTM C1107/C1107M, Type B or Type C.

2. Type Two Approved Manufacturers:
  - a. Normal Construction Grout A by Bonsal American, Charlotte, NC [www.bonsal.com](http://www.bonsal.com).
  - b. Advantage 1107 Grout by Dayton Superior Specialty Chemicals, Kansas City, KS [www.daytonsuperiorchemical.com](http://www.daytonsuperiorchemical.com).
  - c. NS Grout by Euclid Chemical Co, Cleveland, OH [www.euclidchemical.com](http://www.euclidchemical.com)
  - d. 5 Star Special Grout 110 by Five Star Products Inc, Fairfield, CT [www.fivestarprouducts.com](http://www.fivestarprouducts.com).
  - e. Duragrout by L&M Construction Chemicals Inc, Omaha, NE [www.lmcc.com](http://www.lmcc.com)
  - f. Sonneborn / BASF Building Systems, Shakopee, MN [www.chemrex.com](http://www.chemrex.com).
  - g. Tamms Grout 621 by TAMMS Industries, Mentor, OH [www.tamms.com](http://www.tamms.com).
  - h. U S Spec MP Grout by U S Mix Products Co [www.usspec.com](http://www.usspec.com).
  - i. CG-86 Grout by W R Meadows, Hampshire, IL [www.wrmeadows.com](http://www.wrmeadows.com).
  - j. Equal as approved by Architect before use. See Section 01 6200.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Coring of concrete for installation of balusters is acceptable.
- B. Touch up field welds to match pre-finished material.

### **END OF SECTION**

**BLANK PAGE**

**SECTION 06 0573****PRESERVATIVE WOOD TREATMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Quality of wood preservative treatment where specified.
- B. Related Requirements:
  - 1. Section 06 1100:
    - a. Characteristics of wood to be pressure-treated.
    - b. Furnishing and installing of pressure-treated wood.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Preservative-Treated Wood: Wood exposed to high levels of moisture or heat susceptible to decay by fungus and other organisms, and to insect attack. The damage caused by decay or insects can jeopardize the performance of the wood members so as to reduce the performance below that required. Preservative treatment requires pressure-treatment process to achieve depth of penetration of preservative into wood to verify that the wood will be resistant to decay and insects over time.
  - 2. Treated Wood: Wood impregnated under pressure with compounds that reduce its susceptibility to flame spread or to deterioration caused by fungi, insects, or marine bores.
- B. Reference Standards:
  - 1. American Wood Protection Association:
    - a. AWP A N1-06, 'All Millwork Products - Preservative Treatment by Nonpressure Process'.
    - b. AWP A P5-10, 'Standard For Waterborne Preservatives'.
    - c. AWP A P22-10, 'Standard For Ammoniacal Copper Zinc Arsenate (ACZA)'.
    - d. AWP A P51-10, 'Standard for Zinc Borate (ZB)'.
    - e. AWP A T1-12, 'Use Category System: Processing and Treatment Standard For Treated Wood'.
    - f. AWP A U1-12, 'Use Category System: User Specification For Treated Wood'.
  - 2. International Building Code (IBC):
    - a. Chapter 23, 'Wood':
      - 1) Section 2300, 'Minimum Standards and Quality':
        - a) 2303.1, 'General':
          - (1) 2303.1.8, 'Preservative-Treated Wood'.
      - 2) Section 2400, 'General Construction Requirements':
        - a) 2304.11, 'Protection Against Decay and Termites':
          - (1) 2311.2, 'Wood Used Above Ground'.
          - (2) 2311.4, 'Wood In Contact With The Ground'.

**1.3 SUBMITTALS**

- A. Informational Submittals:
  - 1. Certificate: Certificate of pressure treatment showing compliance with specification requirements and including information required under IBC Section 2303.1.8.1, 'Identification'.

**PART 2 - PRODUCTS****2.1 SYSTEMS****A. Manufacturers:****1. Type One Acceptable Manufacturers:**

- a. Arch Wood Protection Inc, Atlanta, GA [www.wolmanizedwood.com](http://www.wolmanizedwood.com).
- b. Hoover Treated Wood Products, Thomson, GA [www.frtw.com](http://www.frtw.com).
- c. Osmose Inc, Griffin, GA [www.osmose.com](http://www.osmose.com).
- d. U S Borax Inc, Valencia, CA [www.borax.com/wood](http://www.borax.com/wood).
- e. Viance LLC, Charlotte, NC [www.treatedwood.com](http://www.treatedwood.com).
- f. Equal as approved by Architect before bidding. See Section 01 6200.

**B. Performance:**

1. Framing lumber grade and species shall be as specified in Section 06 1100 for particular use.
2. Interior Wood In Contact With Concrete or Masonry:
  - a. Preservatives:
    - 1) Disodium octoborate tetrahydrate (DOT / SBX) meeting requirements of AWP A U1 and with retention of **0.25 lbs per cu ft**.
    - 2) Zinc borate meeting requirements of AWP A U1 and with retention of **0.17 lbs per cu ft** (.
  - b. Lumber: Treat in accordance with AWP A U1.
  - c. Millwork: Treat in accordance with AWP A N1 and dry after treatment.

**PART 3 - EXECUTION: Not Used****END OF SECTION**

**SECTION 06 1011****WOOD FASTENINGS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Quality of wood fastening methods and materials used for Rough Carpentry unless specified otherwise.
- B. Related Requirements:
  - 1. Section 03 1511: 'Concrete Anchors and Inserts' for Quality of Anchors and Inserts.
  - 2. Section 05 0523: 'Metal Fastenings' for Quality of bolts used for Rough Carpentry.
  - 3. Furnishing and installing of other fasteners are specified in individual Sections where installed.

**1.2 REFERENCES**

- A. Reference Standards;
  - 1. APA-The Engineered Wood Association:
    - a. APA AFG-01: Adhesives for Field-Gluing Plywood to Wood Framing (September 1974).
  - 2. ASTM International:
    - a. ASTM A153/A153M-09, 'Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware'.
    - b. ASTM D3498-03(2011), 'Standard Specification for Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems'.
    - c. ASTM F1667-15, 'Standard Specification for Driven Fasteners: Nails, Spikes, and Staples'.

**1.3 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Manufacturer's literature on framing anchors and powder actuated fasteners.
  - 2. Shop Drawings:
    - a. Submit diameter and lengths of fasteners proposed for use on Project. If length or diameter of proposed fasteners differ from specified fasteners, also include technical and engineering data for proposed fasteners including, but not limited to:
      - 1) Adjusted fastener spacing where using proposed fasteners and,
      - 2) Adjusted number of fasteners necessary to provide connection capacity equivalent to specified fasteners.
    - b. Submit on powder-actuated fasteners other than those specified in Contract Documents showing design criteria equivalents at each application.
    - c. Show type, quantity, and installation location of framing anchors. Where necessary, reference Drawing details, etc, for installation locations.

**PART 2 - PRODUCTS****2.1 MANUFACTURED UNITS**

- A. Description:
  - 1. Nail Terminology:
    - a. When following nail terms are used in relation to this Project, following lengths and diameters will be understood. Refer to nails of other dimensions by actual length and diameter, not by one of listed terms:

Nail Term	Length	Diameter
8d Box	2-1/2 inches	0.113 inch
8d Common	2-1/2 inches	0.131 inch
10d Box	3 inches	0.128 inch
10d Common	3 inches	0.148 inch
16d Box	3-1/2 inches	0.135 inch
16d Sinker	3-1/4 inches	0.148 inch
16d Common	3-1/2 inches	0.162 inch

**B. Materials:****1. Fasteners:****a. General:**

- 1) Fasteners for preservative treated and fire-retardant-treated wood shall be of hot dipped zinc-coated galvanized steel, stainless steel, silicon bronzed, or copper. Coating weights for zinc-coated fasteners shall be in accordance with ASTM A153/A153M.

**b. Nails:**

- 1) Meet requirements of ASTM F1667.
- 2) Unless noted otherwise, nails listed on Drawings or in Specifications shall be common nail diameter, except 16d nails, which shall be box diameter.

**c. Wood Screws:****1) SDS Screws:**

- a) Category Four Approved Products. See Section 01 6200 for definitions of categories.
  - (1) SDS Screws by Simpson Strong Tie Co, Dublin, CA [www.strongtie.com](http://www.strongtie.com).
- 2) All Other: Standard type and make for job requirements.

**d. Powder-Actuated Fasteners:**

- 1) Type One Quality Standard: Hilti X-DNI 62P8.
- 2) Manufacturers:
  - a) Hilti, Tulsa, OK [www.us.hilti.com](http://www.us.hilti.com).
  - b) Redhead Division of ITW, Wood Dale, IL [www.itw-redhead.com](http://www.itw-redhead.com) and Markham, ON [www.itwconstruction.ca](http://www.itwconstruction.ca).
  - c) Equals as approved by Architect through shop drawing submittal before installation. See Section 01 6200.

**2. Adhesives:****a. Construction Mastics:**

- 1) Meet requirements of 'APA-The Engineered Wood Association' Specification AFG-01 or ASTM D3498.
- 2) Use phenol-resorcinol type for use on pressure treated wood products.

**3. Framing Anchors:**

- a. Framing anchors and associated fasteners in contact with preservative hot dipped zinc-coated galvanized steel or stainless steel. Do not use stainless steel items with galvanized items.
- b. Type Two Acceptable Products:
  - 1) KC Metals Inc, San Jose, CA [www.kcmetals.com](http://www.kcmetals.com).
  - 2) Simpson Strong Tie Co, Dublin, CA [www.strongtie.com](http://www.strongtie.com).
  - 3) United Steel Products Co Inc (USP), Montgomery, MN [www.uspconnectors.com](http://www.uspconnectors.com).
  - 4) Equals as approved by Architect through shop drawing submittal before installation. See Section 01 6200.

**PART 3 - EXECUTION****3.1 ERECTION**

- A. Secure one Manufacturer approved fastener in each hole of framing anchor that bears on framing member unless approved otherwise in writing by Architect.
- B. Provide washers with bolt heads and with nuts bearing on wood.

**END OF SECTION**



**SECTION 06 1100****WOOD FRAMING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install wood framing and blocking as described in Contract Documents.
- B. Products Installed But Not Furnished Under This Section:
  - 1. Miscellaneous structural steel elements.
  - 2. Roof related blocking, wood nailers, and curbs.
  - 3. Structural composite lumber.
  - 4. Wood 'I' joists.
  - 5. Wood panel product sheathing.
  - 6. Wood trusses.
- C. Related Requirements:
  - 1. Section 05 1223: 'Structural Steel For Buildings' for furnishing of miscellaneous structural steel.
  - 2. Section 06 0573: 'Preservative Wood Treatment' for quality of preservative wood treatment.
  - 3. Section 06 0573: 'Fire-Retardant Wood Treatment'.
  - 4. Section 06 1636: 'Wood Panel Product Sheathing'.
    - a. Pre-installation conference held jointly with Section 06 1100.
  - 5. Section 06 1712: 'Structural Composite Lumber - SCL'.
  - 6. Section 06 1733: 'Wood I Joists'.
  - 7. Section 06 1753: 'Shop Fabricated Wood Trusses'.
  - 8. Sections under 06 4000 Heading: 'Architectural Woodwork' for wall blocking requirements.
  - 9. Sections in Division 07: Roofing membranes for related blocking, wood nailers, and curbs.
  - 10. Section 08 4113: 'Aluminum-Framed Entrances And Storefronts':
    - a. Pre-installation conference held jointly with Section 06 1100.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. American Lumber Standard Committee (ALSC) (Maintains NIST standard):
    - a. Voluntary Product Standard:
      - 1) PS 20-15, 'American Softwood Lumber Standard'.
  - 2. National Institute of Standards and Technology (NIST), U. S. Department of Commerce:
    - a. Voluntary Product Standard DOC PS 20-15, 'American Softwood Lumber Standard'.
    - b. TPI / WTCA Building Component Safety Information BCSI 2008, 'Guide to Good Practice for Handling, Installing, Restraining & Bracing of Metal Plate Connected Wood Trusses'.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference:
  - 1. Participate in pre-installation conference held jointly with Section 06 1636.
    - a. Schedule pre-installation conference immediately before beginning framing work.
    - b. In addition to agenda items specified in Section 01 3100, review following:
      - 1) Equipment and gypsum board blocking in wood framed walls.
      - 2) Operable partition headers.
      - 3) Rough opening.
      - 4) Shear walls and struts.
      - 5) Nails and nailing requirements.

- 6) Truss installation.
  - 7) Connections.
2. Participate in pre-installation conference held jointly with Section 08 4113.
  - a. Schedule pre-installation conference for one (1) week before scheduled installation of storefront system.
  - b. In addition to agenda items specified in Section 01 3100, review following:
    - 1) Rough opening requirements.

## 1.4 SUBMITTALS

- A. Informational Submittals:
  1. Test And Evaluation Reports:
    - a. Technical and engineering data on nails to be set by nailing guns for Architect's approval of types proposed to be used as equivalents to specified hand set nails and adjusted number and spacing of pneumatically-driven nails to provide equivalent connection capacity.
  2. Manufacturer Instructions:
    - a. Copies of pamphlets specified in REFERENCE Article. After Architect's examination, keep pamphlets on Project site with approved shop drawings. Pamphlets may be obtained from Truss Plate Institute, Wood Truss Council of America, or from Truss Fabricator.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
  1. Protect lumber and sheathing and keep under cover in transit and at job site.
  2. Do not deliver material unduly long before it is required.
- B. Storage And Handling Requirements:
  1. Store lumber and sheathing on level racks and keep free of ground to avoid warping.
  2. Stack to insure proper ventilation and drainage.
  3. Handle and store wood trusses in accordance with ANSI / WTCA Booklet BSCI except trusses may be unloaded by dumping if trusses are shipped horizontally, are rolled off low profile roller bed trailer, and no part of any truss is required to drop more than **18 inches**.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Dimension Lumber:
  1. Design Criteria:
    - a. Meet requirements of PS 20 and National Grading Rules for softwood dimension lumber.
    - b. Bear grade stamp of WWPA, SPIB, or other association recognized by American Lumber Standards Committee identifying species of lumber by grade mark or by Certificate of Inspection.
    - c. Lumber **2 inches** or less in nominal thickness shall not exceed 19 percent in moisture content at time of fabrication and installation and be stamped 'S-DRY', 'K-D', or 'MC15'.
    - d. Preservative Treated Plates / Sills:
      - 1) **2x4**: Standard and better Douglas Fir, Southern Pine, or HemFir, or StrandGuard by iLevel by Weyerhaeuser Boise, ID [www.ilevel.com](http://www.ilevel.com). (LSL 1.3 E)
      - 2) **2x6** And Wider: No. 2 or or MSR 1650f - 1.5e Douglas Fir, Southern Pine, HemFir, or StrandGuard by iLevel by Weyerhaeuser, Boise, ID [www.ilevel.com](http://www.ilevel.com). (LSL 1.3 E).
    - e. Fire-Retardant:
      - 1) Fire-Retardant as specified in Section 06 0573 applied to wood materials used above top plate that is part of attic space including soffit/fascia components if shown on Contract Drawings.

- B. Posts, Beams, And Timbers **5 Inches by 5 Inches** And Larger:
  - 1. Design Criteria:
    - a. No. 1 or better Douglas Fir or Southern Pine.
- C. Lumber Ledgers:
  - 1. Design Criteria:
    - a. No. 2 Douglas Fir-Larch, or Southern Pine.
- D. See drawings for additional requirements.

## 2.2 ACCESSORIES

- A. Folding Partition Headers:
  - 1. New, unused plywood conforming to plywood specification requirements of Section 06 1636.
- B. Blocking:
  - 1. Sound lumber without splits, warps, wane, loose knots, or knots larger than **1/2 inch**.
- C. Furring Strips:
  - 1. Utility or better.
- D. Sill Sealer:
  - 1. Closed-cell polyethylene foam, **1/4 inch** thick by width of plate.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General:
  - 1. Use preservative treated wood for wood members in contact with concrete or masonry, including wall, sill, and ledger plates, door and window subframes and bucks, etc.
  - 2. Fire-Retardant Wood Treatment:
    - a. Field Cuts:
      - 1) Do not rip or mill fire retardant treated lumber. Cross cuts, joining cuts, and drilling holes are permitted.
- B. Interface With Other Work:
  - 1. Coordinate with other Sections for location of blocking required for installation of equipment and building specialties. Do not allow installation of gypsum board until required blocking is in place.
  - 2. Where manufactured items are to be installed in framing, provide rough openings of dimensions within tolerances required by manufacturers of such items. Confirm dimensions where not shown on Contract Drawings.
- C. Tolerances:
  - 1. Walls:
    - a. **1/4 inch** in **20 feet**, non-cumulative in length of wall.
    - b. **1/8 inch** in **10 feet** with **1/4 inch** maximum in height of wall.
    - c. Distances between parallel walls shall be **1/4 inch** maximum along length and height of wall.
- D. Floors:
  - 1. Place with crown side up.
  - 2. Provide accurately fitted header and trimmer joists of same size as regular joists around floor openings, unless detailed otherwise, and support by steel joist hangers.
  - 3. Double joists under partitions that parallel run of joists.
- E. Walls:

1. Openings: Single, bearing stud supporting header and one adjacent (king) stud continuous between top and bottom plates, unless shown otherwise.
2. Corners And Partition Intersections: Triple studs.
3. Top Plates In Bearing Partitions: Doubled or tripled and lapped. Stagger joints at least **48 inches**.
4. Ends Of Stud Wall To Masonry. Use one of the following methods:
  - a. Connect with **1/2 inch** machine bolts **6 inches** from top, **6 inches** from bottom, and **48 inches** maximum on center. Use three bolts minimum in height of **6 foot** or higher wall.
  - b. Secure wood to masonry using continuous **1/4 inch** minimum bead of construction adhesive and powder actuated fasteners installed at **32 inches** on center minimum.
5. Firestops:
  - a. Horizontal or vertical concealed spaces in walls, light coves, soffits, drop ceilings, and other features over **10 feet** in length or height, and at stairs, ceiling levels, floor levels, and other junctures of horizontal to vertical concealed spaces.
  - b. Within concealed spaces of exterior wall finishes and exterior architectural elements, such as trims, cornices or projections, at maximum intervals of **20 feet**, length or height.
6. Sill Plates:
  - a. Shear Walls And Bearing Walls:
    - 1) Provide specified anchor **12 inches** maximum and **4 inches** minimum from each end of each plate.
    - 2) Shear Walls: Fasten with anchor bolts embedded in concrete or with screw anchors.
    - 3) Bearing Walls: Fasten with anchor bolts embedded in concrete, or with screw anchors or expansion bolts in drilled holes.
  - b. Non-Structural Walls: Fasten with powder actuated fasteners.
  - c. In addition to requirements of paragraphs 'a' and 'b' above, set sill plates of interior walls measuring less than **36 inches** in length in solid bed of specified construction adhesive, except where sill sealer is used.
  - d. Install specified seal sealer under sill plates of exterior walls of main building and of acoustically insulated interior walls.
  - e. Masonry Wall Plates:
    - 1) Anchor 2x6 and 2x8 wall plates to top of block walls with **5/8 inch** diameter anchor bolts at **32 inches** on center unless noted otherwise.
    - 2) Set plates on masonry bearing walls true and level to provide full bearing. Use mortar as specified in Division 04 for leveling if leveling is required.
7. Posts And Columns:
  - a. Unless shown otherwise, nail members of multiple member columns together with 16d at **6 inches** on center from each side.
8. Beams And Girders:
  - a. Built-Up Members:
    - 1) Stagger individual members of multiple span beams and girders so, over any one support, no more than half the members will have a joint. In all cases, however, joints shall occur over supports.
    - 2) Unless shown otherwise on Drawings, nail two-ply built-up members with 10d nails **12 inches** on center top and bottom, staggered on opposite sides. Nail three-ply built-up members with 16d nails at **12 inches** on center, top and bottom, staggered, on opposite sides. Set with crown edge up with full bearing at ends and intermediate supports.
  - b. Pre-Fabricated Members:
    - 1) Solid glu-lam, LVL, LSL, or PSL members may be used in place of built-up **2x** framing members. Size shall be same as built-up member.
    - 2) Solid LVL or PSL members may be used in place of built-up LVL members. Size shall be same as sum of built-up members.
  - c. Wood shims are not acceptable under ends.
  - d. Do not notch framing members unless specifically shown in Drawing detail.
9. Nailing:
  - a. Stud to plate:

<b>2 by 4 inch nominal</b>	End nail, two 16d OR toe nail, four 8d
<b>2 by 6 inch nominal</b>	End nail, three 16d OR toe nail, four 8d
<b>2 by 8 inch nominal</b>	End nail, four 16d OR toe nail, six 8d
<b>2 by 10 inch nominal</b>	End nail, five 16d OR toe nail, six 8d
<b>1-3/4 by 5-1/2 inch LVL</b>	End nail, three 16d OR toe nail, four 8d

1-3/4 by 7-1/4 inch LVL	End nail, four 16d OR toe nail, six 8d
1-3/4 by 9-1/4 inch LVL	End nail, five 16d OR toe nail, six 8d
1-3/4 by 11-1/4 inch LVL	End nail, six 16d OR toe nail eight 8d

- b. Top plates: Spiked together, 16d, 16 inches on center.
  - c. Top plates: Laps, lap members 48 inches minimum and nail with 16d nails 4 inches on center
  - d. Top plates: Intersections, three 16d.
  - e. Backing And Blocking: Three 8d, each end.
  - f. Corner studs and angles: 16d, 16 inches on center.
- F. Roof And Ceiling Framing:
1. Place with crown side up at 16 inches on center unless noted otherwise.
  2. Install structural blocking and bridging as necessary and as described in Contract Documents.
  3. Special Requirements:
    - a. Roof And Ceiling Joists: Lap joists 4 inches minimum and secure with code approved framing anchors.
    - b. Roof Rafters And Outlookers:
      - 1) Cut level at wall plate and provide at least 2-1/2 inches bearing where applicable. Spike securely to plate with three 10d nails.
      - 2) Attach to trusses or other end supports with framing anchors described in Contract Documents.
      - 3) Provide for bracing at bearing partitions.
  4. Installation of Wood Trusses:
    - a. Handle, erect, and brace wood trusses in accordance with TPI / WTCA Booklet BCSI.
    - b. Do not install damaged or broken wood trusses. Replace wood trusses that are broken, damaged, or have had members cut out during course of construction.
    - c. Do not set trusses until masonry bearing walls and masonry shear walls are complete.
    - d. Provide construction bracing for trusses in accordance with TPI DSB-89.
    - e. Provide continuous 2x4 horizontal web bracing as shown on truss shop drawings.
      - 1) Secure bracing to each truss with two 10d or 16d nails.
      - 2) Lap splice bracing by placing bracing members side by side on common web member. Butt splices are not acceptable.
    - f. Unless directed or shown otherwise, provide diagonal 2x4 bracing between trusses at each line of horizontal web bracing.
      - 1) This diagonal bracing shall be continuous and extend from junction of web and top chord of one truss to junction of web and bottom chord of different truss.
      - 2) Install bracing at approximately 45 degree angle. Bracing will extend over three trusses minimum or more as determined by height of trusses and 45 degree installation angle.
      - 3) Install brace on side of web opposite horizontal web bracing and nail to each web with two 10d or 16d nails.
      - 4) Install one brace every 20 feet as measured from top of brace to top of next brace.
  5. Installation of Glue-Laminated Structural Units:
    - a. Install work in accordance with Fabricators instructions and Glue-Lam Erection Safety Practices.
    - b. Adequately support and brace work until tied into building structure to insure against collapse due to wind or other forces.
    - c. Maintain protection of beams until roofing has been installed.
  6. Installation of Structural Composite Lumber:
    - a. Install temporary horizontal and cross bracing to hold members plumb and in safe condition until permanent bracing is installed.
    - b. Install permanent bracing and related components before application of loads to members.
  7. Installation of wood Web Joists:
    - a. Handle, erect, and brace plywood web joists in accordance with Manufacturer's instructions.
    - b. Do not install damaged or broken wood web joists.
    - c. Install temporary horizontal and cross bracing to hold members plumb and in safe condition until permanent bracing is installed.
    - d. Cut holes through webs at locations or of sizes shown on Drawings and as recommended by Manufacturer.

G. Folding Partition Structural Headers:

1. Provide for double or single track as required by Folding Partition Manufacturer.
  2. Stagger joints in plywood.
  3. Glue plywood layers together with continuous bead **2 inches** in from each edge and every **4 inches** on center between. In addition, Screw layers together with **1/4 inch** by **3 inch** screws **one inch** in from each edge and **12 inches** on center for length of header.
  4. Secure headers and header backing to structure as described in Contract Documents.
- H. Accessory / Equipment Mounting And Gypsum Board Back Blocking (nailers):
1. Furnish and install blocking in wood framing required for hardware, specialties, equipment, accessories, and mechanical and electrical items, etc.
  2. Furnish and install back blocking in wood framing required for joints in gypsum wallboard.
    - a. Install back blocking between I-joist framing members with equivalent of Simpson Z2 clips attached with four 10d x **1-1/2 inches** nails at each end, two into 'I' joist and two into blocking.
    - b. Attach back blocking at trusses, stick framing, or walls with two 10d nails in each end of each piece of blocking.
- I. Furring Strips:
1. On Wood or Steel: Nail or screw as required to secure firmly.
    - a. Ceiling:
      - 1) Attach furring strips to the underside of structural elements with #8 wood screws, of length to penetrate wood framing **1 inch** minimum.
  2. On Concrete or Masonry:
    - a. Back up furring strips on exterior walls or walls in contact with earth with **15 lb** felt strip.
    - b. Nail at **12 inches** on center maximum.

**END OF SECTION**

**SECTION 06 1636****WOOD PANEL PRODUCT SHEATHING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install wood panel product sheathing required for walls, roofs, and floors as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 01 1200: 'Multiple Contracts Summary'.
  - 2. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
  - 3. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
  - 4. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
  - 5. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
  - 6. Section 01 6200: Administrative and procedural requirements for product options.
  - 7. Section 01 7800: 'Closeout Submittals'.
  - 8. Section 06 0573: 'Fire-Retardant Wood Treatment'.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. Council of American Structural Engineers. CASE Form 101: *Statement of Special Inspections*. Washington, DC: CASE, 2001. (c/o American Council of Engineering Companies, 1015 15<sup>th</sup> St., NW, Washington, DC 20005; 202-347-7474; [www.acec.org](http://www.acec.org)).
  - 2. National Institute of Standards and Technology (NIST), U. S. Department of Commerce:
    - a. Voluntary Product Standard DOC PS 1-09. 'Structural Plywood'.
    - b. Voluntary Product Standard DOC PS 2-04. 'Performance Standard for Wood-Based Structural-Use Panels'.
  - 3. The Engineered Wood Association (APA), Tacoma, WA [www.apawood.org](http://www.apawood.org).
    - a. Performance Rated Panels, 'Product Guide' (for products bearing the APA trademark) December 2011.
    - b. Voluntary Product Standard:
      - 1) PS 1-09. 'Structural Plywood'.
      - 2) PS 2-04. 'Performance Standard for Wood-Based Structural-Use Panels'.
    - c. PRP-108 'Performance Standards and Policies for Structural-Use Panels'.
  - 4. TECO, Cottage Grove, WI [www.tecotested.com](http://www.tecotested.com).
    - a. TECO PRP-133: ('Fire Rated Assemblies – OSB substitution for plywood in UL fire-rated assemblies that specify plywood).
- B. Definitions:
  - 1. Field Quality Control: Testing, Inspections, Special Testing and Special Inspections to assure compliance to Contract Documents.
  - 2. Inspection/Special Inspection: Inspection of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards:
    - a. Inspection: Not required by code provisions but may be required by Contract Documents.
    - b. Special Inspection: Required by code provisions and by Contract Documents.

- c. Inspection-Continuous: Full-time observation of the Work requiring inspection by approved inspector who is present in area where the Work is being performed.
  - d. Inspection-Periodic: Part-time or intermittent observation of the Work requiring inspection by approved inspector who is present in area where the Work has been or is being performed and at completion of the Work.
  - 3. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform particular construction operation, including installation, erection, application, and similar operations.
  - 4. Observation: Visual observation of building / site elements or structural system by registered design professional for general conformance to approved construction documents at significant construction stages and at completion. Observation does not include or waive responsibility for performing inspections or special inspections.
  - 5. Owner's Representative: Owner's Designated Representative (Project Manager or Facilities Manager) who will have express authority to bind Owner with respect to all matters requiring Owner's approval or authorization.
  - 6. Product Testing: Tests and inspections that are performed by testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
  - 7. Quality Assurance: Testing, Inspections, Special Testing and Special Inspections provided for by Owner.
  - 8. Quality Control: Testing, Inspections, Special Testing and Special Inspections provided for by Contractor.
  - 9. Special Inspection: See Inspection.
  - 10. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
  - 11. Verification: Act of reviewing, inspecting, testing, etc. to establish and document that product, service, or system meets regulatory, standard, or specification requirements.
- C. Reference Standards:
- 1. International Code Council (IBC) (2006):
    - a. IBC Chapter 17, 'Structural Tests and Special Inspections'.
      - 1) Section 1704, 'Special Inspections'.
        - a) Section 1704.3, 'Steel Construction'.
        - b) Section 1704.6, 'Wood Construction'.

### **1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference:
- 1. Participate in pre-installation conference as specified in Section 06 1100.
  - 2. In addition to agenda items specified in Section 01 3100 and Section 06 1100, review following:
    - a. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control inspection required of this section.

### **1.4 SUBMITTALS**

- A. Informational Submittals:
- B. Closeout Submittals:
- 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Record Documentation:
      - 1) Testing and Inspection Reports:
        - a) Testing Agency Inspection Reports of sheathing.

### **1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery And Acceptance Requirements:
- 1. Do not deliver material unduly long before it is required.



2. Protect sheathing and keep under cover in transit and at job site.

B. Storage And Handling Requirements:

1. Store sheathing on level racks and keep free of ground.
2. Stack to insure proper ventilation and drainage.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURED UNITS

A. Performance:

1. Design Criteria:

- a. Meet requirements of PS 1, PS 2, or PRP-133 (TECO). Except where plywood is specifically indicated on Construction Drawings, oriented strand board (OSB) is acceptable.
- b. Fire-Retardant as specified in Section 06 0573 applied to roof sheathing and wall sheathing above top plate that is part of attic space if shown on Contract Drawings.

B. Materials:

1. Sheathing:

- a. Sheathing shall bear grade stamp from American Plywood Association (APA) or equal grading organization.
- b. Sheathing shall not exceed 18 percent moisture content when fabricated or more than 19 percent when installed in Project.
- c. Sheathing **23/32 inch** thick and thicker used for single-layer subflooring shall be tongue and groove.
- d. Sheathing used for same purpose shall be of same thickness. In all cases, thickness specified is minimum required regardless of span rating.
- e. Minimum span ratings for given thicknesses shall be as follows:

Thickness	Span Rating
<b>3/8 inch</b>	24 / 0
<b>7/16 inch nominal</b>	24 / 16
<b>15/32 inch actual</b>	32 / 16
<b>1/2 inch nominal</b>	32 / 16
<b>19/32 inch actual</b>	40 / 20
<b>5/8 inch nominal</b>	40 / 20
<b>23/32 inch actual</b>	48 / 24
<b>3/4 inch nominal</b>	48 / 24

**2.2**

### ACCESSORIES

A. Nails:

1. As indicated on Drawings.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. General:

1. Top of nail heads shall be flush with sheathing surface.
2. Use of edge clips to provide spacing between sheathing panels is acceptable.
3. Fire-Retardant Wood Treatment:
  - a. Field Cuts:
    - 1) Plywood: Fire retardant treated plywood may be cut in any direction.

B. Wall Sheathing:

1. Spacing:

- a. Provide **1/8 inch** space between sheets at end and edge joints.
  2. Edge Bearing And Blocking:
    - a. Panel edges shall bear on framing members and butt along their center lines.
    - b. Back block panel edges, which do not bear on framing members, with **2 inch nominal** framing.
  3. Nail Spacing:
    - a. As indicated on Drawings.
    - b. Place nails not less than **3/8 inch** in from edge.
  4. Thickness:
    - a. As indicated on Drawings.
  5. Do not install any piece of wall sheathing with shortest dimension of less than **12 inches**.
- C. Roof Sheathing:
1. Placing:
    - a. Lay face grain at right angles to supports. Provide blocking for support if framing turns at roof overhang.
    - b. Provide **1/8 inch** space between sheets at end and side joints.
    - c. Stagger panel end joints.
    - d. Sheathing shall be continuous of two spans minimum.
  2. Nail Spacing:
    - a. As indicated on Drawings.
    - b. Place nails at least **3/8 inch** in from edge.
  3. Thickness:
    - a. As indicated on Drawings.
  4. Do not install any piece of roof sheathing with shortest dimension of less than **24 inches** unless support is provided under all edges.

### 3.2 FIELD QUALITY CONTROL

- A. Field Inspections:
1. Wood Sheathing:
    - a. General:
      - 1) Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
      - 2) Quality Control is sole responsibility of Contractor as specified in Section 01 4523 'Testing And Inspection Services'.
    - b. For walls and roof areas where nail spacing is **4 inches** and less on center, Inspector shall verify wood panel sheathing, grade, thickness and nominal size of framing members, adjoining panel edges, nail size and spacing, bolting and other fastening of other components.

### 3.3 PROTECTION

- A. Protect roof sheathing from moisture until roofing is installed.

**END OF SECTION**

**SECTION 06 1712****STRUCTURAL COMPOSITE LUMBER: SCL****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Laminated Veneer Lumber (LVL).
  - 2. Parallel Strand Lumber (PSL).
  - 3. Laminated Strand Lumber (LSL).
- B. Related Requirements:
  - 1. Section 06 1100: 'Wood Framing' for installation, securing, bracing, etc.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. International Code Council (ICC):
    - a. ICC-ES Evaluation Reports, [www.icc-es.org](http://www.icc-es.org).
- B. Reference Standards:
  - 1. ASTM International:
    - a. ASTM D2559-12a, 'Standard Specification for Adhesives for Structural Laminated Wood Products for Use Under Exterior Exposure Conditions'.
    - b. ASTM D5456-14b, 'Standard Specification for Evaluation of Structural Composite Lumber Products'.

**1.3 SUBMITTALS**

- A. Informational Submittals:
  - 1. Certificates: Provide certification confirming that material structural design properties and design stresses have met or exceed requirements shown on Drawings.

**1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Storage And Handling Requirements:
  - 1. Store members on job site in accordance with Manufacturer's instructions.
  - 2. Keep dry and provide supports to keep members off floor or ground.
  - 3. Split plastic wrappers of members stored encased in plastic on bottom side to allow for air circulation.

**PART 2 - PRODUCTS****2.1 MANUFACTURED UNITS**

- A. Acceptable Manufacturers:
  - 1. Boise Cascade Corp, Boise, ID [www.bc.com](http://www.bc.com).
  - 2. Georgia-Pacific Corp, Atlanta, GA [www.gp.com](http://www.gp.com).
  - 3. Jager Industries Inc, Calgary, AB [www.jagerbuildingsystems.com](http://www.jagerbuildingsystems.com).
  - 4. Louisiana Pacific Corp, Portland, OR [www.lpcorp.com](http://www.lpcorp.com).

5. Roseburg Forest Products, Roseburg, OR [www.roseburg.com](http://www.roseburg.com).
6. Trus Joist Corp, Div Weyerhaeuser, Boise, ID [www.tjm.com](http://www.tjm.com) or Surrey, BC (604) 588-7878.
7. Web Joist, Chehalis, WA [www.webjoist.com](http://www.webjoist.com).
8. Weyerhaeuser, Engineered Lumber Products, Boise, ID [www.woodbywy.com](http://www.woodbywy.com).
9. Equal as approved by Architect before bidding. See Section 01 6200.

B. Design Criteria:

1. Materials shall be tested and evaluated in accordance with ASTM D5456.
2. Materials shall have current ICC-ES Evaluation Report, report approved by International Codes Council, or report issued by Architect approved model code evaluation service and shall comply with requirements of report.

C. Fabrication: Materials shall be manufactured in a plant evaluated for fabrication by governing code evaluation service and under supervision of third party inspection agency listed by governing code evaluation service.

**PART 3 - EXECUTION: Not Used**

**END OF SECTION**

**SECTION 06 1753****SHOP-FABRICATED WOOD TRUSSES: Trussed Rafters****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Supplied But Not Installed Under This Section:
  - 1. Wood roof trusses.
  - 2. Trussed blocking for roof trusses.
- B. Related Requirements:
  - 1. Section 01 1200: "Multiple Contract Summary".
  - 2. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
  - 3. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
  - 4. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
  - 5. Section 06 1100: 'Wood Framing':
    - a. Storage and handling of trusses on Project site.
    - b. Installing, securing, bracing, etc.
    - c. Required blocking other than trussed blocking.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. International Standards Organization (ISO) / International Electrotechnical Commission (IEC):
    - a. ISO/IEC 17020-2012, 'Conformity Assessment - Requirements for the operation of various types of bodies performing inspection'.
  - 2. Structural Building Components Association (SBCA) [www.sbcindustry.com](http://www.sbcindustry.com).
  - 3. Truss Plate Institute (TPI):
    - a. DSB-89, 'Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses'.
  - 4. Truss Plate Institute (TPI) / Structural Building Components Association (SBCA):
    - a. TPI/SBCA Structural Building Components Association Components Safety Information BCSI 'Guide to Good Practice for Handling, Installing, Restraining & Bracing of Metal Plate Connected Wood Trusses' (2013 Edition with 2015 Update).
- B. Definitions:
  - 1. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.
- C. Reference Standards:
  - 1. American National Standards Institute (ANSI) / Truss Plate Institute (TPI):
    - a. ANSI/TPI 1-2014, 'National Design Standard for Metal Plate Connected Wood Truss Construction.
  - 2. ASTM International:
    - a. ASTM A641-09a/A641M-09a(2014), 'Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire'.
  - 3. International Code Council (ICC):
    - a. ESR-1082 (Reissued February 2015), 'Eagle Metal Products Eagle 20, Eagle 18, Eagle 16, Eagle 20HS, Eagle 18HS and Eagle 18 Hinge Plate Metal Truss Connector Plates'.

- b. ESR-1118 (Reissued January 2015), 'ITW BCF Wave, H, S, K, Trulox, and Hinge Plate Metal Connector Plates for Wood Trusses'.
- c. ESR-1988 (Reissued December 2014), 'MiTek Truss Connector Plates: TL18, MT18, MT18HS, MT18SHS, TL20 AND MT20'.

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Sequencing:
  - 1. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying progress of other trades whose work follow erection of trusses.

### 1.4 SUBMITTALS

- A. Action Submittals:
  - 1. Shop Drawings:
    - a. Truss design drawings:
      - 1) Base truss design drawings on truss configurations and truss loads and requirements of Contract Documents. Joint configurations may be modified to allow double cut webs. Determine member forces from exact analysis method as defined by TPI.
      - 2) Include following information:
        - a) Allowable loads in lbs per effective nail or lbs per sq inch for lumber and plates used as allowed by ICBO and current ICBO report number.
        - b) Stress reduction factors used for plates and lumber.
        - c) Top and bottom chord design loads in psf.
        - d) Size, thickness, and exact location by dimension of plates.
        - e) Lumber species and grades used.
        - f) Combine stress index for each member.
        - g) Stamp and signature of Engineer responsible for preparation of drawings.
        - h) Name and trademark of Plate Manufacturer if metal plates are used.
        - i) Name and address of Truss Fabricator and Project name and address.
- B. Informational Submittals:
  - 1. Certificates:
    - a. Complete and provide copy of certification "Truss Plant Certification Requirements Form" to Architect before bid.
    - b. Provide attachment copy of truss plant certification with completed "Truss Plant Certification Requirements Form" to Architect and Testing Agency before commencing fabrication of Wood Trusses.
  - 2. Test And Evaluation Reports:
    - a. Copies of previous four quarterly inspection reports verifying compliance with TPI regulations unless the Truss Fabricator provides proof that they are certified and in good standing with the In-Plant WTCA QC program certification.

### 1.5 QUALITY ASSURANCE

- A. Qualifications. Requirements of Section 01 4301 applies, but is not limited to the following:
  - 1. Metal Connector-Plate Manufacturer Qualifications:
    - a. Member of TPI and complies with quality-control procedures in TPI 1 for manufacturer of connector plates.
      - 1) Fabricator's responsibility include providing professional engineering services needed to assume engineering responsibility.
      - 2) Engineering responsibility: Preparation of shop drawings and comprehensive engineering analysis by qualified professional engineer registered in location of jurisdiction.
  - 2. Fabricator Qualifications:

- a. Fabricator must have a letter providing evidence that they are certified and in good standing with their third party accredited Quality Assurance business.
- b. Fabricator shall have in place a program requiring fabrication plant to be inspected four times each year by an independent testing laboratory in accordance with TPI regulations.

## 1.6 DELIVERY, HANDLING, AND STORAGE

### A. Delivery And Acceptance Requirements:

1. Notify Architect two (2) days minimum before arrival of trusses to allow for scheduling of truss inspection on site before unloading and for monitoring of unloading procedure.
2. Unload trusses by one of following methods.
  - a. As outlined in TPI / SBCA Booklet BCSI, 'Guide to Good Practice For Handling, Installing & Bracing of Metal Plate Connected Wood Trusses'.
  - b. Trusses may be unloaded by dumping if trusses are shipped horizontally, are rolled off low profile roller bed trailer, and if no part of any truss is required to drop more than **18 inches**.
3. After delivery of trusses:
  - a. Inspect for damage before installing trusses.
  - b. Inspect for "gaps" between framing members.
  - c. Discard and replace trusses that are damaged or defective.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

#### A. Wood Truss Fabricators:

1. Type Two Acceptable Fabricator:
  - a. Meet following requirements:
    - 1) Wood Truss fabricator whose products meet quality requirements of this Section.
    - 2) Wood Truss fabricator shall be certified and submit copy of the truss plant certification with 'Truss Plant Certification Requirements Form' the Architect and Testing Agency before commencing fabrication of Wood Trusses.

### 2.2 MANUFACTURED UNITS

#### A. Performance:

##### 1. Design Criteria:

- 1) Of quality to meet or exceed stress grade requirements given in table below for each lumber classification and to meet requirements for dimension lumber in Section 06 1100. Truss members not called out on Drawings shall meet or exceed stresses of classification C.
  - a) Of quality to meet minimum stress grade requirements given below:

	Class A, 2x6	Class B, 2x6	Class C, 2x4	Class C, 2x6
Fb Bending	1720	1495	1510	1310
Ft Tension	1010	880	825	725
Fv Shear	75	75	75	75
Fc Perpendicular	405	405	405	405
Fc Parallel	1650	1485	1495	1430
E	$1.6 \times 10^6$	$1.5 \times 10^6$	$1.5 \times 10^6$	$1.5 \times 10^6$

- b) Allowable stresses shown are for normal duration of load and repetitive member use.
- c) Following machine stress rated lumbers may be substituted for the above lumbers provided the combined stress ratio for each member is less than 1.0 by National Design Specification for Wood formulas, 2001. Total load deflection is less than  $L/240$  and live load deflection is less than  $L/360$ .

$$\begin{array}{ccc} \frac{A}{2100f - 1.8E} & \frac{B}{1800f - 1.6E} & \frac{C}{1650f - 1.5E} \end{array}$$

- b. Metal Gusset Plates:
  - 1) Plate design and manufacture shall be as approved by 'The Research Committee for the ICC'.
  - 2) Truss plates for symmetrical trusses shall be same size on both sides of truss. Determine size to be used by highest loading value on either side of truss.
- B. Materials:
  - 1. Top And Bottom Chords And Web Members: Douglas Fir or Southern Pine No. 2 or better.
  - 2. Metal Gusset Plates:
    - a. Connector plates to comply with TPI 1 from hot-dip galvanized steel sheet complying with ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than **0.036 inch** thick.
      - 1) Use for interior locations.
    - b. Manufacturer's name or trademark shall be visible on plates.
    - c. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
      - 1) Eagle Metal Products, Dallas, TX [www.eaglemetal.com](http://www.eaglemetal.com).
      - 2) ITW Building Components Group, Glenview, IL [www.itwbcbg.com](http://www.itwbcbg.com).
      - 3) MiTek Industries, Inc.; a subsidiary of Berkshire Hathaway Inc. Chesterfield, MO [www.mii.com](http://www.mii.com) or MiTek Canada, Bradford ON [www.mii.com/canada](http://www.mii.com/canada).
      - 4) Simpson AS Truss Connector Plates; Simpson Strong-Tie Company Inc. Pleasanton, CA [www.strongtie.com](http://www.strongtie.com).
- C. Fabrication:
  - 1. General:
    - a. Fabrication of trusses shall be as approved by ICC except that this Specification shall govern when it exceeds ICC requirements.
    - b. Fabricate trusses from approved shop drawings.
    - c. Fabricate trusses in jigs with members accurately cut to provide good bearing at joints. Joints shall be acceptable if the average opening between ends of members immediately after fabrication is less than **1/16 inch**.
    - d. Each chord section shall be involved in two (2) panel points before being spliced.
  - 2. Metal Gusset Plates:
    - a. No panel point shall have more than one (1) plate per truss side.
    - b. Plates shall have minimum bite of **2-1/2 inches** on members. Measure bite along center line of webs and perpendicular to chord axes. Orient plate axis parallel with truss chord axis except where chords change pitch or terminate. Plates may be placed parallel with webs at single web joints.
      - 1) Minimum bite requirements are waived for non-structural webs parallel to top chords added for insulation backing and for other non structural members.
      - 2) Minimum bite requirements are waived for truss blocking.
    - c. Plate Sizes:
      - 1) Minimum width of plates shall be **3 inches**.
        - a) Minimum bite requirements are waived for non-structural webs parallel to top chords added for insulation backing.
        - b) Minimum width requirements are waived for truss blocking.
      - 2) For flat bottom chord trusses, size plates for 110 percent of member forces. For scissor trusses, size plates for 150 percent of member forces. If webs are double cut, plates are to be sized for additional 10 percent of the member forces.
      - 3) Size plates, nail and steel section for 110 percent of member forces.



- 4) No increase in plate values will be allowed for duration of loading or other factors.
- d. Press plates into members to obtain full penetration without crushing outer surface of wood. Plate embedment is acceptable if opening between plate and wood surface is less than **1/32 inch**.
- e. Lumber defects and plate misplacement, in combination, shall not reduce plate area or number of effective teeth, prongs, or nails by more than ten percent.
- f. Do not apply metal gusset plates after shop fabrication.

### **PART 3 - EXECUTION**

#### **3.1 FIELD QUALITY CONTROL**

- A. Field Tests And Inspections:
  - 1. Prefabricated Metal Plate Wood Trusses:
    - a. Testing Agency will obtain "Truss Plant Certification Requirements Form" attachment copy from Architect as per requirements of Section 06 1753 Shop-Fabricated Wood Trusses: Trusses Rafters.
    - b. Where truss clear span is **60 feet** or greater, Inspector shall verify that temporary installation restraint/bracing and permanent individual truss member restraint/bracing are installed in accordance with approved truss submittal package.

**END OF SECTION**

**ATTACHMENTS**

BLANK PAGE

# Truss Plant Certification Requirements Form

---

Wood Truss suppliers shall be certified as evidenced by submittal of a copy of the truss plant certification with this completed form to the Architect and Testing Agency before commencing fabrication of Wood Trusses.

Metal Plate Connected (MPC) wood truss operations must design, manufacture and provide quality control and quality audits that comply with the latest edition of ANSI/TPI-1 promulgated by the Truss Plate Institute.

The truss plant must be certified by an independent third party accredited Quality Assurance business such as, but not limited to, the Truss Plate Institute (TPI); the Southern Pine Inspection Bureau, the Timber Products Inspection Bureau or the PFS Corp. The third party accredited Quality Assurance business must be under the auspices of the International Accreditation Services (IAS) or the American National Standards Institute (ANSI) and be ISO/IES Standard 17020 compliant. The inspection/audit process is to be completely independent of the truss manufacturer.

Truss plant shall fulfill the following requirements (see [www.sbcindustry.com](http://www.sbcindustry.com) and [www.tpinst.org](http://www.tpinst.org) or [www.tpic.ca](http://www.tpic.ca)):

- \_\_\_\_\_ Shall have an independent and accredited third party inspection agency (Quality Assurance business) staff member visit the truss plant for the certification, and shall have at least one inspection done quarterly by an independent third party inspection agency that is itself certified.
- \_\_\_\_\_ Shall meet all necessary in-plant requirements including: The Acceptance Criteria for Quality Documentation (ICC AC-10) by the ICC Evaluation Service, Inc. which shall include the quality control requirements of the Product Standard of ANSI / TPI. Meeting the ANSI / TPI standard includes having an in-plant quality control manual, quality control procedures in place, and meeting the weekly inspection frequency.
- \_\_\_\_\_ Do inspections at the required frequency and of the type established by the certification program. Specifically as a minimum, three trusses per set up location per shift per week.
- \_\_\_\_\_ Not manufacture trusses or use components that do not comply with the requirements of this form and of the Contract Documents.
- \_\_\_\_\_ Provide proof of compliance to the requirements of this form and provide the proof to the General Contractor who will forward it to the Architect prior to the truss plant providing a bid.

OR

Truss plant shall be certified and be in good standing with the In-Plant WTCA QC program. This includes the following requirements (see [www.sbcindustry.com](http://www.sbcindustry.com) and [www.tpinst.org](http://www.tpinst.org) or [www.tpic.ca](http://www.tpic.ca)):

- \_\_\_\_\_ Truss plant has been trained by SBCA on the ANSI/TPI 1 QC standard.
- \_\_\_\_\_ Truss plant has quarterly third party inspections, and that the third party has been trained by SBCA.
- \_\_\_\_\_ Truss plant has quality control manual that meets the AC-10 requirements.
- \_\_\_\_\_ Truss plant has quality control procedures in place including: meeting the weekly inspection frequency, performing detailed inspections, and documenting any inspection problems and how they were resolved.
- \_\_\_\_\_ Truss plant is sending their data quarterly to SBCA for review.
- \_\_\_\_\_ Truss plant shall not manufacture trusses or use components that do not comply with the requirements of this form and of the Contract Documents.

In-Plant WTCA QC certified plants are listed at [www.sbcindustry.com/wtcaqccertco.php](http://www.sbcindustry.com/wtcaqccertco.php).

---

BLANK PAGE



**SECTION 06 2001****COMMON FINISH CARPENTRY REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install sealants required for items installed under this Section, as described in Contract Documents.
- B. Products Installed But Not Furnished Under This Section:
  - 1. Architectural Woodwork.
  - 2. Casings, stops, handrails, and jambs.
  - 3. Chair Rails.
  - 4. Factory Manufactured Access Doors.
  - 5. Fixed Shelving not part of casework.
  - 6. Hardwood Trim at light coves, speaker cabinets, etc.
  - 7. Hardwood Trim for wall covering.
  - 8. Miscellaneous Wood Trim.
  - 9. Plastic Laminate Countertops.
  - 10. Selected Building Specialties.
  - 11. Selected Equipment.
  - 12. Windows.
  - 13. Window Stools.
  - 14. Miscellaneous as specified elsewhere.
- C. Related Requirements:
  - 1. Section 06 1100: 'Wood Framing' for furring and blocking.
  - 2. Section 06 1636: 'Wood Panel Product Sheathing'.
  - 3. Section 06 2210: 'Miscellaneous Wood Trim'.
    - a. Wood Trim.
  - 4. Sections under 06 4000 Heading: Furnishing of Architectural Woodwork.
    - a. Section 06 4001: 'Common Architectural Woodwork Requirements':
      - 1) Approved Fabricators.
      - 2) Quality of wood materials to be used in Finish Carpentry.
    - b. Section 06 4005: 'Plastic Laminate' for countertops.
    - c. Section 06 4114: 'Wood-Veneer-Faced Architectural Cabinets'.
      - 1) Custom Casework:
    - d. Section 06 4512: 'Architectural Woodwork Wood Trim'.
  - 5. Section 06 6001: 'Miscellaneous Plastic Fabrications' for quality of Window Stools.
  - 6. Section 07 9213: 'Elastomeric Joint Sealants' for quality of sealants, submittal and installation requirements.
  - 7. Section 08 3110: 'Access Doors And Panels' for furnishing of Factory Manufactured Access Doors.
  - 8. Section 08 5113: 'Aluminum Windows' for furnishing of Windows.
    - or
  - 9. Section 08 5619: 'Pass Windows' for pass-through window used in CES Module.
  - 10. Section 09 8413: 'Fixed Sound-Absorptive Panels' for furnishing of Sound Panels.
  - 11. Sections under 09 9000 heading: Back priming of work to be installed against concrete or masonry or subjected to moisture, and finishing of finish carpentry and architectural woodwork.
  - 12. Sections in Division 10: Furnishing of Specialties.
  - 13. Sections in Division 11: Furnishing of Equipment.

## 1.2 REFERENCES

- A. Association Publications:
  - 1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada / Woodwork Institute, 46179 Westlake Drive, Suite 120, Potomac Falls, VA [www.awinet.org](http://www.awinet.org).
    - a. Architectural Woodwork Standards (AWS), 2nd Edition, 2014.
- B. Definitions:
  - 1. Grade: Unless otherwise noted, this term means Grade rules for Economy, Custom, and/or Premium Grade:
    - a. Economy Grade: The lowest acceptable grade in both material and workmanship requirements, and is for work where price outweighs quality considerations.
    - b. Custom Grade: Typically specified for and adequately covers most high-quality architectural woodwork, providing a well-defined degree of control over a project's quality of materials, workmanship, or installation.
    - c. Premium Grade: The highest Grade available in both material and workmanship where the highest level of quality, materials, workmanship, and installation is required.
- C. Reference Standards:

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Manufacturers:
  - 1. Manufacturer Contact List:
    - a. Dow Chemical, Midland, MI [www.dow.com](http://www.dow.com).
    - b. Hafele America Co., Archdale, NC [hafele.com](http://hafele.com).
    - c. Hillside Wire Cloth Co., Inc., Bloomfield, NJ [www.hillsidewirecloth.com](http://www.hillsidewirecloth.com).
    - d. Ives, Indianapolis, IN [www.iveshardware.com](http://www.iveshardware.com).
    - e. Knape & Vogt, Grand Rapids, MI [www.knapeandvogt.com](http://www.knapeandvogt.com) or Knape & Vogt Canada, Mississauga, ON (905) 676-8972.
    - f. Salice America Inc, Charlotte, NC [www.saliceamerica.com](http://www.saliceamerica.com).
    - g. SOSS Door Hardware (Division of Universal Industrial Products Company) Pioneer OH [www.soss.com](http://www.soss.com).
    - h. Stanley, New Britain, CT [www.stanleyhardware.com](http://www.stanleyhardware.com) or Oakville, ON (800) 441-1759.
    - i. TWP Inc., Berkley, CA [www.twpinc.com](http://www.twpinc.com).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification Of Conditions:
  - 1. Verify walls, ceilings, floors, and openings are plumb, straight, in-line, and square before installing Architectural Woodwork.
  - 2. Report conditions that are not in compliance to Architect before starting installation.

### 3.2 PREPARATION

- A. Surface Preparation:
  - 1. Install Architectural Woodwork after wall and ceiling painting is completed in areas where Architectural Woodwork is to be installed.

**3.3 INSTALLATION**

- A. Special Techniques:
  - 1. AWS Custom Grade is minimum acceptable standard, except where explicitly specified otherwise, for installation of architectural woodwork.
- B. General Architectural Woodwork Installation:
  - 1. Fabricate work in accordance with measurements taken on Project site.
  - 2. Scribe, miter, and join accurately and neatly to conform to details.
  - 3. Exposed surfaces shall be machine sanded, ready for finishing.
  - 4. Allow for free movement of panels.
  - 5. Countersink nails. Countersink screws and plug those exposed to view.
  - 6. Attach custom casework as specified in Sections under 06 4000 Heading: 'Furnishing of Architectural Woodwork' to wall blocking with #10 x 3 inch minimum Cabinet Screws. Attach wall cabinets with screws equally spaced horizontally not to exceed 12 inches O.C. with 3 inch maximum spacing at cabinet edges.
- C. Items Installed But Not Furnished Under This Section: Install in accordance with requirements specified in Section furnishing item.
  - 1. Window Stool:
    - a. Install window stool to structure with silicone sealant as specified in Section 07 9213 'Elastomeric Joint Sealant'.

**END OF SECTION**

**BLANK PAGE**



**SECTION 06 2024****DOOR, FRAME, AND FINISH HARDWARE INSTALLATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install sealants for caulking door frames as described in Contract Documents.
  - 2. Furnish and install insulation in doorframes as described in Contract Documents.
- B. Products Installed But Not Furnished Under This Section:
  - 1. Fire-rated wood door frames.
  - 2. Flush wood doors.
  - 3. Hollow metal doors.
  - 4. Hollow metal door frames.
  - 5. Finish hardware.
- C. Related Requirements:
  - 1. Sections under 04 2000 heading: Grouting of frames installed in masonry walls.
  - 2. Section 08 1416: 'Flush Wood Doors'.
  - 3. Section 07 2116: 'Blanket Insulation' for quality of fiberglass insulation.
  - 4. Section 07 9213: 'Elastomeric Joint Sealants' for quality of sealants.
  - 5. Sections under 08 1000 heading: Furnishing of doors and metal frames.
  - 6. Sections under 08 7000 heading: Furnishing of finish hardware.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. Door and Hardware Institute (DHI) 14150 Newbrook Drive, Suite 200 Chantilly, VA [www.dhi.org](http://www.dhi.org), *Installation Guide for Doors & Hardware* by Door & Hardware Institute.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference.
  - 1. Participate in pre-installation conference.
  - 2. In addition to agenda items specified in Section 01 3100, review following:
    - a. Schedule conference after hardware has been delivered to site and organized into hardware groups by door, but before installation of hardware.
    - b. Check for appropriate blocking and for correct hardware models and fasteners for substrates.
    - c. Review submittals and set of Manufacturer's installation, adjustment, and maintenance instructions submitted under Section 08 7101.
    - d. Review use of crowbar or other prying devices are not permitted to be used to set door frame into wall opening.

**1.4 SUBMITTALS**

- A. Informational Submittals:
  - 1. Installer Report:
    - a. Report verifying correct operation and adjustment of installed hardware.
  - 2. Special Procedure Submittals:
    - a. Copy of 'Installation Guide for Doors & Hardware' by Door & Hardware Institute. Guide may be obtained from Door and Hardware Institute (DHI).

## 1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
  - 1. Fire door installations shall meet code requirements.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
  - 1. Wood Doors:
    - a. Do not have doors delivered to building site until after plaster, cement, and taping compound are dry.
    - b. If doors are to be stored at job-site for more than one week, seal top and bottom edges if not factory sealed.
  - 2. Metal Frames:
    - a. Examine door frames and note damage upon acceptance.
- B. Storage And Handling Requirements:
  - 1. Wood Doors:
    - a. Store flat on a level surface in a dry, well ventilated building.
      - 1) Cover to keep clean but allow air circulation
    - b. Handle with clean gloves and do not drag doors across one another or across other surfaces.
    - c. Do not subject doors to abnormal heat, dryness, or humidity or sudden changes therein
      - 1) Condition doors to average prevailing humidity of locality before hanging.
  - 2. Metal Frames:
    - a. Protect metal frames from damage before and during installation.

## PART 2 - PRODUCTS: Not Used

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Hollow Metal Frames:
  - 1. Site Tolerances:
    - a. Squareness: **1/16 inch** from top edge to opposite top edge.
    - b. Plumbness: **1/16 inch** from top of jamb to bottom of jamb.
    - c. Alignment: **1/16 inch** from plane of left side face of jamb to right side face of jamb.
    - d. Twist: **1/16 inch** across throat of jamb plane measured across each face to plane of opposite jamb throat.
    - e. Finished Clearance Between Door And Frame:
      - 1) **1/16 inch** at head and hinge jamb plus **1/16 inch** maximum
      - 2) **1/8 inch** at strike jamb plus or minus **1/16 inch** maximum.
      - 3) **1/2 inch** to top of finished floor surface or **1/4 inch** to top of threshold, plus or minus **1/16 inch** maximum.
  - 2. Set frame in location and level head.
    - a. Use of crowbar or other prying device to set door frame into wall opening will damage door frames and are not permitted to be used.
  - 3. Equalize with adjustable floor anchor.
  - 4. Set spreaders and fasten jambs to floor and wall.
    - a. Wood spreaders shall be square, fabricated from lumber one inch minimum thick, be same length as door opening at header, and same depth as frame.
    - b. Cut notches for frame stops.
    - c. Do not remove spreaders until frames are permanently anchored in wall.
    - d. Use one spreader at base of frame and another at strike level.
    - e. Do not use temporary spreaders welded to base of jambs during installation of frame.

5. Fill gap between frame and framing with urethane foam or tightly-packed fiberglass insulation. If urethane foam is used, foam interior of frames before installing frame. Trim excess before installation of frame.
  6. Caulking:
    - a. Caulk around both sides of frames of doors receiving acoustical seals with specified sealant.
    - b. Caulk around both sides of frames installed in exposed masonry walls with specified sealant.
- B. Doors:
1. When Project is completed, doors shall not bind, stick, or be mounted so as to cause future hardware difficulties.
  2. Do not impair utility or structural strength of door in fitting of door, applying hardware, or cutting and altering door louvers, panels, or other special details.
- C. Hardware:
1. General:
    - a. Install using set of Manufacturer's installation, adjustment, and maintenance instructions submitted with hardware under Section 08 7101. Follow as closely as possible.
    - b. Mount closers on jamb stop side of door in parallel arm configuration where it is physically possible to do so and not damage or hinder operation of door or closer.
  2. Hardware for Wood Doors:
    - a. If doors are not factory-machined, use hardware templates furnished by Hardware Manufacturer when mounting hardware.
    - b. Set hinges flush with edge surface. Be sure that hinges are set in a straight line to prevent distortion.
    - c. Mount door latches high in strike plate opening so when door later settles, latch will not bind.

### 3.2 FIELD QUALITY CONTROL

- A. Field Tests:
1. Arrange to have keys brought to Project site and, in meeting attended by local representatives and Architect, test every new key and locking mechanism.
- B. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
1. Correct any work found defective or not complying with contract document requirements at no additional cost to the Owner.
  2. Door frames:
    - a. Door frames damaged by use of crowbar or other prying devices to set door frames shall be repaired or replaced at no additional cost to Owner.

### 3.3 CLOSEOUT ACTIVITIES

- A. Instruction of Owner:
1. Using Owner's Operations And Maintenance Manual, explain keying systems at same time keys and locking mechanisms are tested.
- B. Key Delivery:
1. Immediately before Final Acceptance Meeting, turn change keys over to Owner properly organized, tagged, and placed in new or existing key cabinet.

**END OF SECTION**

**BLANK PAGE**

**SECTION 06 2210****MISCELLANEOUS WOOD TRIM****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install wood trim not specified elsewhere as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 06 1100: 'Wood Framing' for wall blocking required for Wood Trim.
  - 2. Section 06 2001: 'Common Finish Carpentry Requirements':
    - a. Installation of Wood Trim.
  - 3. Section 06 4001: 'Common Architectural Woodwork Requirements':
    - a. Approved Fabricators.
    - b. General standards for materials and fabrication of Architectural Woodwork.
  - 4. Section 06 4512: 'Architectural Woodwork Wood Trim'.
  - 5. Section 09 9324: 'Interior Clear-Finished Hardwood'.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada / Woodwork Institute, 46179 Westlake Drive, Suite 120, Potomac Falls, VA [www.awinet.org](http://www.awinet.org).
    - a. Architectural Woodwork Standards (AWS), 2nd Edition, 2014.
- B. Definitions:
  - 1. Grade: Unless otherwise noted, this term means Grade rules for Economy, Custom, and/or Premium Grade:
    - a. Custom Grade: Typically specified for and adequately covers most high-quality architectural woodwork, providing a well-defined degree of control over a project's quality of materials, workmanship, or installation.
  - 2. Plain-Sawn: A hardwood figure developed by sawing a log lengthwise at a tangent to the annual growth rings. It appears as U-shaped or straight markings in the board's face.

**1.3 SUBMITTALS**

- A. Action Submittals:
  - 1. Samples:
    - a. Interior Hardwood for Transparent Finish:
      - 1) Before performing work of this Section, prepare Control Sample, to match sample available from Owner, to be used as finishing standard for interior clear finished hardwood as specified in Section 09 9324.
      - 2) Design Criteria:
        - a) Provide **8 inch by 10 inch** sample of Red Oak to match Owner provided stain color selected for Project.
        - b) Control Sample will be used as performance standard for evaluating finish provided.
- B. Informational Submittals:
  - 1. Source Quality Control Submittals:

- a. Samples:
  - 1) Interior Hardwood for Transparent Finish:
    - a) Owner will provide Control Sample for finish.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- A. Design Criteria:
  - 1. General:
    - a. Meet requirements of Section 06 4001 for general standards for materials and fabrication of Architectural Woodwork.
  - 2. Clear Finished Hardwood:
    - a. Match materials specified in Section 06 4512.
    - b. Match finish specified in Section 06 4512 and match Owner selected sample as specified in Section 09 9324.
  - 3. Opaque Finished Hardwood: Hardwood allowed by AWS Custom Grade.
  - 4. Opaque Finished Softwood: Solid stock Pine, C or better, S4S.
  - 5. Opaque Finished Paneling: Paneling allowed by AWS Custom Grade.

### **2.2 SOURCE QUALITY CONTROL**

- A. Inspections:
  - 1. Clear Finished Hardwood:
    - a. Color matches Owner provided sample specified in Section 09 9324.

## **PART 3 - EXECUTION: Not Used**

**END OF SECTION**

**SECTION 06 4001****COMMON ARCHITECTURAL WOODWORK REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. General standards for materials and fabrication of Architectural Woodwork and for hardware associated with Architectural Woodwork.
- B. Related Requirements:
  - 1. Section 06 1100: 'Wood Framing' for furring and blocking.
  - 2. Section 06 2001: 'Common Finish Carpentry Requirements' for Installation.
  - 3. Section 06 2210: 'Miscellaneous Wood Trim'.
  - 4. Section 06 4005: 'Plastic Laminate'.
  - 5. Section 06 4114: 'Wood-Veneer-Faced Architectural Cabinets'.
  - 6. Section 06 4512: 'Architectural Woodwork Wood Trim'.
  - 7. Section 06 6001: 'Miscellaneous Plastic Fabrications'.
  - 8. Section 09 9324: 'Interior Clear-Finished Hardwood' for filling of nail holes and finishing.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada / Woodwork Institute, 46179 Westlake Drive, Suite 120, Potomac Falls, VA [www.awinet.org](http://www.awinet.org).
    - a. Architectural Woodwork Standards (AWS), 2nd Edition, 2014.
- B. Definitions:
  - 1. Grade: Unless otherwise noted, this term means Grade rules for Economy, Custom, and/or Premium Grade:
    - a. Custom Grade: Typically specified for and adequately covers most high-quality architectural woodwork, providing a well-defined degree of control over a project's quality of materials, workmanship, or installation.
      - a) for compliance to Contract Drawings for approval to Project Architect.

**1.3 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Manufacturer's literature for specialty items and hardware not manufactured by Architectural Woodwork fabricator.
  - 2. Shop Drawings:
    - a. Fabricator:
      - 1) Provide shop drawings for cabinet and casework that are included for project showing details, casework locations and layout in compliance with Contract Drawings.
- B. Informational Submittals:
  - 1. Qualification Statement:
    - a. Fabricator:
      - 1) Provide Qualification documentations as requested.

## 1.4 QUALITY ASSURANCE

- A. Qualifications: Requirements of Section 01 4301 applies, but not limited to following:
  - 1. Fabricator:
    - a. Fabricator Firm specializing in performing work of this section.
      - 1) Firm experience in supplying products indicated for this Project.
      - 2) Firm with sufficient production capacity to produce required units.
      - 3) Firm will comply with specifications and Contract Documents for this Project.
      - 4) Minimum five (5) years experience in Woodwork installations.
      - 5) Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and installation procedures required for this project before bidding.
    - b. Upon request by Architect or Owner, submit documentation.

## 1.5 DELIVERY, HANDLING, AND STORAGE

- A. Delivery And Acceptance Requirements:
  - 1. Assemble architectural woodwork at Architectural Woodwork Fabricator's plant and deliver ready for erection insofar as possible.
  - 2. Protect architectural woodwork from moisture and damage while in transit to job site.
  - 3. Report damaged materials received within two (2) days from delivery at project site.
- B. Storage And Handling Requirements:
  - 1. Unload and store in place where it will be protected from moisture and damage and convenient to use.

## PART 2 - PRODUCTS

### 2.1 FABRICATORS

- A. Approved Fabricators. See Section 01 4301 for Qualification Requirements.
  - 1. Category One VMR Approved Fabricators. See Section 01 6200 for definitions of Categories and Section 01 4301 for Qualification Requirements.
    - a. Anderson Cabinet and Millwork, 198 North 4700 East, Rigby, ID 83442.
      - 1) Contact Information: Matt Miller phone (208) 538-7415 cell (208) 317-7412 e-mail [matt@andersoncabinet.net](mailto:matt@andersoncabinet.net).
    - b. Michael Seiter & Co., Inc., P.O. Box 315 Heber City, UT 84032.
      - 1) Contact Information: Mark Seiter phone (435) 654-0601 fax (435) 654-0613 e-mail [mark@msandcoinc.com](mailto:mark@msandcoinc.com).
    - c. Thompson and Sons Cabinets, 11834 N. 3400 West, Deweyville, UT 84309.
      - 1) Contact Information: David Thompson cell (435) 230-0876 office (435) 257-7152 e-mail [zcabinets@comcast.net](mailto:zcabinets@comcast.net).

### 2.2 FABRICATORS

- A. Approved Fabricators. See Section 01 4301:
  - 1. Meet Quality Assurance Fabricator Qualifications as specified in Part 1 of this specification.

### 2.3 ASSEMBLIES

- A. Design Criteria:
  - 1. General:
    - a. AWS Custom Grade is minimum acceptable standard, except where explicitly specified otherwise, for materials, construction, and installation of architectural woodwork.



2. Materials:
  - a. Lumber:
    - 1) Grade:
      - a) No defects in boards smaller than 600 sq in.
      - b) One defect per additional 150 sq inches in larger boards.
      - c) Select pieces for uniformity of grain and color on exposed faces and edges.
      - d) No mineral grains accepted.
    - 2) Allowable Defects:
      - a) Tight knots not exceeding 1/8 inch in diameter. No loose knots permitted.
      - b) Patches (dutchmen) not apparent after finishing when viewed beyond 18 inches.
      - c) Checks or splits not exceeding 1/32 inch by 3 inches and not visible after finishing when viewed beyond 18 inches.
      - d) Stains, pitch pockets, streaks, worm holes, and other defects not mentioned are not permitted.
      - e) Normal grain variations, such as cats eye, bird's eye, burl, curl, and cross grain are not considered defects.
    - 3) Use maximum lengths possible, but not required to exceed 10 feet without joints. No joints shall occur closer than 72 inches in straight runs exceeding 18 feet. Runs between 18 feet and 10 feet may have no more than one joint. No joints shall occur within 72 inches of outside corners nor within 18 inches of inside corners.
    - 4) Moisture content shall be six (6) percent maximum at fabrication. No opening of joints due to shrinkage is acceptable.

B. Fabrication:

1. Follow Architectural Woodwork Standards (AWS) for fabrication of Architectural Woodwork.
2. Tolerances:
  - a. No planer marks (KCPI) allowed. Sand wood members and surfaces with 100 grit or finer.
  - b. Maximum Gap: None allowed.
  - c. Flushness Variation: 0.015 inch maximum.
  - d. Sanding Cross Scratches: 1/4 inch maximum.
  - e. Plug screw holes. Screw locations not to be visible beyond 18 inches.
3. Fabricate work in accordance with measurements taken on job site.
4. 'Ease' sharp corners and edges of exposed members to promote finishing and protect users from splinters. Radius of 'easing' shall be uniform throughout Project and between 1/32 and 1/16 of an inch.
5. Fabricate so veneer grain is vertical.
6. Joints:
  - a. Use lumber pieces with similar grain pattern when joining end to end.
  - b. Compatibility of grain and color from lumber to panel products is required.
7. Install hardware in accordance with Manufacturer's directions. Leave operating hardware operating smoothly and quietly.
8. Remove or repair damaged surface or defects in exposed finished surfaces of architectural woodwork to match adjacent similar undamaged surface.

**PART 3 - EXECUTION: Not Used**

**END OF SECTION**

**BLANK PAGE**

**SECTION 06 4005****PLASTIC LAMINATE****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Wall-hung counters.
  - 2. Countertops for custom casework.
- B. Related Requirements:
  - 1. Section 06 2001: 'Common Finish Carpentry Requirements':
    - a. Installation of wall-hung counters.
    - b. Installation of countertops for custom casework.
  - 2. Section 06 4001: 'Common Architectural Woodwork Requirements':
    - a. Approved Fabricators.
    - b. General standards for materials and fabrication of Architectural Woodwork.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada / Woodwork Institute, 46179 Westlake Drive, Suite 120, Potomac Falls, VA [www.awinet.org](http://www.awinet.org).
    - a. Architectural Woodwork Standards (AWS), 2nd Edition, 2014.
- B. Definitions:
  - 1. Flame Spread: The propagation of flame over a surface.
  - 2. Flame Spread Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723 or ULC 102.
  - 3. Grade: Unless otherwise noted, this term means Grade rules for Economy, Custom, and/or Premium Grade.
    - a. Premium Grade: Highest Grade available in both material and workmanship where highest level of quality, materials, workmanship, and installation is required.
  - 4. High-Pressure Decorative Laminate (HPDL): Laminated thermosetting decorative sheets intended for decorative purposes. Sheets consist essentially of layers of fibrous sheet material, such as paper, impregnated with thermosetting condensation resin and consolidation under heat and pressure. Top layers have decorative color or printed design. Exposed surface has attractive exposed surface that is durable and resistant to damage from abrasion and mild alkalies, acids, and solvents.
  - 5. Smoke-Developed Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723 or ULC 102.
- C. Reference Standards:
  - 1. ASTM International:
    - a. ASTM E84-15a, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
    - b. ASTM E162-15a, 'Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source'.
  - 2. Kitchen Cabinet Manufacturers Association:
    - a. ASTM/KCMA A161.1-2012, 'Performance And Construction Standards For Kitchen And Vanity Cabinets'.
  - 3. National Electrical Manufacturer's Association / American National Standards Institute:
    - 4. ANSI/NEMA LD-3-2005, 'High Pressure Decorative Laminates'. Underwriters Laboratories, Inc.:

- a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (10th Edition).

### 1.3 SUBMITTALS

- A. Action Submittals:
  1. Product Data:
    - a. Color selections.
    - b. Manufacturer's technical data sheet.
- B. Informational Submittals:
  1. Certificates:
    - a. Provide Manufacturer's certification of compliance to ANSI/NEMA LD 3.
  2. Test And Evaluation Reports:
    - a. Test reports: Certified test reports showing compliance with specified performance characteristics and physical properties for Quality Assurance if requested by Owner or Architect.
- C. Closeout Submittals:
  1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Record Documentation:
      - 1) Manufacturers documentation:
        - a) Manufacturer's literature for plastic laminate.
        - b) Color selections.

### 1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
  1. Fire-Test-Response Characteristics: Provide plastic laminate with surface burning characteristics as determined by testing identical products by qualified testing agency.
    - a. Surface-Burning Characteristics:
      - 1) Plastic Laminate shall have Class A flame spread rating in accordance with ASTM E84 or UL 723 Type 1.
        - a) Class A (Flame spread index 0-25; Smoke-developed index 0-450).
        - b) Flash point: None.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Fabricators:
  1. Approved Fabricators. See Section 06 4001 for Approved Fabricators.
- B. Manufacturers:
  1. Type Two Acceptable Manufacturers:
    - a. Formica, Cincinnati, OH [www.formica.com](http://www.formica.com) or Formica Canada Inc, St Jean sur Richelieu, PQ (450) 347-7541, all matte finish.
    - b. Nevamar, Odenton, MD [www.nevamar.com](http://www.nevamar.com).
    - c. Pionite Decorative Surfaces, Auburn, ME [www.pionite.com](http://www.pionite.com).
    - d. WilsonArt, Temple, TX [www.wilsonart.com](http://www.wilsonart.com) or WilsonArt International Inc, Mississauga, ON (905) 565-1255.
    - e. Equal as approved by Architect before bidding. See Section 01 6200.
- C. Plastic Laminates:
  1. Design Criteria:

- a. Countertops:
  - 1) Post-formed front edge and backsplash, except where detailed otherwise, with plastic laminate meeting requirements of ANSI/NEMA LD 3: PF 42.
    - a) Vertical Applications: GP 28.
    - b) Horizontal (other than countertops): GP 38.
  - 2) No raised lip on front edge.
- b. Balancing Material: BK 20.
- c. AWS Quality Grade: Premium.
- 2. Assemblies:
  - a. Countertops shall meet requirements of KCMA A161.1.
  - b. Adhesives for other than post-formed types shall be spray grade, high heat resistant, neoprene contact adhesive.
- 3. Category Four Approved Colors. See Section 01 6200 for definition of Categories:
  - a. Formica: 300-58.
  - b. Nevamar: ES2001, TQ2001, MR7001, MR7002.
  - c. Pionite: AT951-5, LG110-S, AT161.
  - d. WilsonArt: 2932-60, 4810-60, 4170-60.

**PART 3 - EXECUTION: Not Used****END OF SECTION**

**BLANK PAGE**

**SECTION 06 4114****WOOD-VENEER-FACED ARCHITECTURAL CABINETS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Custom casework.
- B. Related Requirements:
  - 1. Section 06 1100: 'Wood Framing' for wall blocking required for Custom Casework.
  - 2. Section 06 2001: 'Common Finish Carpentry Requirements' for installation of Custom casework.
  - 3. Section 06 4001: 'Common Architectural Woodwork Requirements' for:
    - a. Approved Fabricators.
    - b. General standards for materials and fabrication of Architectural Woodwork and for hardware associated with Architectural Woodwork.
  - 4. Section 09 9324: 'Interior Clear-Finished Hardwood' for wood finishes.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada / Woodwork Institute, 46179 Westlake Drive, Suite 120, Potomac Falls, VA [www.awinet.org](http://www.awinet.org).
    - a. Architectural Woodwork Standards (AWS), 2nd Edition, 2014.
    - b. HPVA, NWWDA, or APA
  - 2. Hardwood Plywood & Veneer Association (HPVA), Reston, VA [www.hpva@hpva.org](http://www.hpva@hpva.org).
  - 3. The Engineered Wood Association (APA), Tacoma, WA [www.apawood.org](http://www.apawood.org).
  - 4. Window & Door Manufacturers Association (WDMA) Chicago, IL [www.wdma@wdma.com](http://www.wdma@wdma.com):
    - a. WDMA-INF03, 'A Specifier's Guide to Door Face Veneers'.
- B. Definitions:
  - 1. Adhesive, Type I (fully waterproof): Forms a bond that will retain practically all of its strength when occasionally subjected to a thorough wetting and drying; bond shall be of such quality that specimens will withstand shear and the two-cycle boil test specified in ANSI/HPVA HP (latest edition).
  - 2. Adhesive, Type II (water-resistant): Forms a bond that will retain practically all of its strength when occasionally subjected to a thorough wetting and drying; bond shall be of such quality that specimens will withstand the three-cycle cold soak test specified in ANSI/HPVA HP (latest edition).
  - 3. Book-Match: Matching between adjacent veneer leaves on one panel face. Every other piece of veneer is turned over so that the adjacent leaves are "opened" as two pages in a book. The fibers of the wood, slanting in opposite directions in the adjacent leaves, create a characteristic light and dark effect when the surface is seen from an angle.
  - 4. Concealed Surfaces: Top and bottom edges of wood unless the top edge is visible from above.
  - 5. Core: The material (typically, veneer, lumber, particleboard, medium-density fiberboard, or a combination of these) on which an exposed surface material (typically, veneer or high-pressure decorative laminate HPDL) is applied.
  - 6. Core, Solid: The innermost layer or section in flush door construction. Typical constructions are as follows:
    - a. Fiberboard Core: Manufactured from wood reduced to fine fibers mixed with binders and formed by the use of heat and pressure into panels.
    - b. Particleboard - A solid core of wood or other lignocellulose particles bonded together with a suitable binder, cured under heat, and pressed into a rigid panel in a flat-platen press.

7. Edge Banding: Method of concealing plies or inner cores of plywood or particleboard when edges are exposed.
8. Exposed Surfaces: Surfaces normally visible after installation.
9. Face: The better side of any panel in which the outer plies are of different veneer grades; also either side of a panel in which there is no difference in veneer grade of the outer plies.
10. Face Veneer: The outermost exposed wood veneer surface of a veneered wood door, panel, or other component exposed to view when the project is completed.
11. Flitch: A hewn or sawn log made ready for veneer production or the actual veneer slices of one half log, kept in order, and used for the production of fine plywood panels.
12. Grade: Unless otherwise noted, this term means Grade rules for Economy, Custom, and/or Premium Grade:
  - a. Custom Grade: Typically specified for and adequately covers most high-quality architectural woodwork, providing a well-defined degree of control over a project's quality of materials, workmanship, or installation.
13. Hardwood: General term used to designate lumber or veneer produced from temperate zone deciduous or tropical broad-leaved trees in contrast to softwood, which is produced from trees which are usually needle bearing or coniferous. Term does not infer hardness in its physical sense.
14. High-Pressure Decorative Laminate (HPDL): Laminated thermosetting decorative sheets intended for decorative purposes. Sheets consist essentially of layers of fibrous sheet material, such as paper, impregnated with thermosetting condensation resin and consolidation under heat and pressure. Top layers have decorative color or printed design. Exposed surface has attractive exposed surface that is durable and resistant to damage from abrasion and mild alkalis, acids, and solvents. Also known as Plastic Laminate.
15. Joint: Line of juncture between edges or ends of two adjacent pieces of veneer.
16. Medium Density Fiberboard (MDF): Generic name for a panel or core manufactured from lignocellulosic fibers combined with synthetic resin or other suitable binder and bonded together under heat and pressure in hot press by process in which added binder creates entire bond.
17. Melamine: Resin-impregnated paper used in decorative composite panel products.
18. Panel Product: Panels manufactured with differences in core materials, adhesives or binders which affect characteristics of the panels. These include wood veneers and many prefinished wood panels and decorative overlays with aesthetic and performance characteristics.
19. Plain-Sawn: A hardwood figure developed by sawing a log lengthwise at a tangent to the annual growth rings. It appears as U-shaped or straight markings in the board's face.
20. Plain Slicing: Most commonly used for hardwood plywood. The log is cut in half, and one half is placed onto a carriage and moved up and down past a fixed knife to produce the veneers. Veneer is sliced parallel to the pith of the log and approximately tangent to the growth rings to achieve flat-cut veneer. Each piece is generally placed in a stack and kept in order. One half log, sliced this way, is called a "flitch."
21. Running Match: Each panel face is assembled from as many veneer leaves as necessary. Any portion left over from one panel may be used to start the next.
22. Semi-Exposed Surfaces: Surfaces that is only visible under closer examination.
23. Solid Stock: Solid, sound lumber (as opposed to plywood), that may be more than one piece of the same species, securely glued for width or thickness.
24. Veneer: A thin sheet or layer of wood, usually rotary cut, sliced or sawn from a log or flitch. Thickness may vary from 1/100 inch (0.3 mm) to 1/4 inch (6.4 mm).

C. Reference Standards:

1. American National Standards Institute / Builders Hardware Manufacturers Association:
  - a. ANSI/BHMA A156.11-2014, 'Cabinet Locks'.
2. American National Standards Institute / Hardwood Plywood & Veneer Association:
  - a. ANSI/HPVA HP-1-2009, 'Standard for Hardwood and Decorative Plywood'.
3. American National Standards Institute / Window & Door Manufacturers Association (WDMA):
  - a. ANSI/WDMA I.S. 6A-13, 'Industry Standard for Architectural Stile and Rails Doors'.

### 1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the efforts of the various trades affected by the Work of this Section.



2. Coordinate completion of 2x6 wall blocking for custom casework.
3. Coordinate completion of custom casework.

## 1.4 SUBMITTALS

- A. Action Submittals:
  1. Product Data:
    - a. Manufacturer's literature or cut sheets for hardware.
  2. Shop Drawings:
    - a. Confirm compliance with Contract Document requirements as to configuration and dimensions of custom casework.
    - b. Include plan and elevation views, materials used, standing and running trim profiles, assembly methods, joint details, fastening methods, accessories, and hardware.
  3. Samples:
    - a. Interior Hardwood for Transparent Finish:
      - 1) Before performing work of this Section, prepare Control Sample, to match sample available from Owner, to be used as finishing standard for interior clear finished hardwood as specified in Section 09 9324.
      - 2) Design Criteria:
        - a) Provide 8 inch by 10 inch sample(s) of Red Oak to match Owner provided stain color selected for Project.
        - b) Control Sample will be used as performance standard for evaluating finish provided.
- B. Informational Submittals:
  1. Source Quality Control Submittals:
    - a. Samples:
      - 1) Interior Hardwood for Transparent Finish:
        - a) Owner will provide Control Sample for finish.

## PART 2 - PRODUCTS

### 2.1 ASSEMBLIES

- A. Components:
  1. Design Criteria:
    - a. General:
      - 1) Except as noted otherwise, fabricate the work of this section according to AWS 'Custom Grade'.
        - a) Cabinet door wood grain direction shall run vertically and all doors shall be set matched.
        - b) Cabinet drawer front wood grain direction may run vertically or horizontally, with same direction maintained on all cabinet or elevation of cabinets.
      - 2) Casework Construction Type:
        - a) Type B: Face-frame construction where front edge of cabinet body components are overlaid with frame.
      - 3) Door interface style:
        - a) Type B Construction: Flush Overlay.
    - b. Solid Stock:
      - 1) Exposed: Plain sawn Red Oak.
      - 2) Semi-exposed And Concealed: Species as acceptable for AWS 'Custom Grade'.
    - c. Panel Product:
      - 1) Glues (adhesives) used in manufacture and fabrication of panel products shall be Type I or II.
      - 2) Moisture content shall be same as specified for lumber.
      - 3) Cores:

- a) Cabinet Doors: Medium density fiberboard (MDF) with minimum density of **48 lbs per cu ft.**
  - b) All Other: Industrial grade particle board with minimum density of **45 lbs per cu ft.**
  - 4) Facings:
    - a) Hardwood veneer facings shall be plain sliced Red Oak AWS Grade A, or equal by HPVA, WDMA, or APA.
    - b) All other facings shall be Melamine or Kortron.
  - 5) Edgings:
    - a) Other Cabinet Doors And Drawer Fronts Higher Than **8 Inches**:
      - (1) **3/4 inch by 1/8 to 1/4 inch** edge-band of wood species matching hardwood face veneer.
    - b) Wood Veneer Faced Shelves:
      - (1) **3/4 inch by 1/4 inch** edge-band of wood species matching hardwood face veneer on front edge with hot-glued, 2 mm thick minimum, wood-grained PVC edge-banding on other three sides.
    - c) Cabinet Doors And Drawer Fronts Higher Than **8 Inches**:
      - (1) **3/4 inch by 1/8 to 1/4 inch** edge-banding of wood species matching hardwood face veneer.
    - d) Shelves And Exposed Panel Product Edges:
      - (1) Hot-glued, 3 mm thick, PVC edge-banding. Wood-grain, except color matching Melamine or Kortron surface at shelf edges.
    - e) Shelves And Exposed Panel Product Edges:
      - (1) Hot-glued, 3 mm thick, PVC edge-banding. Wood-grain, except color matching Melamine or Kortron surface at shelf edges.
    - f) Semi-Exposed Panel Product Edges:
      - (1) Hot-glued, 3 mm thick, wood grained PVC edge-banding.
  - d. Casework Doors:
    - 1) Face Veneer:
      - a) Design Criteria:
        - (1) Plain sliced Red Oak meeting requirements of AWS Grade A, **1/50 inch** thick minimum immediately before finishing.
        - (2) Face veneers shall be running book matched.
    - 2) Doors under **1-3/8 inch thick**: Panel Product.
    - 3) Doors **1-3/8 inch** or more thick:
      - a) Door Grade: AWS Custom hollow-core.
      - b) Stiles:
        - (1) **1-1/4 inches** deep minimum before fitting.
        - (2) **1/4 inch** minimum of stile face to be hardwood matching face veneer material.
      - c) Rails:
        - (1) **1-1/8 inches.**
        - (2) Mill option material.
- B. Fabrication:
- 1. Cabinet Body:
    - a. Use AWS Flush Overlay construction on cabinet bodies.
    - b. If used, install Rail System adjustable shelf supports recessed.
  - 2. Drawers:
    - a. Fabricate with separate, screw-attached drawer front.
    - b. Joints shall be dowel and pressure-glued, or lock shoulder, glued, and pin nailed.
    - c. Set bottoms into sides, backs, and subfront with **1/4 inch** deep groove with **3/8 inch** minimum standing shoulder.
    - d. Every drawer shall have specified drawer guides and pull installed. Install drawer guides with 'Euroscrows', and pulls with through-bolts passing through both front and sub-front.
  - 3. Cabinet Doors:
    - a. Full height, panel product cabinet doors may be fabricated in two pieces and joined on back with metal backplate. Backplate shall match interior door surface color.
    - b. Hinges: Install hinges using plastic insertion dowels for hinges and 'Euroscrows' for baseplates.
    - c. Every cabinet door shall have specified pull installed.

4. Cabinet Component Thickness And Material:
  - a. Use hardwood veneer facing on panel product, except on following surfaces:
    - 1) Where Kortron or Melamine shall be used.
    - 2) Cabinet exposed interiors surfaces (not including cabinet doors) and shelving faces behind cabinet doors in all rooms.
    - 3) Cabinet semi-exposed surfaces.
    - 4) Cabinet concealed surfaces.
    - 5) Cabinet exposed exteriors permanently concealed (not exposed to view).
    - 6) Drawer sides, backs, bottoms, and subfronts.
  - b. Ends, Divisions, Bottoms, Tops: **3/4 inch** thick panel product.
  - c. Rails: **3/4 inch** thick panel product.
  - d. Shelves:
    - 1) Panel product.
    - 2) Thickness:
      - a) **30 Inch** Span And Less: **3/4 inch** thick.
      - b) Spans Over **30 Inches** To **42 Inches**: **One inch** thick.
      - c) Spans Over **42 inches**: **One inch** thick and provide Hafele or equal center supports.
  - e. Backs: **1/4 inch** thick panel product.
  - f. Doors: **3/4 inch** thick panel product.
  - g. Drawer Sides, Backs, And Subfronts: **1/2 inch** thick minimum panel product.
  - h. Drawer Bottoms: **1/4 inch** thick panel product.
  - i. Separate Drawer Front:
    - 1) **8 Inches** High And Less: **3/4 inch** thick solid hardwood.
    - 2) More Than **8 Inches** High: **3/4 inch** panel product.
  - j. Hardboard Dividers: **1/4 inch** thick panel product.
  - k. Hardboard Shelves: **1/8 inch** thick hardboard, smooth both sides.
5. Cabinet and Drawer Locks:
  - a. Install only on cabinets and drawers as shown on Contract Documents.
6. Install plastic grommets in cable access holes in countertops located as located on Contract Documents.

#### C. Finishes:

1. Factory Finishing:
  - a. Design Criteria:
    - 1) Applied before leaving factory.
    - 2) Factory-finish to match Owner selected sample as specified in Section 09 9324.
  - b. Match existing Project Color Scheme:
    - 1) Control Sample provided by Owner:
      - a) Control Sample will be existing wood item from Project.

## 2.2 ASSESSORIES

#### A. Manufacturers:

1. Manufacturer Contact List for Assessories:
  - a. Accuride, Santa Fe Springs, CA [www accuride.com](http://www accuride.com).
  - b. Anybumper, Amite, LA [www Anybumper.com](http://www Anybumper.com).
  - c. Blum Inc, Stanley, NC [www blum.com](http://www blum.com).
  - d. CompX National, Mauldin, SC [www nclnet.com](http://www nclnet.com).
  - e. Glynn Johnson, Chicago, IL [www glynn-johnson.com](http://www glynn-johnson.com).
  - f. Grass America Inc, Kernerville, NC [www grassusa.com](http://www grassusa.com).
  - g. Hafele America Co., Archdale, NC [hafele.com](http://hafele.com).
  - h. Hager Companies, St Louis, MO [www hagerhinge.com](http://www hagerhinge.com).
  - i. Ives, Indianapolis, IN [www iveshardware.com](http://www iveshardware.com).
  - j. Knappe & Vogt, Grand Rapids, MI [www knapeandvogt.com](http://www knapeandvogt.com).
  - k. Mark Eaton LLC, American Fork, UT [www markeatonllc.com](http://www markeatonllc.com).
    - 1) Contact Information: Mark Eaton (801) 756-5639.
  - l. Mckinney, Scranton, PA [www mckinneyhinge.com](http://www mckinneyhinge.com).
  - m. Olympus Lock Co, Seattle, WA [www olympus-lock.com](http://www olympus-lock.com).

- n. Salice America Inc, Charlotte, NC [www.saliceamerica.com](http://www.saliceamerica.com).
  - o. Stanley, New Britain, CT [www.stanleyhardware.com](http://www.stanleyhardware.com).
  - p. Techna-Base Inc, Pleasant Grove, UT (801) 361-2289 or [dlundahl@earthlink.net](mailto:dlundahl@earthlink.net).
    - 1) Contact Information: Dewey Lundahl (801) 785-6477 or (801) 361-2289 (cell).
  - q. Trimco, Los Angeles, CA [www.trimcobbw.com](http://www.trimcobbw.com).
- B. Cabinet Hardware:
- 1. Cabinet And Drawer Pulls:
    - a. Satin Chromium Plated brass / bronze core bow handles, 4 inches long minimum.
    - b. Type Two Acceptable Products:
      - 1) 4484 by Stanley.
      - 2) Equal as approved by Architect before installation. See Section 01 6200.
  - 2. Cabinet And Drawer Locks:
    - a. General:
      - 1) Pin tumbler type suitable for location.
      - 2) Keying: Key each cabinet and drawer individually as shown on Contract Documents except as follows:
        - a) Key each cabinet and drawer within each Office alike.
      - 3) Stamp keys with Room number and cabinet designation as shown on Signage Plan of Contract Drawings.
      - 4) Provide six (6) keys per cabinet.
    - b. Design Criteria:
      - 1) Barrel diameter: 7/8 inch
      - 2) Cylinder length: 7/8 inch Key removable in locked or unlocked position.
      - 3) Meet ANSI/BHMA A156.11 Grade 2 requirements.
    - c. Type Two Acceptable Manufacturers:
      - 1) Advantage Plus cam lock by CompX National Lock.
      - 2) 100DR/200DW N Series door and drawer lock by Olympus Lock Inc.
      - 3) Equal as approved by Architect before installation. See Section 01 6200.
  - 3. Cabinet Adjustable Shelf Supports:
    - a. Either of following systems are acceptable, at Fabricator's option:
      - 1) 32mm System: Casework Fabricator's standard.
      - 2) Traditional System:
        - a) Class Two Quality Standards: 255 and 256 by Knappe & Vogt.
  - 4. Cabinet Hinges:
    - a. Description:
      - 1) Cup Hinge (Concealed Hinge or European style).
      - 2) Steel, nickel-plated, full overlay, self closing with dowel, Mod 17.
    - b. Design Criteria:
      - 1) Doors 48 inches High or Less:
        - a) Two (2) hinges.
        - b) Hinge Opening: 165 degree minimum.
      - 2) Doors over 48 inches High:
        - a) Four (4) hinges.
        - b) Hinge Opening: 165 degree minimum.
    - c. Basis of Design: Model 329.03.558 with Model 329.73.510 mounting plate by Hafele.
      - 1) Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
        - a) Blum.
        - b) Grass America.
        - c) Hafele.
        - d) Knappe & Vogt.
        - e) Salice.
  - 5. Cabinet Inactive Leaf Catches:
    - a. Class Two Quality Standards:
      - 1) Full-Height Doors: Two Surface Bolts No 043 - 2 inch by Ives.
      - 2) All Other Doors: Elbow Catch No 2 by Ives.
  - 6. Drawer Guides:
    - a. Keyboard / Pencil Drawers:
      - 1) Steel ball bearings, 45 lb load rating minimum.

- 2) 3/4 extension, top mounting.
  - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a) Series 2006 by Accuride.
    - b) Article 422.14.345 by Haffele.
    - c) Series KV8200 by Knape & Vogt.
- C. Cabinet Door Bumpers:
- 1. Description:
    - a. Polyurethane bumper to protect gypsum board from cabinet handle damage where cabinet handles hit gypsum wallboard surface.
  - 2. Design Criteria:
    - a. Clear.
    - b. Peel adhesion.
    - c. Size: **3/8 inch** diameter x **1/8 inch** thick.
  - 3. Type Two Acceptable Products:
    - a. WS-34 Cylindrical Soft Durometer Cabinet Bumper by Anybumper.
    - b. Equal as approved by Architect before installation. See Section 01 6200.

## 2.3 SOURCE QUALITY CONTROL

- A. Inspections:
- 1. Clear Finished Hardwood:
    - a. Color matches Owner provided sample specified in Section 09 9324.

## PART 3 - EXECUTION: Not Used

**END OF SECTION**

**BLANK PAGE**

**SECTION 06 4512****ARCHITECTURAL WOODWORK WOOD TRIM****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Casings, stops, handrails, and jambs.
  - 2. Chair rails.
  - 3. Fixed shelving not part of casework.
- B. Related Requirements:
  - 1. Section 06 1100: 'Wood Framing' for wall blocking required for Wood Trim.
  - 2. Section 06 2001: 'Common Finish Carpentry Requirements':
    - a. Installation of Wood Trim.
  - 3. Section 06 2210: Remaining Wood Trim.
  - 4. Section 06 4001: 'Common Architectural Woodwork Requirements':
    - a. Approved Fabricators.
    - b. General standards for materials and fabrication of Architectural Woodwork.
  - 5. Section 08 1429: Interior Flush Wood Doors.
  - 6. Section 09 9324: 'Interior Clear-Finished Hardwood'.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada / Woodwork Institute, 46179 Westlake Drive, Suite 120, Potomac Falls, VA [www.awinet.org](http://www.awinet.org).
    - a. Architectural Woodwork Standards (AWS), 2nd Edition, 2014.
- B. Definitions:
  - 1. Grade: Unless otherwise noted, this term means Grade rules for Economy, Custom, and/or Premium Grade.
    - a. Custom Grade: Typically specified for and adequately covers most high-quality architectural woodwork, providing a well-defined degree of control over a project's quality of materials, workmanship, or installation.
  - 2. Plain Slicing: Most commonly used for hardwood plywood. The log is cut in half, and one half is placed onto a carriage and moved up and down past a fixed knife to produce the veneers. Veneer is sliced parallel to the pith of the log and approximately tangent to the growth rings to achieve flat-cut veneer. Each piece is generally placed in a stack and kept in order. One half log, sliced this way, is called a "flitch".
  - 3. Plain-Sawn: A hardwood figure developed by sawing a log lengthwise at a tangent to the annual growth rings. It appears as U-shaped or straight markings in the board's face.
  - 4. Running Trim: Generally combined in the term "standing and running trim" and refers to random, longer length trims delivered to the jobsite (e.g., baseboard, chair rail, crown molding).

**1.3 SUBMITTALS**

- A. Action Submittals:
  - 1. Shop Drawings:
    - a. Include materials used, standing and running trim profiles, joint details, and hardware.
  - 2. Samples:
    - a. Interior Hardwood for Transparent Finish:

- 1) Before performing work of this Section, prepare Control Sample, to match sample available from Owner, to be used as finishing standard for interior clear finished hardwood as specified in Section 09 9324.
- 2) Design Criteria:
  - a) Provide 8 inch by 10 inch sample of Red Oak to match Owner provided stain color selected for Project.
  - b) Control Sample will be used as performance standard for evaluating finish provided.

B. Informational Submittals:

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Manufacturers:
1. Approved Fabricators. See Section 06 4001 for Approved Fabricators.
- B. Performance / Design Criteria: Conform to requirements of Section 06 4001 'Common Architectural Woodwork Requirements'.
1. Glue: Waterproof and of best quality.
  2. Factory-finish to match Owner selected sample as specified in Section 09 9324.
- C. Architectural Woodwork Wood Trim:
1. Interior Hardwood For Transparent Finish:
    - a. Design Criteria:
      - 1) Solid wood shall be plain sawn Red Oak.
      - 2) Paneling shall be panel product with plain sliced Red Oak veneer.
      - 3) Finish to match Owner selected sample as specified in Section 09 9324.
    - b. Match existing Project Color Scheme:
      - 1) Control Sample provided by Owner:
        - a) Control Sample will be existing wood item from Project.
  2. Interior Wood For Opaque, Painted Finish:
    - a. Applies to ceiling trim only.
    - b. Solid wood shall be any species allowed by AWS Custom grade.
- D. Shelves:
1. Conform to applicable requirements of Sections 06 4001 and 06 4114.
  2. Use 3/4 inch Kortron or Melamine faced Panel Product with hot glued 3 mm thick PVC edge banding with eased edges. Apply banding on exposed edges with one inch return onto unexposed edges. Edge banding color to match Panel Product.

### 2.2 SOURCE QUALITY CONTROL

- A. Inspections:
1. Clear Finished Hardwood:
    - a. Color matches Owner provided sample specified in Section 09 9324.

## PART 3 - EXECUTION Not Used

### END OF SECTION



**SECTION 06 6001****MISCELLANEOUS PLASTIC FABRICATIONS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But not Installed Under This Section:
  - 1. Furnish window stools as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 06 2001: 'Common Finish Carpentry Requirements' for:
    - a. Installation of Window Stools.
  - 2. Section 06 4001: 'Common Architectural Woodwork Requirements' for Approved Fabricators.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Solid Surface: Solid surface materials are manufactured from polymeric materials. Granules may also be added to enhance the color effects. Solid surface materials are non-porous and homogeneous, with the same composition throughout the thickness of the solid surface material. They are capable of being repaired, renewed to the original finish and fabricated into continuous surfaces with inconspicuous seams.
- B. Reference Standards:
  - 1. American National Standards Institute/International Cast Polymer Alliance:
    - a. ANSI/ICPA SS-1-2001, 'Performance Standard for Solid Surface Materials'.

**1.3 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Manufacturer's literature.
    - b. Color selections.

**PART 2 - PRODUCTS****2.1 ASSEMBLIES**

- A. Manufacturers:
  - 1. Acrylic Solid Surface:
    - a. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
      - 1) Corian by DuPont Co, Wilmington, DE. Contact Steve Finch at (314) 941-5179 or email [stephen.m.finch@dupont.com](mailto:stephen.m.finch@dupont.com).
      - 2) LG Hi-Macs Solid Surfacing by LG Solid Source LLC, Peoria, AZ [www.lgcreate.com](http://www.lgcreate.com).
      - 3) Staron Solid Surfacing by Cheil Industries / Samsung Chemical USA, La Mirada, CA [www.staron.com](http://www.staron.com).
      - 4) 'Gibraltar Solid Surface' by Wilsonart International Inc, Temple, TX [www.wilsonart.com](http://www.wilsonart.com).
- B. Materials:
  - 1. Acrylic Solid Surface Window Stools:
    - a. Design Criteria:

- 1) Meet requirements of ANSI/ICPS SS-1.
- b. General:
  - 1) **1/2 inch** thick 100 percent acrylic polymer.
- c. Approved Colors: As selected by Architect from Manufacturer's standard solid (white or off-white only) colors.
  - 1) Glacier White by Corian.
  - 2) Bisque by Corian.
  - 3) Cameo White by Corian.
  - 4) Vanilla by Corian.

**PART 3 - EXECUTION: Not Used****END OF SECTION**

**SECTION 07 1113****BITUMINOUS DAMPPROOFING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and apply bituminous dampproofing to exterior foundation walls and top of footings as described in Contract Documents.

**1.2 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Manufacturer's product literature or cut sheet products provided.

**1.3 DELIVERY, STORAGE, AND HANDLING**

- A. Storage And Handling Requirements:
  - 1. Maintain dampproofing at **40 deg F** or above before application.

**1.4 FIELD CONDITIONS**

- A. Ambient Conditions:
  - 1. Do not apply when ambient temperature is below **40 deg F**, surface temperature is below **33 deg F**, or when rain is expected before applied dampproofing will dry.

**PART 2 - PRODUCTS****2.1 MANUFACTURERS**

- A. Bituminous Dampproofing:
  - 1. Type Two Acceptable Products:
    - a. Ecomul-11 by Epro Waterproofing Systems, Derby, KS [www.eproserv.com](http://www.eproserv.com).
    - b. Henry 788 by Henry Company, El Segundo, CA [www.henry.com](http://www.henry.com).
    - c. Karnak 100 by Karnak Chemical Corp, Clark, NJ [www.karnakcorp.com](http://www.karnakcorp.com).
    - d. Sealmastic Asphalt Emulsion Dampproofing Type I by W R Meadows, Hampshire, IL [www.wrmeadows.com](http://www.wrmeadows.com).
    - e. Equal as approved by Architect before application. See Section 01 6200.

**PART 3 - EXECUTION****3.1 APPLICATION**

- A. Spray Application:
  - 1. Spray to a thickness of **10 mils** minimum.
- B. Brush / Roller Application:

1. Apply two coats of dampproofing at rate recommended by Manufacturer.
  2. Apply coats in cross hatch method so coats are applied perpendicular to each other.
  3. Before applying second coat allow first coat to dry in accordance with Manufacturer's recommendations.
- C. Apply dampproofing to cover area from **6 inches** below finish grade line down to and including top of footings.
- D. Do not backfill against bituminous dampproofing for twenty four (24) hours after application.

**END OF SECTION**

**SECTION 07 2113****BOARD INSULATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install board insulation on interior side of perimeter foundation walls and under floor slabs as described in Contract Documents.
  2. Furnish and install board insulation in exterior metal-framed walls as described in Contract Documents.

**1.2 REFERENCES**

- A. Association Publications:
1. International Code Council (ICC) [www.icc-es.org](http://www.icc-es.org):
    - a. ICC-ES Evaluation Report, [www.icc-es.org](http://www.icc-es.org).
      - 1) ESR-1061, 'Foamular 150, 250, 400, 600, and 1000 Extruded Polystyrene Insulation Boards' (Issued May 1, 2011).
      - 2) ESR-2142, 'Styrofoam Brand Insulation Boards and DOW Fan-Fold Products' (Issued October 1, 2012).
    - B. ESR-2912, 'Greenguard and Greenguard RCY extruded polystyrene insulation board' (Issued July 1, 2012).Definitions:
      1. Flame Spread: The propagation of flame over a surface.
      2. Flame Spread Index: The numerical value assigned to a material tested in accordance with ASTM E84.
      3. Smoke-Developed Index: The numerical value assigned to a material tested in accordance with ASTM E84.
- C. Reference Standards:
1. ASTM International:
    - a. ASTM C518-10, 'Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus'.
    - b. ASTM C578-15, 'Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation'.
    - d. ASTM C1289-15, 'Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board'.ASTM E84-15a, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
    - e. ASTM E96/E96M-15, 'Standard Test Methods for Water Vapor Transmission of Materials'.
  2. Underwriters Laboratories, Inc.:
    - a. UL 723: 'Tests for Surface Burning Characteristics of Building Materials' (10th Edition).

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conferences:
1. Participate in pre-installation conference as specified in Section 01 3100:
    - a. Schedule pre-installation conference prior to commencement of installing insulation with Installer and Manufacturer's Representative if available.
    - b. In addition to agenda items specified in Section 01 3100, review following:
      - 1) Review installation procedures.
      - 2) Review coordination of work with related and adjacent work.
      - 3) Review special details and flashing.

**1.4 QUALITY ASSURANCE**

- A. Regulatory Agency Sustainability Approvals:
  - 1. Insulation shall be manufactured to be in compliance with International Code Council (IBC) or other applicable building codes.
  - 2. Fire-Test-Response Characteristics: As determined by test method indicated below by qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    - a. Surface-Burning Characteristics:
      - 1) Insulation shall have Class A flame spread rating in accordance with ASTM E84 or UL 723.
        - a) Class A (Flame spread index 0-25; Smoke-developed index 0-450).
        - b) Flash point: None.
  - 3. Qualifications:
    - a. Installer: Firm which has at least three (3) years experience in work of type required by this specification.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery And Acceptance Requirements:
  - 1. Materials shall be delivered in original, unopened packages with labels intact. Exercise care to avoid damage during unloading.
  - 2. Deliver materials in sufficient quantities to allow continuity of work.
- B. Storage And Handling Requirements:
  - 1. Store, protect and handle materials in accordance with Manufacturer's recommendations to prevent damage, contamination and deterioration. Keep material free of dirt and other foreign matter.
  - 2. Store in cool, dry area away from sources of heat, flame, ignition and strong oxidizing agents.
  - 3. Following Manufacturer's instructions for protection when handling and cutting insulation.

**1.6 WARRANTY**

- A. Manufacturer Warranty:
  - 1. Manufacturer's Insulation Warranty.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Type 1 Insulation (Below Grade):
  - 1. Description:
    - a. Extruded polystyrene foam insulation.
  - 2. Design Criteria:
    - a. Meet requirements of ASTM C578, Type IV.
    - b. Meet requirements of ASTM E84 or UL 723 for 'surface burning characteristics of building materials'.
  - 3. Type One Acceptable Products:
    - a. Foamular 250 by Owens Corning.
    - b. GreenGuard 25 PSI by Pactiv Building Products.
    - c. Styrofoam SM by Dow Chemical.
    - d. Equal as approved by Architect before bidding. See Section 01 6200.

## 2.2 ACCESSORIES

- A. Fasteners:
  - 1. Tapping screws with washers.
    - a. As recommended by Manufacturer.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification Of Conditions:
  - 1. Prior to all work of this section, carefully inspect installed work of all other trades and verify that all such work is complete to point where installation may properly commence.
  - 2. Verify insulation may be installed in accordance with original design and manufacturer's recommendations
  - 3. Discrepancies:
    - a. In event of discrepancy, immediately notify Architect.
    - b. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

### 3.2 INSTALLATION

- A. General: Install insulation in compliance with International Code Council (IBC) or other applicable building codes and in accordance with Manufacturer's current recommendations.
- B. Type 1 Insulation (Below Grade):
  - 1. Remove ties and concrete protrusions that would keep insulation from fully contacting foundation wall face.
  - 2. Install against interior side of perimeter foundation walls extending downward from top of slab **48 inches** or to top of footing, whichever is less. Install using **3/8 inch** beads of adhesive at **12 inches** on center vertically and at each vertical and horizontal joint to completely seal insulation.

### 3.3 FIELD QUALITY CONTROL

- A. Field Tests And Inspections:
  - 1. Upon completion of installation, visually inspect each insulated area and verify that all insulation is complete and properly installed.
- B. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
  - 1. Correct any work found not complying with contract document requirements at no additional cost to the Owner.

### 3.4 CLEANING

- A. Waste Management:
  - 1. Remove from site debris resulting from work of this Section.

**END OF SECTION**

**BLANK PAGE**



**SECTION 07 2116****BLANKET INSULATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install faced thermal and acoustic batt insulation as described in Contract Documents.
  - 2. Quality of insulation used in speaker enclosures.
  - 3. Furnish and install unfaced thermal and acoustic batt insulation in metal framing as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 06 2024: 'Door, Frame, And Finish Hardware Installation' for furnishing and installing of insulation in hollow metal door frames.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. ASTM International:
    - a. ASTM C665-12, 'Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing'.

**1.3 QUALITY ASSURANCE**

- A. Regulatory Agency Sustainability Approvals:
  - 1. Insulation shall be manufactured to be in compliance with International Code Council (IBC) or other applicable building codes.

**PART 2 - PRODUCTS****2.1 SYSTEMS**

- A. Manufacturers:
  - 1. Insulation:
    - a. Type One Acceptable Manufacturers:
      - 1) Certaineed Corp, Valley Forge, PA [www.certainteed.com](http://www.certainteed.com).
      - 2) FiberTEK, Salt Lake City, UT [www.fibertekinsulation.com](http://www.fibertekinsulation.com).
      - 3) Guardian Fiberglass, Greer, SC [www.guardianbp.com](http://www.guardianbp.com).
      - 4) Johns Manville, Denver, CO [www.jm.com](http://www.jm.com).
      - 5) Knauf Fiber Glass, Shelbyville, IN [www.knaufusa.com](http://www.knaufusa.com).
      - 6) Owens-Corning Fiberglass Corporation, Toledo, OH [www.owens-corning.com](http://www.owens-corning.com).
      - 7) Thermafiber, Wabash, IL [www.thermafiber.com](http://www.thermafiber.com).
    - b. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Materials:
  - 1. Thermal And Acoustic Insulation:
    - a. Faced Insulation:
      - 1) Kraft faced meeting requirements of ASTM C665, Type II, Class C.
    - b. Unfaced Insulation: Meet requirements of ASTM C665, Type I.

- 1) Support at trussed rafters:
  - a) Provide support at trussed rafters where insulation is not enclosed by structure or drywall.
  - b) Provide stings/wires which run perpendicular to framing and attach at each trussed rafter and to framing at **32 inches** O.C. minimum and where batt ends adjoin each other.
  - or
  - c) Class Two Quality Standard: Simpson Strong Tie IS Insulation Supports with **14 gauge** carbon steel, spring wire and mitered tips for **16 inch** O.C. and **24 inch** O.C. spacing.
- c. Order insulation by 'R' factor rather than 'U' factor, rating, or thickness, either **16 or 24 inches** wide according to framing spacing.
- d. 'R' Factor Required:
  - 1) Acoustically Insulated Ceilings:
    - a) Enclosed Spaces: Fill framed cavity with batt of appropriate thickness.
    - b) Unenclosed Spaces: R19.
  - 2) Wood or Metal Wall Stud Framing:
 

R11	<b>3-1/2 inches deep</b>
R19	<b>5-1/2 inches deep</b>
  - 3) Thermally Insulated Ceilings / Roof:
    - a) R38 Standard: All Other.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General:
  1. Leave no gaps in insulation envelope.
  2. If two layers of insulation are used to attain required 'R' factor, only layer towards interior of building shall have facing.
  3. Provide minimum clearance around recessed lighting fixtures as approved by local code.
- B. In Framing:
  1. Install insulation behind plumbing and wiring, around duct and vent line penetrations, and in similar places.
  2. Fit ends of batts snug against top and bottom plates.
  3. Fit batts snug against stud framing at each side.
  4. Install baffles between trusses and rafters at ventilation spaces if necessary to prevent insulation from blocking airflow from soffit.

**END OF SECTION**

**SECTION 07 2616****BELOW-GRADE VAPOR RETARDER****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Vapor retarder, seam tape, and penetration accessories for installation under interior slabs-on-grade.
- B. Related Requirements:
  - 1. Section 31 1123: 'Aggregate Base' for the following:
    - a. Installation of vapor retarder over aggregate base.

**1.2 REFERENCE**

- A. Association Publications:
  - 1. American Concrete Institute:
    - a. ACI 302.1R-04, 'Guide for Concrete Floor and Slab Construction'.
      - 1) Section 3.2.3, 'Vapor Retarder'.
    - b. ACI 302.2R-06, 'Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials'.
- B. Definitions:
  - 1. Perm:
    - a. US Perm: 1 grain of water vapor per hour, per square foot, per inch of mercury.
    - b. Metric Perm: 1 gram of water vapor per day, per square meter, per millimeter of mercury.
  - 2. Permeability: Measure of the ability to transmit a fluid. Amount of moisture that can pass through a material, is measured in perms. Lower the number, the less permeable the material and more moisture it will block.
  - 3. Vapor Barrier: Material that has permeance of 0.1 perm or less. Vapor barrier is a material that is essentially vapor impermeable. Vapor barrier is a Class I vapor control layer. Test procedure for classifying vapor retarders is ASTM E-96 Test Method A—the desiccant or dry cup method.
  - 4. Vapor Retarder: Vapor retarder is a material that has permeance of 1.0 perm or less and greater than 0.1 perm. Vapor retarder is a material that is vapor semi-impermeable. Vapor retarder is a Class II vapor control layer. The test procedure for classifying vapor retarders is ASTM E-96 Test Method A—the desiccant or dry cup method.
  - 5. Vapor Retarder Classes and Permeance Descriptions:
    - a. Classes of Vapor Retarders:
      - 1) Class I Vapor Retarder: 0.1 perm or less.
      - 2) Class II Vapor Retarder: 1.0 perm or less and greater than 0.1 perm.
      - 3) Class III Vapor Retarder: 10 perm or less and greater than 1.0 perm.
    - b. Four general classes based on permeance):
      - 1) Vapor Impermeable: 0.1 perm or less.
      - 2) Vapor semi-impermeable: 1.0 perm or less and greater than 0.1 perm.
      - 3) Vapor semi-permeable: 10 perm or less and greater than 1.0 perm.
      - 4) Vapor permeable: greater than 10 perms.
- C. Reference Standards:
  - 1. ASTM International:
    - a. ASTM D638-10, 'Standard Test Method for Tensile Properties of Plastics'.
    - b. ASTM D882-10, 'Standard Test Method for Tensile Properties of Thin Plastic Sheeting'.
    - c. ASTM D1004-09, 'Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting'.

- d. ASTM D1709-09, 'Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method'.
- e. ASTM D4882-05, 'Standard Test Method for Bond Strength of Electrical Insulating Varnishes by the Twisted-Coil Test'.
- f. ASTM D5199-11, 'Standard Test Method for Measuring the Nominal Thickness of Geosynthetics'.
- g. ASTM D5261-10, 'Standard Test Method for Measuring Mass per Unit Area of Geotextiles'.
- h. ASTM E96/E96M-10, 'Standard Test Methods for Water Vapor Transmission of Materials'.
- i. ASTM E154-08a, 'Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover'.
- j. ASTM E1643-11, 'Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs'.
- k. ASTM E1745-11, 'Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs'.
- l. ASTM F710-11, 'Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring'.
- m. ASTM F1249-06(2011), 'Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor'.

### 1.3 SUBMITTALS

- A. Action Submittals:
  - 1. Product Data:
    - a. Manufacturer's literature or cut-sheets.
  - 2. Samples:
    - a. Vapor Retarder:
      - 1) Submit sample of specified vapor retarder.
- B. Informational Submittals:
  - 1. Test And Evaluation Reports:
    - a. Independent laboratory test results showing compliance with ASTM C1745 Standard.
  - 2. Source Quality Control Submittals:
    - a. Vapor Retarder:
      - 1) Installation, seaming, and penetration boot instructions.
- C. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Warranty Documentation:
      - 1) Final, executed copy of Warranty:
    - b. Record Documentation:
      - 1) Manufacturers documentation:
        - a) Manufacturer's documentation showing compliance to Contract Documents.

### 1.4 WARRANTY

- A. Manufacturer Warranty:
  - 1. Manufacturer standard warranty to be free of defects and installed without damage.

## PART 2 - PRODUCTS

### 2.1 ASSEMBLIES

- A. Manufacturers:
  - 1. Manufacturer Contact List:
    - a. Fortifiber, Reno, NV [www.fortifiber.com](http://www.fortifiber.com).

- b. Insulation Solutions, East Peoria, IL [www.insulationsolutions.com](http://www.insulationsolutions.com).
  - c. Inteplast Group, Livingston NJ [www.BarrierBac.com](http://www.BarrierBac.com).
  - d. Raven Industries, Sioux Falls, SD [www.ravenind.com](http://www.ravenind.com).
  - e. Reef Industries, Houston, TX [www.reefindustries.com](http://www.reefindustries.com).
  - f. Stego Industries, San Juan Capistrano, CA [www.stegoindustries.com](http://www.stegoindustries.com).
  - g. W R Meadows, Hampshire, IL [www.wrmeadows.com](http://www.wrmeadows.com).
- B. Materials:
- 1. Vapor Retarder:
    - a. Design Criteria:
      - 1) Meet requirements of ASTM E1745, Class A rating.
      - 2) Thickness: **15 mil** minimum.
      - 3) Physical Properties:
        - a) Water Vapor Pemeance      ASTM E96, Method A      Perm 0.01
        - b) Puncture Resistance      ASTM D1709.
    - b. Category Four Approved Products. See Section 01 6200 for definition of Categories.
      - 1) Barrier-Bac VB-350 (16 mil) by Inteplast Group.
      - 2) Griffolyn 15 by Reef Industries.
      - 3) Moistop Ultra 15 Underslab Vapor Retarder by Fortifiber.
      - 4) Perminator (15 mil) by W R Meadows.
      - 5) Stego Wrap by Stego.
      - 6) Vapor Block 15 by Raven Industries.
      - 7) Viper Vaporcheck II (**15 mil**) by Insulation Solutions.
- C. Accessories:
- 1. Vapor Barrier:
    - a. Seam Tape: As recommended by Membrane Manufacturer for continuous taping of seams and sealing of penetration boots.
    - b. Penetration Boots at Utility Penetrations:
      - 1) Quality Standard: Factory fabricated pipeboots:
        - a) Moistop: The Boot.
        - b) Raven: VaporBoot.
        - c) Reef Industries: VaporBoot.
        - d) All Others:
          - (1) Other Manufacturer's boot system.
          - or
          - (2) Field fabricated from same material as vapor retarder membrane.

**PART 3 - EXECUTION Not Used****END OF SECTION**

**BLANK PAGE**

**SECTION 07 2719****PLASTIC SHEET AIR BARRIERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install air infiltration barriers on exterior side of exterior wall sheathing as described in Contract Documents.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. ASTM International:
    - a. ASTM E1677-11, 'Standard Specification for an Air Barrier (AB) Material or System for Low-Rise Framed Building Walls'.

**1.3 SUBMITTALS**

- A. Informational Submittals:
  - 1. Test And Evaluation Reports: Copy of test results showing performance characteristics.
- B. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Warranty Documentation:
      - 1) Final, executed copy of Warranty (if available from Manufacturer).

**1.4 QUALITY ASSURANCE**

- A. Qualifications: Requirements of Section 01 4301 applies, but is not limited to following:
  - 1. Manufacturer Qualifications:
    - a. Provide single source for all products of system.

**1.5 WARRANTY**

- A. Manufacturer Warranty:
  - 1. Manufacturer's limited warranty (if available on product).

**PART 2 - PRODUCTS****2.1 ASSEMBLIES**

- A. Manufacturers:
  - 1. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a. Styrofoam Weathermate Plus by Dow, Chemical Co, Midland, MI [www.dow.com](http://www.dow.com)
    - b. Tyvek HomeWrap by Du Pont Company, Wilmington, DE [www.dupont.com](http://www.dupont.com)
    - c. DriShield Housewrap by Protecto Wrap, Denver, CO [www.protectowrap.com](http://www.protectowrap.com)
    - d. Fortress Pro by Raven Industries, Sioux Falls, SD [www.ravenind.com](http://www.ravenind.com)
    - e. Typar Housewrap by Fiberweb, Old Hickory, TN [www.typar.com](http://www.typar.com).

- B. Materials:
1. Air Retarder:
    - a. Non-woven.
    - b. Meet requirements of ASTM E1677, Type I.
  2. Sealing Tape:
    - a. Type Two Acceptable Products:
      - 1) DuPont Contractor Tape.
      - 2) Fortress Pro Seaming Tape.
      - 3) Typar Construction Tape.
      - 4) 3M Contractor Sheathing Tape.
      - 5) Protecto Wrap BT25 XL Window Sealing Tape.
      - 6) As recommended in writing by Air Retarder Manufacturer.
  3. Fasteners:
    - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - 1) Wood Framing: Corrosion resistant roofing nails with **3/4 inch** long shank minimum and **one inch** diameter plastic head or Tyvek Wrap Caps. Staples are only allowed to aid in installation with permanent fasteners installed immediately thereafter.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install over exterior wall sheathing.
1. Apply specified fasteners along stud lines at **18 inches** maximum on center. Lap horizontal joints **6 inches** minimum, with upper layer placed over lower layer. Lap vertical seams **16 or 24 inches** as necessary to match framing spacing. Do not fasten at bottom where necessary to allow for installation of flashing behind air infiltration barrier at base of masonry veneer.
  2. Seal joints and penetrations through air infiltration barrier with specified tape before installation of finish material. Air infiltration barrier shall be air tight and free from holes, tears, and punctures.

**END OF SECTION**



**SECTION 07 3113****ASPHALT SHINGLES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install Asphalt Shingle Roofing System as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 06 2001: 'Common Finish Carpentry Requirements' for installation of wood nailers, curbs and blocking if required.
  - 2. Division 22: Plumbing vent piping.
  - 3. Division 23: HVAC flues and air piping.
- C. Products Installed But Not Furnished Under This Section:
  - 1. Miscellaneous flashing and sheet metal.
    - a. Drip metal.
    - b. Valley flashing.
    - c. Wall flashings.
  - 2. Pipe and flue roof jacks.
  - 3. Ridge vent.
- D. Related Requirements:
  - 1. Section 07 6310: 'Steep Slope Roof Flashing: Asphalt Shingle' for furnishing of roof flashing, pipe jacks, drip edge and miscellaneous flashing and sheet metal.
  - 2. Section 07 7226: 'Ridge Vent.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Algae: Rooftop fungus that can leave dark stains on roofing.
  - 2. Base Flashing: That portion of flashing attached to or resting on roof deck to direct flow of water onto the roof covering.
  - 3. Blind Nailing (also back nailing): Nailing roofing material so that fastener is shielded from weather by next course of material being installed.
  - 4. Cap Flashing: Material used to cover top edge of base flashings or other flashings to prevent water seepage behind base flashing. Cap flashing overlaps base flashing.
  - 5. Chalk Line: Line made on roof by snapping taut string or cord dusted with chalk. Used for alignment purposes.
  - 6. Collar: Pre-formed flange placed over vent pipe to seal roof around vent pipe opening. Also called vent sleeve.
  - 7. Corrosion: When rust, rot or age negatively affect roofing metals.
  - 8. Course: Row of shingles running length of roof.
  - 9. Deck: Structural component of roof of building which provides substrate to which roofing system is applied.
  - 10. Drip Edge: Non-corrosive, non-staining material used along eaves and rakes to allow water run-off to drip clear of underlying building.
  - 11. Eaves: Horizontal, lower edge of sloped roof.
  - 12. Felt: Fibrous material saturated with asphalt and used as an underlayment or sheathing paper.
  - 13. Flame Spread Classification: Categories as per ASTM E84/UL 723 or ULC 102:
    - a. Class A: Highest fire-resistance rating for roofing as per ASTM E108. Indicated roofing is able to withstand severe exposure to fire exposure to fire originating from sources outside building.

- b. Class B: Fire-resistance rating indicating roofing materials are able to withstand moderate exposure to fire originating from sources outside of building.
  - c. Class C: Fire-resistance rating indicating roofing materials are able to withstand light exposure to fire originating from sources outside of building.
- 14. Flange: Metal pan extending up and down roof slope around flashing pieces. Usually at plumbing vents.
  - 15. Flashing: Components used to prevent seepage of water into a building around any intersection or projection in a roof such as vent pipes, chimneys, adjoining walls, dormers and valleys.
  - 16. Hip Roof: Roof that rises by inclined planes on all sides of building. Line where two adjacent sloping sides of roof meet is called the Hip.
  - 17. Ice Dam: Condition formed at lower roof edge by thawing and re-freezing of melted snow on roof overhang. Ice dams force water to 'back up' under shingles potentially causing leakage.
  - 18. Lap: Part of roofing material that overlaps section of adjacent material.
  - 19. Louver: Slanted opening for ventilation.
  - 20. Organic Felt: Asphalt roofing base material manufactured from cellulose fibers.
  - 21. Overhang: That portion of roof structure that extends beyond exterior walls of building.
  - 22. Metal Flashing: Roof components made from sheet metal that are used to terminate roofing membrane or other material alongside roof perimeters as well as at roof penetrations.
  - 23. Nailing Pattern: Refers to specific method or pattern at which nails are applied.
  - 24. Penetration: Any object that pierces surface of roof.
  - 25. Pipe Boot: Prefabricated flashing piece used to flash around circular pipe penetrations. Also known as a Roof Jack.
  - 26. Rake: Inclined edge of sloped roof over a wall from eave to the ridge.
  - 27. Ridge: Line where two planes of roof intersect, forming highest point on roof that runs entire length of roof.
  - 28. Ridge Shingles: Shingles used to cover horizontal external angle formed by intersection of two sloping roof planes.
  - 29. Roof Assembly: System of interacting roof components (including roof deck) designed to weatherproof, and normally, to insulate building's top surface.
  - 30. Roof Jack: Term used to describe a Pipe Boot or Flashing Collar.
  - 31. Shiner: Incorrectly placed nail which isn't covered by subsequent course of shingles.
  - 32. Starter Course: Row or course of shingle that is installed under initial course of shingle at lowest point of roof.
  - 33. Tab: Exposed portion of shingle defined by cutouts.
  - 34. Tear-Off: Removal of existing roof components down to structural deck, followed by installation of completely new roof system.
  - 35. UL Label: Label displayed on packaging to indicate level of fire and/or wind resistance of asphalt roofing.
  - 36. Underlayment:
    - a. Primary Underlayment: Asphalt saturated and coated organic felt base sheet installed under roofing material to serve as added protection meeting requirements of ASTM D2626.
    - b. Secondary Underlayment (Ice and Water Shield): Rubberized asphalt membrane with peel off backing that adheres to roof deck creating waterproof seal installed under roofing material meeting requirements of ASTM D1970/D1970M. Degrades with exposure to UV light. Due to its consistency, seals around roofing nails.
  - 37. Valley: Internal angle formed by intersection of two sloping roof planes to provide water runoff.
  - 38. Vent: Any outlet for air that protrudes through roof deck such as pipe or stack. Any device installed on roof, gable or soffit for purpose of ventilating underside of roof deck.
  - 39. Vent Sleeve: See collar.
  - 40. Wind Uplift: Wind-induced forces on roof system or components in roof system. Wind uplift generally includes negative pressure component caused by wind being deflected around and across surfaces of building and positive pressure component from air flow beneath roof deck.

B. Reference Standards:

- 1. ASTM International:
  - a. ASTM D226-09/D226M-09, 'Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing'.
  - b. ASTM D228/D228M-15, 'Standard Test Methods for Sampling, Testing, and Analysis of Asphalt Roll Roofing, Cap Sheets, and Shingles Used in Roofing and Waterproofing'.

- c. ASTM D1970/D1970M-15a, 'Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection'.
- d. ASTM D2626-04(2012), 'Standard Specification for Asphalt-Saturated and Coated Organic Felt Base Sheet Used in Roofing'.
- e. ASTM D3018/D3018M-11, 'Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules'.
- f. ASTM D3019-08, 'Standard Specification for Lap Cement Used with Asphalt Roll Roofing, Non-Fibered, Asbestos-Fibered, and Non-Asbestos-Fibered'.
- g. ASTM D3161/D3161M-15, 'Standard Test Method for Wind-Resistance of Asphalt Shingles (Fan-Induced Method)'.
- h. ASTM D3462/D3462M-10a, 'Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules'.
- i. ASTM D4869/D4869M-15, 'Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing'.
- j. ASTM D6757-07(2013), 'Standard Specification for Underlayment Felt Containing Inorganic Fibers Used in Steep-Slope Roofing'.
- k. ASTM D7158/D7158M-11, 'Standard Test Method for Wind Resistance of Asphalt Shingles (Uplift Force/Uplift Resistance Method)'.
- l. ASTM E84-15b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
- m. ASTM E108-11, 'Standard Test Methods for Fire Tests of Roof Coverings'.
- n. ASTM F1667-15, 'Standard Specification for Driven Fasteners: Nails, Spikes, and Staples'.
- 2. International Building Code (IBC):
  - a. Chapter 15, 'Roof Assemblies And Rooftop Structures':
    - 1) Section 1507, 'Requirements for Roof Coverings':
      - a) 1507.2, 'Asphalt Shingles':
        - (1) 1507.2.1, 'Deck Requirements'.
        - (2) 1507.2.3, 'Underlayment'.
        - (3) 1507.2.5, 'Asphalt Shingles'.
        - (4) 1507.2.6, 'Fasteners'.
        - (5) 1507.2.7, 'Attachment'.
        - (6) 1507.2.8, 'Underlayment Application'.
        - (7) 1507.2.9, 'Flashing'.
  - b. Chapter 16, 'Structural Design'. (2006, IBC Code):
    - 1) Section 1609 'Wind Loads'.
      - a) 1609.3, 'Basic Wind Speed'.
- 3. International Code Council Evaluation Services (ICC-ES Report):
  - a. AC48, 'Acceptance Criteria For Roof Underlayment for Use in Severe Climate Areas' (Approved October 2012).
  - b. AC127, 'Acceptance Criteria For Roofing Systems With Asphalt Shingles Made with Glass Felt' (Approved July 1999).
  - c. AC188, 'Acceptance Criteria For Roof Underlayments' (Approved February 2012).
  - d. ESR-1322 'Weather Watch, Leak Barrier and Stormguard Leak Barrier' (Reissued January 2015).
  - e. ESR-1492 'CertainTeed Winterguard Series Roof Underlayment: Winterguard Granular, Winterguard HT, and Witerguard Sand CertainTeed Metalayment' (Reissued January 2013).
  - f. ESR-3229, 'Deck Defense Roofing Underlayment' (Reissued July 2015).
  - g. ESR-3286, 'Tiger Paw Roof Deck Protection Underlayment' (Reissued February 2015).
  - h. ESR-3344, 'CertainTeed Diamond Deck Underlayment' (Reissued May 2015).
- 4. National Fire Protection Association:
  - a. NFPA 101: 'Life Safety Code' (2015 Edition).
- 5. Underwriters Laboratories (UL):
  - a. UL 580: 'Tests for Uplift Resistance of Roof Assemblies' (5th Edition).
  - b. UL 723, 'Tests for Safety Test for Surface Burning Characteristics of Building Materials' (10th Edition).
  - c. UL 790, 'Standard Test Methods for Fire Tests of Roof Coverings' (8th Edition).
  - d. UL 2218, 'Standard for Impact Resistance of Prepared Roof Covering Materials' (2nd Edition).
  - e. UL 2390, 'Standard for Tests for Wind Resistant Asphalt Shingles with Sealed Tabs' (1st Edition).

### 1.3 ADMINISTRATIVE REQUIREMENTS

#### A. Pre-Installation Conference:

1. Participate in mandatory pre-installation conference:
  - a. Roofing Installer's Foreman and those responsible for installation of roofing to be in attendance. Include Shingle Manufacturer's Representative if available.
  - b. Schedule pre-installation conference at project site after completion of the installation of roof sheathing but before installation of any roofing system component.
  - c. In addition to agenda items specified in Section 01 3100, review following:
    - 1) Review if Project is in high wind area.
    - 2) Review if Project could have ice dam problems.
    - 3) Review if Project could have fungus-algae resistance problems.
    - 4) Review Shingle Manufacturer's ventilation requirements.
    - 5) Review Shingle Manufacturer's Ambient Conditions requirements.
    - 6) Review existing roof conditions including moisture on deck, protruding deck fasteners, specified gaps between sheathing, and other items affecting issuance of roofing warranty.
    - 7) Review proper valley, flashing, penetrations, secondary underlayment, sealants, and nailing requirements.
    - 8) Review racking installation method is not permitted.
    - 9) Review Cleaning and Disposal requirements.
    - 10) Review Special Procedure Submittal for Warranty Information to be given to Manufacturer before Manufacture will issue Roof Warranty by Installer.
    - 11) Review safety issues.

#### B. Sequencing:

1. Sequence of Roofing Materials (see valley flashing detail in Contract Drawings):
  - a. Apply continuous **12 inches** wide strip at edge of eaves and rakes of secondary underlayment.
  - b. Metal drip edge.
  - c. Secondary underlayment.
  - d. Apply three (3) continuous **36 inch** wide sheets of secondary underlayment in valley.
  - e. Install one (1) continuous **36 inch** wide strip of primary underlayment atop secondary underlayment and centered over valley.
  - f. Install formed valley metal over strip of primary underlayment.
  - g. Apply **12 inches** wide strips of secondary underlayment lapping nailed edge of formed valley metal **3 inches**.
  - h. Primary underlayment.
  - i. Asphalt shingles.
  - j. Counter flashings over step flashing.
2. Coordinate sequencing of products furnished in Section 07 7226: 'Ridge Vents'.

### 1.4 SUBMITTALS

#### A. Action Submittals:

1. Product Data:
  - a. Color and style selection.
2. Samples:
  - a. Full size shingle.

#### B. Informational Submittals:

1. Certificates:
  - a. Installers:
    - 1) Provide current Certification for completion of certified training from Shingle Manufacturer.
    - 2) Installer's signed certificate stating roofing system complies with Contract Documents performance requirements and work only performed by trained and authorized personnel in those procedures.
2. Tests And Evaluation Reports:

- a. Manufacturer's test reports.
  - b. ICC-ESR evaluation report.
  - c. Wind speed coverage for warranted wind speed.
  3. Manufacturers' Instructions:
    - a. Shingle Manufacturer's installation instructions and details for installation of secondary underlayment at penetrations, dormers, eaves, rakes, etc, to fit environmental conditions at Project.
  4. Special Procedure Submittals:
    - a. Contact Owner's Representative (FM Group or Project Manager) for following information:
      - 1) Installer to include following mandatory information to be added to 'Roofing Manufacturer System Warranty' submitted with Closing Documents.
        - a) Name of Owner (name of FM Group) \_\_\_\_\_
        - b) Mailing Address (FM office address) \_\_\_\_\_
        - c) Building Property ID (unique 7 digit identifier) \_\_\_\_\_
        - d) Project site address: \_\_\_\_\_
        - e) Roof Completion Date \_\_\_\_\_
        - f) Any addition data required from Manufacturer.
      - 2) Installer to include following mandatory information to be added to 'Roof Installer Workmanship Warranty' submitted with Closing Documents:
        - a) Name of Owner (name of FM Group) \_\_\_\_\_
        - b) Mailing Address (FM office address) \_\_\_\_\_
        - c) Building Property ID (unique 7 digit identifier) \_\_\_\_\_
        - d) Project site address: \_\_\_\_\_
        - e) Roof Completion Date \_\_\_\_\_
        - f) Any addition data required from Manufacturer.
  5. Qualification Statement:
    - a. Installer:
      - 1) Asphalt Shingles:
        - a) Provide Qualification documentation.
- C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Warranty Documentation:
      - 1) Asphalt Shingles:
        - a) Final, executed copy of 'Roofing Manufacturer System Warranty' including wind speed coverage and required Owner mandatory information.
        - b) Final, executed copy of 'Roof Installer Workmanship Warranty' including required Owner mandatory information.
      - 2) Verify mandatory information as specified in Special Procedure Submittal has been included in Final Warranty.
    - b. Record Documentation:
      - 1) Manufacturers Documentation:
        - a) Manufacturer's literature.
        - b) Color selections.
        - c) Test and evaluation reports.
      - 2) Roofing Inspection Documentation:
        - a) Include copy of roof inspection report.
      - 3) Certificate: Installer statement of compliance for performance requirements.
      - 4) Certificate: Installer completion of certified training.
      - 5) Test And Evaluation Report: UL fire-resistance rating test report.
      - 6) Test And Evaluation Report: NFPA 101 Class A approval.
      - 7) Test And Evaluation Report: Wind resistance requirements required.
- D. Maintenance Material Submittals:
1. Extra Stock Materials:
    - a. Provide one (1) square minimum of bundled shingles.

**1.5 QUALITY ASSURANCE**

- A. Regulatory Agency Sustainability Approvals:
1. Building Codes:
    - a. Meet requirements for NFPA 101 Class A roof assembly.
    - b. Roof system will meet requirements of all federal, state, and local codes having jurisdiction.
  2. Fall Protection: Meet requirement of fall protection as required by federal, state, and local codes having jurisdiction.
  3. Fire Characteristics:
    - a. Provide shingles and related roofing materials with fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL / ULC or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency:
      - 1) Exterior Fire-Test Exposure: Class A; UL 790 or ASTM E108, for application and roof slopes indicated.
        - a) Materials shall be identified with appropriate markings of applicable testing agency.
  4. Impact Resistance:
    - a. Meet UL 2218 impact resistant testing.
    - b. Meet UL 2218 Class 4 impact resistant rating for hail.
  5. Wind Resistance:
    - a. Meet ASTM D3161/D3161M for wind resistance.
      - 1) Installation shall comply with IBC Table 1507.2.7, 'Attachment'.
  6. Wind Speed:
    - a. As required to meet local codes having jurisdiction.
  7. Wind Uplift Resistance:
    - a. Meet UL 580 wind uplift of roof assemblies.
    - b. Meet UL 1897 uplift test for roof covering systems.
    - c. Meet ASTM D7158/D7158M for wind resistance for uplift force/uplift resistance.
- B. Qualifications:
1. Manufacturer:
    - a. Asphalt Shingles:
      - 1) Asphalt shingles are required to be produced under quality control program administered by inspection agency currently accredited by ICBO ES or recognized by National Evaluation Service, Inc. Quality control manual developed in consultation with approved agency, and complying with ICBO ES Acceptance Criteria for Quality Control Manuals (AC10), must be submitted.
    - b. Underlayment:
      - 1) Underlayment is required to be manufactured under approved quality control program with inspections by inspection agency accredited by International Accreditation Service (IAS) or otherwise acceptable to ICC-ES.
      - 2) Quality documentation complying with ICC-ES Acceptance Criteria for Quality Documentation (AC10) shall be submitted for roof underlayment.
  2. Roof Installer Foreman Qualifications:
    - a. Requirements of Section 01 4301 applies but not limited to the following:
      - 1) Provide documentation if requested by Architect.
        - a) Approved and authorized by Roofing Manufacturer to install Manufacturer's product and eligible to receive Manufacturer's warranty before bid.
        - b) Completed Shingle Manufacturer's certified trained.
        - c) Have thorough knowledge of installing asphalt shingle roofing and have minimum of five (5) years roofing experience.
        - d) Current license for the city, county, and state where project is located and license for specific type of roofing work to be performed.
        - e) Roofing Installer's foreman shall be skilled in his trade and qualified to lay out and supervise the Work.
        - f) Flashing installation shall be performed by personnel trained and authorized by Roofing Manufacturer.
  3. Roof Installer:
    - a. Provide 'Roof Installer Workmanship Warranty' as specified in Warranty in Part 1 of this specification.

## 1.6 DELIVERY, STORAGE, AND HANDLING

### A. Delivery And Acceptance Requirements:

1. Make no deliveries to job site until installation is about to commence, or until approved storage area is provided.
2. Deliver products job site in Manufacturer's original unopened containers or wrappings with labels intact and legible bearing all seals and approvals.
3. Deliver materials in sufficient quantities to allow continuity of work.
4. Remove any material not approved from job site.

### B. Storage And Handling Requirements:

1. Storage Requirements:
  - a. Follow Manufacturer's instructions and precautions for storage and protection of materials.
  - b. Protect roof materials from physical damage, moisture, soiling, and other sources in a clean, dry, protected location.
  - c. Stacking:
    - 1) Shingles: Bundles should be stacked flat.
    - 2) Underlayment:
      - a) Do not double-stack pallets.
      - b) Stack rolls upright until installation.
  - d. Temperature:
    - 1) Shingles:
      - a) Store in covered ventilated area at maximum temperature of 110 deg F
      - b) Use extra care in handling shingles when temperature is below 40 deg F
    - 2) Underlayment: Store in area with temperature between 40 deg F and 100 deg F
  - 2) Unacceptable Material:
    - 3) Remove from job site materials that are determined to be damaged by Architect or by Roofing Manufacturer and replace at no additional cost to Owner.
2. Handling Requirements:
  - a. Handle rolled goods so as to prevent damage to edge or ends.
3. Roof Top Loading:
  - a. Lay shingle bundles flat.
  - b. Do not bend over ridge.

## 1.7 FIELD CONDITIONS

### A. Ambient Conditions:

1. General:
  - a. Proceed with installation only when existing and forecasted weather conditions permit roofing to be performed according to manufacturer's written instructions and warranty requirements.
2. Shingles:
  - a. Do not install shingles at lower temperatures than allowed by Shingle Manufacturer for application.
3. Underlayment:
  - a. Install self-adhering sheet underlayment within range of ambient and substrate temperatures recommended by manufacturer.

## 1.8 WARRANTY

### A. Special Warranty:

1. Shingle Manufacturer's special forty (40) year minimum labor and material warranty written for VMR program, including but not limited to:
  - a. CertainTeed:
    - 1) First ten (10) years minimum of warranty will provide for full replacement cost, including tear-off and disposal, for any failure, including material defects and workmanship. Remaining thirty (30) years of warranty will provide for pro-rated replacement cost.

- b. GAF:
  - 1) First ten (10) years minimum of warranty will provide for full replacement cost, including tear-off and disposal, for any failure, including material defects and workmanship. Remaining thirty (30) years of warranty will provide for pro-rated replacement cost.
- c. Owens Corning:
  - 1) First ten (10) years minimum of warranty will provide for full replacement cost, including tear-off and disposal, for any failure, including material defects and workmanship. Remaining thirty (30) years of warranty will provide for pro-rated replacement cost.
- 2. Roofing system will resist blow-offs in winds between **110 mph** and up to **130 mph** for ten (10) years when installed as specified below.
  - a. Meet requirements of ASTM D3161/D3161M UL Class F.
  - b. Meet requirements of ASTM D7158/D7158M UL Class H.
  - c. Shingle Manufacturer's starter shingles are installed on all eave and rakes.
  - d. Shingle Manufacturer's hip and ridge shingles are installed where shown on Contract Documents.
  - e. Shingle Manufacturer's recommended nailing pattern is followed.
- 3. Algae resistance for fifteen (15) years.
- 4. Roof Installer Workmanship Warranty:
  - a. Provide ten (10) year workmanship warranty on roofing system and related components, including flashings, and responsible for all repairs to roofing system and related components due to roof installer's own negligence or faulty workmanship:
    - 1) In the event that, during ten (10) year period following installation, Roof Installer defaults or fails to fulfill its obligation in relation to workmanship warranty as specified in Manufacturer's Agreement, Manufacturer will assume that obligation for remainder of ten (10) year period following original installation and Owner shall have no obligation to make or pay for repairs to or materials for roofing system that are necessary due to Roof Installer's negligence or faulty installation during that period.

## PART 2 - PRODUCTS

### 2.1 SYSTEM

- A. Manufacturers:
  - 1. Manufacturer Contact List:
    - a. CertainTeed Roofing Products, Valley Forge, PA [www.certainteed.com](http://www.certainteed.com).
      - 1) Contact Information: Wendy Fox, (800) 404-9880 [wfox@dataworksintl.com](mailto:wfox@dataworksintl.com).
    - b. GAF Materials Corp., Wayne, NJ [www.gaf.com](http://www.gaf.com).
      - 1) Contact Information: John Arellano (office) (210) 896-1041 (fax) (210) 259-8050.
    - c. Owens Corning, Toledo, OH [www.owenscorning.com](http://www.owenscorning.com).
      - 1) Duration Premium shingles are available in all areas of the USA and Canada including all Duration Premium colors under LDS Church contract. Request shingles through local distribution. Any distribution questions, contact Area Sales Manager.
      - 2) For all other questions, Contact: Sam Baroudi (419) 248-7754 [sam.baroudi@owenscorning.com](mailto:sam.baroudi@owenscorning.com). or Robert Hill (801) 553-2417 [Robert.Hill@owenscorning.com](mailto:Robert.Hill@owenscorning.com).
- B. Components:
  - a. Shingles And Underlayment: Fiberglass mat shingles meeting or exceeding requirements of:
    - 1) UL Class A Fire Resistance.
    - 2) ASTM D3018/D3018M, Type I (self sealing).
    - 3) ASTM D3161/D3161M UL Class F.
    - 4) ASTM D7158/D7158M UL Class H.
    - 5) ASTM E108 Class A.
    - 6) CSA A123.1/A123.5 (Canadian standard).
    - 7) ASTM D3462/D3462M where required by local codes.
    - 8) Impact Resistant Shingles: Meet requirements of UL 2218 Class 4 Impact, ASTM E108 Class A Fire Resistance, ASTM D3161/D3161M Class F Wind, ASTM D7158/D7158M



- Class H Wind, ASTM D3018/D3018M Type 1, ASTM D3462/D3462M, and UL 790 Class A Fire Resistance.
- 9) Primary Underlayment: Meet requirements of ASTM D226/D226M and ASTM D4869/D4869M.
  - 10) Secondary Underlayment: Meet requirements of ASTM D1970/D1970M and UL 790 Class A Fire Resistance.
  - 11) Synthetic Underlayment: Meet requirements of ASTM D226/D226M and ASTM D4869/D4869M (physical properties only) or ASTM D1970/D1970M and ASTM E108 Class A Fire.
  - 12) Integral algae resistance:
    - a) Use compatible flashing and trim materials to avoid electrolysis problem with material used in algae shingles.
  - 13) Color as selected by Architect from Shingle Manufacturer's full color line.
- b. Category One VMR Products And Manufacturers. See Section 01 6200 for definitions of Categories:
- 1) CertainTeed:
    - a) Shingles:
      - (1) High Wind: Landmark Premium.
      - (2) Hip And Ridge Shingles: Shadow Ridge or Laminate Accessory for shingle used.
    - b) Primary Underlayment Under Shingles:
      - (1) Synthetic Underlayment: Diamond Deck.
    - c) Secondary Underlayment Under Shingles:
      - (1) WinterGuard Granular.  
or
      - (2) WinterGuard Sand.  
or
      - (3) WinterGuard High Tack/High Temperature.
  - 2) GAF:
    - a) Shingles:
      - (1) High Wind: Timberline Ultra HD.
      - (2) Hip And Ridge Shingles: TimberTex or Ridglass.
    - b) Primary Underlayment Under Shingles:
      - (1) Synthetic Underlayment: Tiger Paw.
    - c) Secondary Underlayment Under Shingles:
      - (1) Weatherwatch.  
or
      - (2) StormGuard.
  - 3) Owens Corning:
    - a) Note:
      - (1) Duration Premium shingles are available in all areas of the USA and Canada including all Duration Premium colors under LDS Church contract. Request shingles through local distribution.
      - (2) Any questions, contact Manufactures Area Sales Manager.
    - b) Shingles:
      - (1) High Wind: Duration Premium shingles.
    - c) Primary Underlayment Under Shingles:
      - (1) Synthetic Underlayment: Deck Defense High Performance Roof Underlayment.
    - d) Secondary Underlayment Under Shingles:
      - (1) Weatherlock G Granulated Self-Sealing Ice & Water Barrier.  
or
      - (2) Weatherlock Specialty Tile & Metal for High Temperature.  
or
      - (3) Weatherlock Cold Climate for cold weather adhesion and flexibility.

## 2.2 ACCESSORIES

### A. Fasteners:

1. Primary Underlayment:
    - a. Corrosion resistant roofing nails with **one inch** diameter head and **3/4 inch** long shank minimum.
      - 1) If shingles applied as underlayment is laid, use metal or plastic head Simplex roofing nails.
      - 2) If shingles not applied as underlayment is laid, use plastic head only.
    - b. Staples not permitted.
  2. Shingles:
    - a. Design Criteria:
      - 1) Meet following requirements for nails:
        - a) Comply with ASTM F1667, Type I, Style 20-Roofing Nails.
        - b) Eleven gauge galvanized steel or equivalent corrosion-resistant roofing nail.
        - c) Nail head sizes: **3/8 inch** nominal diameter.
        - d) Sufficient length to penetrate through roof sheathing **1/4 inch** or **3/4 inch** minimum into solid wood decking.
        - e) Hot-dipped galvanized or electroplated fasteners comply with requirements of ASTM A153, Class D.
        - f) Stainless-steel fasteners meet requirements of Type 304 (UNS S30400) or Type 316 (UNS S31600).
    - b. General:
      - 1) Hot-dipped galvanized, electroplated non-corrosive gun-driver nails, or stainless steel fasteners may be used.
      - 2) Fasteners within **15 miles** of coastal areas (oceanside) applications must use hot-dipped galvanized or stainless steel.
      - 3) All exposed fasteners (including ridge shingles) must use hot-dipped galvanized or stainless steel.
      - 4) Staples not permitted.
- B. Elastomeric Roofing Sealant:
1. Design Criteria:
    - a. Meet requirements of ASTM D3019.
    - b. Non asphalt roofing cement (not permitted).
    - c. Elastomeric.
    - d. Cold temperature pliability.
    - e. Compatible with roof penetration boots.
  2. Category Four Products And Manufacturers. See Section 01 6200 for definitions of Categories:
    - a. Flintbond SBS Modified Bitumen Caulk by CertainTeed.

## PART 3 - EXECUTION

### 3.1 INSTALLERS

- A. VMR Manufacture's Approved Roofing Installers: See Section 01 4301.
1. All Areas except Utah:
    - a. CertainTeed:
      - 1) Cox Roofing, Springfield, MO (417) 887-3874.
      - 2) Larry L. Vaught Roofing, Inc., Grandview, MO (816) 761-9859.
      - 3) Zucca & Daughters & Sons Roofing Co., Blue Springs, MO (816) 224-6515.
    - b. GAF:
      - 1) Bordner Roofing Co., Contact: Rob Poettgen, (816) 358-2102, [rob.poettgen@bordnerinstall.com](mailto:rob.poettgen@bordnerinstall.com)
      - 2) Olneya Restoration Group, Contact: Samantha Colbert, (314) 432-6100, [scolbert@olneya.com](mailto:scolbert@olneya.com)
      - 3) Redhammer Roof Group, Eric Lueck, (816) 965-6220, [elueck@redhammerroof.com](mailto:elueck@redhammerroof.com)
    - c. Owens-Corning:
      - 1) Armor Roofing & Sales LLC, Contact: David, (417) 583-2358, [david.armorroof@yahoo.com](mailto:david.armorroof@yahoo.com).

- 2) Terry Parsons Roofing, Contact: Terry Parsons, (417) 335-0606, terryparsons@hotmail.com.
- 3) John Cotton Roofing, Joplin, MO (417) 626-8284, jcottenroofing@aol.com.

### 3.2 EXAMINATION

- A. Verification Of Conditions:
  1. Examine deck to determine if it is satisfactory for installation of roofing system. Conditions include, but are not limited to, moisture on deck, protruding deck fasteners, specified gaps between sheathing, and other items affecting issuance of roofing warranty.
    - a. Report unsatisfactory conditions in writing to Architect.
    - b. Commencement of Work by installer is considered acceptance of substrate.
  2. Verify existing soffit and ridge vents meet ventilation code requirements.
    - a. Report inadequate ventilation conditions with recommendations in writing to Architect.

### 3.3 PREPARATION

- A. Protection Of In-Place Conditions:
  1. Install only as much roofing as can be made weathertight each day, including flashing and detail work.
- B. Surface Preparation:
  1. Clean roof deck:
    - a. Remove dirt, protruding nails, shingle nails, and debris, before installation of underlayment.
  2. Roof deck must be dry to help prevent buckling of deck, which can result in deck movement and damage to primary underlayment.
  3. Following Manufacturer's recommendations for placing materials on roof.
    - a. Prevent material from sliding off roof.

### 3.4 INSTALLATION

- A. General:
  1. Schedule and execute work without exposing interior building areas to effects of inclement weather. Protect existing building and its contents against all risks.
- B. Sequence of Roofing Materials as shown and noted on Contract Drawings:
  1. 12 inch strip Secondary Underlayment at Eave.
  2. Metal Drip Edge.
  3. General Secondary Underlayment.
  4. Valley Secondary Underlayment 8' - 6" " wide strip of Secondary Underlayment (3 strips) in Valleys applied over sheathing).
  5. Valley Secondary Underlayment 36 inch wide Primary Underlayment under Valley Metal).
  6. Valley Metal (24 inch wide valley metal 10 ft lengths).
  7. 12 inch strip of Secondary Underlayment over nailed edges (of Valley Metal).
  8. General Primary Underlayment.
  9. Asphalt Shingles, Step Flashings.
  10. Counter Flashing.
- C. Underlayment:
  1. General:
    - a. Temporary Roof:
      - 1) Do not use permanent underlayment installation as temporary roof.
      - 2) If temporary roof is used, remove completely before installation of permanent underlayment.

- b. Follow Shingle Manufacturer's recommendations for installation of primary and secondary underlayment, particularly at eaves, rakes, and penetrations, unless specified installation procedures and Contract Drawing details are more stringent.
  - c. Avoid scuffing underlayment that can compromise surface and cause leaking. If scuffing occurs, following Manufacturer's recommendation for repair.
  - d. Staples are not permitted.
  - e. Weather conditions:
    - 1) Do not leave underlayment exposed to weather more than thirty (30) days after beginning of underlayment installation even if Manufacture allows longer period of time.
    - 2) If underlayment is exposed for more than thirty (30) days after beginning of underlayment installation, treat as temporary roof under first paragraph above.
    - 3) If moisture is deposited on exposed underlayment, obtain written approval from Shingle Manufacturer's Representative before installing shingles.
  - f. Install valley secondary underlayment, valley primary underlayment, and valley metal after installation of general secondary underlayment, but before installation of general primary underlayment.
2. Primary Underlayment:
- a. Apply **48 inch** wide courses over complete deck, including areas covered with secondary underlayment unless specified otherwise.
    - 1) Overlap underlayment before fastening.
    - 2) Maintain end laps of **6 inch** and side laps of **3 inch**.
    - 3) Stop primary underlayment between **3 and 6 inches** of inside edge of strip of secondary underlayment installed over edge of formed valley metal.
  - b. Nailing Synthetic Underlayment:
    - 1) Use low-profile plastic or steel cap corrosion resistant nails with **1 inch** diameter heads to fasten underlayment in place. (Fastening underlayment without caps is not permitted).
    - 2) Nails must be driven properly. Improperly driven fasteners such as over-driving, under-driving and nails driven at an angle are not permitted.
    - 3) Fasteners should be long enough to penetrate at least **3/4 inch into** roof sheathing. Fasteners must be lie flush to roof deck at 90 degree angle to roof deck and tight with underlayment.
    - 4) Do not nail through metal flashing, except drip edge, when installing primary underlayment.
    - 5) Follow Shingle Manufacturer's installation instructions for following:
      - a) Securing underlayment to roof deck adjusting for roof slope nailing requirements.
      - b) Side lap, end lap, and overlapping nailing requirements.
      - c) Rake and eave nailing requirements.
      - d) High wind condition nailing requirements.
      - e) Sealants recommendations.
3. Secondary Underlayment:
- a. Under Shingles:
    - 1) Lap end joints **6 inches** and side joints **3 inch** minimum.
    - 2) Apply continuous **12 inches** wide strip at edge of eaves and rakes before installing drip edge.
    - 3) Apply two (2) **36 inch** wide courses along eaves and rakes as described in Contract Documents with first course overlapping drip edge and **12 inches** wide previously applied strip.
4. Valley Underlayment:
- a. Apply three (3) continuous **36 inch** wide sheets of secondary underlayment in valley lapped so as to provide **102 inch** wide covered area centered over valley.
  - b. Apply one (1) continuous **36 inch** wide strip of primary underlayment atop secondary underlayment and centered over valley.
  - c. Install formed valley metal over strip of primary underlayment.
    - 1) Nail top of each section and lap **8 inches** in direction of flow.
    - 2) Seal laps with continuous bead of elastomeric roofing sealant.
    - 3) Secure edges of valley metal with fasteners spaced at **12 inches** maximum on center and approximately **1/2 inch** in from edge of metal.
  - d. Install **12 inches** wide strips of secondary underlayment lapping nailed edge of formed valley metal **3 inches**.

## D. Shingles:

1. Before installing shingles, inspect underlayment and metal installation with Architect and Owner. Correct improperly installed and damaged material before beginning shingle installation.
2. Racking installation method is not permitted by Owner and will be considered non-conforming work.
3. Starter shingles:
  - a. Manufacturer's starter shingles are required for Warranty.
  - b. Install shingles at eave and rakes in accordance with Shingle Manufacturer's instructions.
  - c. Cut shingles in accordance with Shingle Manufacturer's instructions, or use approved starter course.
  - d. Nail to eave granule side up in continuous mastic bed with cut edge down-slope and edge overhanging eave **3/8 inch** so sealing tabs are at edge of eave.
  - e. Install shingles with maximum exposure recommended by Shingle Manufacturer.
  - f. Lay first course directly over starter strip with ends flush with starter strip at eaves and so joints in starter strip are offset **4 inches** minimum from joints in first course.
4. Lay shingles so end joints are offset in accordance with Shingle Manufacturer's installation procedures.
5. Insure alignment by snapping chalk line at least each fifth course to control horizontal and vertical alignment.
6. Run courses true to line with end joints properly placed. Leave shingles flat without wave and properly placed.
7. Hip and ridge shingles:
  - a. Manufacturer's hip and ridge shingles are required for Warranty.
  - b. Install specified hip and ridge shingles in accordance with Shingle Manufacturer's instructions.
  - c. Run ridge shingles as directed by Architect.
8. Nailing:
  - a. General:
    - 1) Six (6) Nail Pattern as recommended by Shingle Manufacturer in each shingle.
    - 2) Place in relation to top edge of shingle as required by Shingle Manufacturer.
    - 3) Place nails **one inch** from each end of shingle and remainder evenly spaced between.
    - 4) Should any nail fail to penetrate sheathing by **1/4 inch** minimum, drive additional nail nearby.
  - b. Nailing guns:
    - 1) Nails must be driven properly. Improperly driven fasteners such as over-driving, under-driving and nails driven at an angle are not permitted.
    - 2) Adjust nail gun pressure for nailing flush and tight to deck without cutting shingle surface.
    - 3) Drive nails perpendicular to shingle surface so nail head is flat against shingle.
    - 4) Should any nail fail to penetrate sheathing by **1/4 inch** minimum, drive additional nail nearby.
9. Hand-Sealing:
  - a. If ambient temperature or exposure to sun will not be sufficient to secure adhesive strip to under-lying shingle within one week, hand seal shingles with elastomeric roofing sealant.
10. Over valley metal:
  - a. Do not drive nails through valley metal.
  - b. Run chalk line so valley metal will be exposed **6 inches** wide at top and diverge **3/32 inch** per **ft** down to eaves.
  - c. Neatly trim shingles to this line.
  - d. Seal trimmed shingle edges to valley metal with continuous bead of elastomeric roofing sealant applied within **one inch** of shingle edge.
11. Vent pipe sleeve flange:
  - a. Vent pipe sleeve flange as specified in Section 07 6310.
  - b. Fit shingles under lower edge and over sides and upper edge.
  - c. Set vent pipe flange in elastomeric roofing sealant.
  - d. Embed shingles in elastomeric roofing sealant where they overlap flange.
  - e. Apply bead of elastomeric roofing sealant at junction of vent pipe and vent flashing.
12. Furnished and installed in Section 07 7226 'Ridge Vents'.

**3.5 FIELD QUALITY CONTROL**

- A. Non-Conforming Work:
  - 1. Correct any work found defective or not complying with Contract Document requirements at no additional cost to the Owner.
  - 2. Raking installation method is not permitted by Owner and will be considered to be not complying with Contract Document requirements and must be corrected at no additional cost to Owner.

**3.6 CLEANING**

- A. General:
  - 1. All tools and unused materials must be collected at end of each workday and stored properly off finished roof surface and protected from exposure to elements.
  - 2. Leave metals clean and free of defects, stains, and damaged finish.
    - a. Replace fascia metal that is scratched through finish to base metal.
  - 3. Properly clean finished roof surface after completion.
  - 4. Verify drains and gutters are not clogged.
  - 5. Clean shingles and building of soiling caused by this installation.
  - 6. Clean and restore all damaged surfaces to their original condition.
- B. Waste Management:
  - 1. Disposal:
    - a. All work areas are to be kept clean, clear and free of debris at all times.
    - b. Do not allow trash, waste, or debris to collect on roof. These items shall be removed from roof on a daily basis.
    - c. Remove debris resulting from work of this Section from roof and site. Dispose of or recycle all trash and excess material in manner conforming to current EPA regulations and local laws.

**3.7 PROTECTION**

- A. Do not permit traffic over finished roof surface.

**END OF SECTION**

**SECTION 07 6210****GALVANIZED STEEL FLASHING AND TRIM****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install miscellaneous flashing, counterflashing, and hold-down clips as described in Contract Documents and not specified to be of other material.
- B. Products Furnished But Not Installed Under This Section:
  - 1. Miscellaneous sheet metal specialties not specified to be of other materials.
- C. Related Requirements:
  - 1. Section 06 1100: 'Wood Framing' for wood base.
  - 2. Sections under 07 3000 heading: 'Steep Slope Roofing' for installation of gravel stops, copings, scuppers, and miscellaneous roofing related flashing.
  - 3. Section 07 9213: 'Elastomeric Joint Sealant'.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. ASTM International:
    - a. ASTM A653/A653M-13, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
    - b. ASTM A792/A792M-10, 'Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process'.
  - 2. Federal Specifications:
    - a. TT-S-00230C(2) Sealing Compound, Elastomeric Type, Single Component, (For Caulking, Sealing, and Glazing in Buildings and Other Structures).

**PART 2 - PRODUCTS****2.1 SYSTEM**

- A. Manufacturers:
  - 1. Type Two Acceptable Manufacturers Of Metal:
    - a. CMG – Coated Metals Group, Denver, CO [www.cmgmetals.com](http://www.cmgmetals.com).
    - b. Drexel Metals, LLC, Ivyland, PA [www.drexmet.com](http://www.drexmet.com).
    - c. Fabral, Lancaster, PA [www.fabral.com](http://www.fabral.com).
    - d. Firestone Metal Products, Anoka, MN [www.unaclad.com](http://www.unaclad.com).
    - e. MBCI, Houston, TX [www.mbc.com](http://www.mbc.com).
    - f. Metal Sales Manufacturing Corp, Sellersburg, IN [www.mtlsales.com](http://www.mtlsales.com).
    - g. O'Neal Flat Rolled Metals (member of O'Neal Industries), Brighton, CO [www.ofrmetals.com](http://www.ofrmetals.com).
    - h. Petersen Aluminum Corp, Elk Grove, IL [www.pac-clad.com](http://www.pac-clad.com).
    - i. Ryerson, Chicago, IL [www.ryerson.com](http://www.ryerson.com).
    - j. Equal as approved by Architect before installation. See Section 01 6200.
- B. Materials:
  - 1. Sheet Metal:
    - a. Galvanized iron or steel meeting requirements of ASTM A653/A653M, G 90 or Galvalume steel meeting requirements of ASTM A792/A792M AZ50, 50 ksi.

- 1) 22 ga for hold-down clips.
- 2) 24 ga for all other.

C. Fabrication:

1. Form accurately to details.
2. Profiles, bends, and intersections shall be even and true to line.
3. Fold exposed edges 1/2 inch to provide stiffness.

D. Finish:

1. Exposed to view:
  - a. Provide face coating of polyvinylidene Fluoride (PVF<sub>2</sub>) Resin-base finish (Kynar 500 or Hylar 5000) containing seventy (70) percent minimum PVF<sub>2</sub> in resin portion of formula. Thermo-cured two coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
  - b. Reverse side coating shall be thermo-cured system consisting of corrosion inhibiting epoxy primer applied over properly pre-treated metal.
2. Color as selected by Architect from Manufacturer's standard colors.

## 2.2 ACCESSORIES

A. Sealants: Rubber base type conforming to Fed Spec TT-S-00230C.

B. Fasteners:

1. Of strength and type consistent with function.
2. Nails: Hot-dipped galvanized.
3. Screws, Bolts, And Accessory Fasteners: Galvanized or other acceptable corrosion resistant treatment.

C. Roof Diverter:

1. Roof Diverter (Kickout Diverter) required when vertical wall extends beyond lower roof.
  - a. 24 ga galvanized iron or steel meeting requirements for sheet metal specified in materials above.
  - b. Size: 6 inch x 6 inch by 12 inches length.

D. Step Flashing:

1. Step flashing required for steep slope for roof to wall flashing.
  - a. 24 ga galvanized iron or steel meeting requirements for sheet metal specified in materials above.
  - b. Size: 5 inch x 5 inch by 8 inch or 12 inches length.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install with small, watertight seams.
- B. Slope to provide positive drainage.
- C. Provide sufficient hold down clips to insure true alignment and security against wind.
- D. Provide 4 inch minimum overlap.
- E. Allow sufficient tolerance for expansion and contraction.
- F. Insulate work to prevent electrolytic action.



- G. Roof Diverter (Kickout Diverter):
1. Extend roof diverter **1 inch** minimum beyond face edge of lower roof.
  2. Extend underlayment vertically up wall behind flashing.
  3. Solder all joints.
  4. Apply sealant.

### **3.2 CLEANING**

- A. Leave metals clean and free of defects, stains, and damaged finish.

**END OF SECTION**

**BLANK PAGE**

**SECTION 07 6310****STEEP SLOPE ROOF FLASHING: Asphalt Shingles****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Roof flashing including:
    - a. Formed Valley Metal.
    - b. Pipe flashing for vent piping and flues.
    - c. Roof jacks.
    - d. Saddles and curb flashings.
    - e. Miscellaneous flashing.
- B. Related Requirements:
  - 1. Section 07 3113: 'Asphalt Shingles' for installation.
  - 2. Section 07 9213: 'Elastomeric Joint Sealants' for quality of sealants.
  - 3. Division 22: Plumbing vent piping.
  - 4. Division 23: HVAC flues and air piping.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Base Flashing: That portion of flashing attached to or resting on roof deck to direct flow of water onto the roof covering.
  - 2. Cap Flashing: Material used to cover top edge of base flashings or other flashings to prevent water seepage behind base flashing. Cap flashing overlaps base flashing.
  - 3. Collar: Pre-formed flange placed over vent pipe to seal roof around vent pipe opening. Also called vent sleeve.
  - 4. Drip Edge: Non-corrosive, non-staining material used along eaves and rakes to allow water runoff to drip clear of underlying building.
  - 5. Flange: Metal pan extending up and down roof slope around flashing pieces. Usually at plumbing vents.
  - 6. Flashing: Components used to prevent seepage of water into a building around any intersection or projection in a roof such as vent pipes, adjoining walls, and valleys.
  - 7. Metal Flashing: Roof components made from sheet metal that are used to terminate roofing membrane or other material alongside roof perimeters as well as at roof penetrations.
  - 8. Penetration: Any object that pierces surface of roof.
  - 9. Pipe Boot: Prefabricated flashing piece used to flash around circular pipe penetrations. Also known as a Roof Jack.
  - 10. Roof Jack: Term used to describe a Pipe Boot or Flashing Collar.
  - 11. Valley: Internal angle formed by intersection of two sloping roof planes to provide water runoff.
  - 12. Vent: Any outlet for air that protrudes through roof deck such as pipe or stack. Any device installed on roof, gable or soffit for purpose of ventilating underside of roof deck.
  - 13. Vent Sleeve: See collar.
- B. Reference Standards:
  - 1. ASTM International:
    - a. ASTM A653/A653M-15, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
    - b. ASTM A792/A792M-10(2015), 'Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process'.
  - 2. ASTM International: (specifically referenced for pipe flashing only):
    - a. ASTM B117-11, 'Standard Practice for Operating Salt Spray (Fog) Apparatus'.

- b. ASTM E283-04(2012), 'Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen'.
- c. ASTM E330/E330M-14, 'Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference'.
- d. ASTM E331-00(2009), 'Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference'.
- e. ASTM E2140-01(2009), 'Standard Practice for Water Penetration of Metal Roof Panel Systems by Static Water Pressure Head'.

### 1.3 SUBMITTALS

- A. Informational Submittals:
  - 1. Tests And Evaluation Reports:
    - a. Manufacturer's test reports:
    - b. ICC-ESR evaluation report.

### 1.4 WARRANTY

- A. Pipe Flashing:
  - 1. Manufacturer's warranty against defects in materials and workmanship when correctly installed in appropriate application for life of original roofing material from installation or replacement or fifty (50) years whichever is greater.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Manufacturers:
  - 1. Type Two Acceptable Manufacturers:
    - a. CMG – Coated Metals Group, Denver, CO [www.cmgmetals.com](http://www.cmgmetals.com).
    - b. Drexel Metals, LLC, Ivyland, PA [www.drexmet.com](http://www.drexmet.com).
    - c. Fabral, Lancaster, PA [www.fabral.com](http://www.fabral.com).
    - d. Firestone Metal Products, Anoka, MN [www.unaclad.com](http://www.unaclad.com).
    - e. MBCI, Houston, TX [www.mbc.com](http://www.mbc.com).
    - f. Metal Sales Manufacturing Corp, Sellersburg, IN [www.mtlsales.com](http://www.mtlsales.com).
    - g. O'Neal Flat Rolled Metals (member of O'Neal Industries), Brighton, CO [www.ofrmetals.com](http://www.ofrmetals.com).
    - h. Petersen Aluminum Corp, Elk Grove, IL [www.pac-clad.com](http://www.pac-clad.com).
    - i. Ryerson, Chicago, IL [www.ryerson.com](http://www.ryerson.com).
    - j. Equal as approved by Architect before installation. See Section 01 6200.
- B. Formed Valley Metal And Drip Edge:
  - 1. Metal:
    - a. Steel: Minimum **24 ga**, hot-dipped galvanized to meet requirements of ASTM A653/A653M, 1.25 oz/sq ft. or galvalume meeting requirements of ASTM A792/A792M AZ50, 50 ksi.
- C. Fabrication:
  - 1. Valley-ribbed flashing:
    - a. Form accurately to details. Provide formed valley metal in **10 foot** lengths with **one inch** 'V' crimp and break in center to match roof slopes.
  - 2. Profiles, bends, and intersections shall be even and true to line.
- D. Finishes:
  - 1. Face coating polyvinylidene Fluoride (PVF<sub>2</sub>) Resin-base finish (Kynar 500 or Hylar 5000) for coil coating components containing seventy (70) percent minimum PVF<sub>2</sub> in resin portion of formula.

- Thermo-cured two coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
- 2. Reverse side coating of steel flashings to be thermo-cured system consisting of corrosion inhibiting epoxy primer applied over properly pre-treated metal.
- 3. Color as selected by Architect from Manufacturer's standard colors.

## 2.2 ACCESSORIES

- A. Pipe Flashing For Plumbing Vent Lines metal flues, and HVAC Air Piping:
  - 1. Description:
    - a. Ultra-pure high consistency molded one hundred (100) percent silicone rubber pipe boot that prevents cracking and splitting for life of roof.
  - 2. Design Criteria:
    - a. Meet following Tests:
      - 1) ASTM B117 (Salt Spray Test).
      - 2) ASTM E283 (Air Leakage).
      - 3) ASTM E 330 (Uniform Structural Load).
      - 4) ASTM E331 (Water Penetration).
      - 5) ASTM E2140 (Water).
    - b. Material warranty of product for life of roof.
  - 3. 24 ga coated galvanized steel plate.
  - 4. Minimum 4 inch flashing on each side, 6 inch flashing at top, 3 inch flashing at bottom with nailing slots.
  - 5. UV stable solid molded PVC compression collar.
  - 6. Use Ultimate Pipe Flashing for PVC, ABS and IP.
  - 7. Use Ultimate Pipe Flashing and Easy Sleeve for Copper, Cast Iron, or irregular and damaged pipes:
    - a. Black PVC with integral cap.
  - 8. Sizes: 1-1/4 inch 1-1/2 inch 2 inch 3 inch and 4 inch Slope: Flat to 18/12 pitch.
  - 9. Flashing Finish: Face coating polyvinylidene Fluoride (PVF<sub>2</sub>) Resin-base finish (Kynar 500) for coil coating components containing seventy (70) percent minimum PVF<sub>2</sub> in resin portion of formula. Thermo-cured two coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
  - 10. Color: Brown (no other color available).
  - 11. Category Four Approved System Manufacturers. See Section 01 6200 for definitions of Categories:
    - a. Ultimate Pipe Flashing by Lifetime Tool & Building Products LLC, Winchester, VA [www.lifetimetool.com](http://www.lifetimetool.com) (877) 904-1002.
    - b. Ultimate Pipe Flashing and Easy Sleeve by Lifetime Tool & Building Products LLC, Winchester, VA [www.lifetimetool.com](http://www.lifetimetool.com) (877) 904-1002.
- B. Roof Jacks For Metal Flues: Factory-made galvanized steel.
- C. Pipe Flashing For Concentric Piping Flashing Retrofitting:
  - 1. Description:
    - a. Black EPDM Pipe flashing for existing Concentric Piping for reroofing existing roofs (cutting Concentric Roof Termination cap off and replacing is not permitted).
    - b. Weather resistance to withstand ultra violet light and ozone.
    - c. Malleable base to conform to different roof pitches.
    - d. Pipe size: 1/2 inch to 4 inch.
      - 1) On-site customization.
    - e. Fasteners included.
  - 2. Type One Acceptable Products:
    - a. Aztec RF101BP.
    - b. Equal as approved by Architect before bidding. See Section 01 6200.

**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Interface With Other Work:
  - 1. Coordinate with pipe installers for proper size of roof jacks and pipe flashing.
- B. Pipe Flashing:
  - 1. Follow Manufacturer's installation instructions.
- C. Pipe Flashing For Concentric Piping Flashing Retrofitting:
  - 1. Follow Manufacturer's installation instructions including but not limited to:
    - a. Choose appropriate retrofit size.
    - b. Wrap pipe flashing around pipe.
    - c. Apply 100 percent silicone sealant between base, roof, and top of flashing.
    - d. Use fasteners provided.
    - e. Apply cable tie as directed.

**END OF SECTION**

**SECTION 07 6312****PERFORATED METAL SOFFIT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install perforated metal soffit system as described in Contract Documents.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. American Architectural Manufacturers Association:
    - a. AAMA 1402-09, 'Standard Specification for Aluminum Siding Soffit and Fascia'.
- B. Reference Standards:
  - 1. ASTM International:
    - a. ASTM A653/A653M-13, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
    - b. ASTM A792/A792M-10, 'Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process'.
    - c. ASTM E84-13a, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
  - 2. Military Specifications and Standards:
    - a. MIL-DTL-5541F, 'Chemical Conversion Coatings On Aluminum And Aluminum Alloys'. (Superseding MIL-C-5541E) 11-Jul-2006'.

**1.3 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Manufacturer's literature or cut sheet for products furnished.
- B. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Warranty Documentation:
      - 1) Final, executed copy of Warranty.

**1.4 QUALITY ASSURANCE**

- A. Regulatory Agency Sustainability Approvals:
  - 1. Fire Characteristics Performance Requirement:
    - a. Meet requirements of ASTM E84 Class A fire rating.
- B. Qualifications:
  - 1. Installer:
    - a. Minimum three (3) years experience with installations of comparable quality, scope, similar size, and complexity before bidding.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
  - 1. Materials shall be delivered in original, unopened packages with labels intact.
  - 2. Inspect delivered material for damage.
- B. Storage And Handling Requirements:
  - 1. Stack panels on pallets or above ground, covered with weathertight and ventilated covering. Prevent condensation build-up or moisture entrapment in materials.
  - 2. Store panels not in contact with other materials that might cause staining, denting or other surface damage.

## 1.6 WARRANTY

- A. Manufacturer Warranty:
  - 1. Manufacturer's written 20-year guarantee for finish.

## PART 2 - PRODUCTS

### 2.1 SYSTEMS

- A. Manufacturers
  - 1. Type One Acceptable Manufacturers:
    - a. Alcoa Architectural Products, Eastman, GA [www.alcoaarchitecturalproducts.com](http://www.alcoaarchitecturalproducts.com).
    - b. Alside Inc, Cuyahoga Falls, OH [www.alside.com](http://www.alside.com).
    - c. ATAS Aluminum Products, Allentown, PA [www.atas.com](http://www.atas.com).
    - d. Gentek Building Products, Akron, OH and Burlington, ON [www.gentekinc.com](http://www.gentekinc.com).
    - e. Kaycan Ltd, Montreal, QB [www.kaycan.com](http://www.kaycan.com).
    - f. Norandex/Reynolds, Macedonia, OH [www.norandexreynolds.com](http://www.norandexreynolds.com).
    - g. O'Neal Flat Rolled Metals (member of O'Neal Industries), Brighton, CO [www.ofrmetals.com](http://www.ofrmetals.com).
    - h. Petersen Aluminum Corp, Elk Grove, IL [www.pac-clad.com](http://www.pac-clad.com).
    - i. System 3-12L by Rollex, Elk Grove Village, IL [www.rollex.com](http://www.rollex.com).
    - j. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Performance Requirements:
  - 1. Capacities: Installed soffit system shall meet minimum required structural loading conditions when tested in accordance with Test Method No. 4 of AAMA Specification 1402-86.
- C. Materials:
  - 1. **0.019 inch** thick minimum.
  - 2. 'V' groove design complete with matching trim.
  - 3. Panels shall be interlocked full length of panel.
  - 4. Perforated full width of panel with holes designed so one dimension does not exceed **1/8 inch**.
- D. Finish:
  - 1. Face finish shall meet performance requirements of Test Method No. 6 of AAMA Specification 1402-86. Reverse side coating shall pass requirements of paragraphs 1.1 through 1.4 of Test Method No. 6.
  - 2. Double baked enamel to meet or exceed specifications of MIL-DTL-5541F with protective coating on back side.
  - 3. Color as selected by Architect from Manufacturer's standard colors.

### 2.2 ASSESSORIES

- A. Fastening Devices:



1. Non-corrosive screws of length and type recommended by Soffit Manufacturer.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification Of Conditions:
  1. Examine substrate and verify framing is suitable for installation of soffit system.
  2. Notify Architect of unsuitable conditions in writing.
    - a. Do not install soffit over unsuitable conditions.
    - b. Commencement of Work by installer is considered acceptance of substrate.

### **3.2 INSTALLATION**

- A. Conceal fasteners where possible. Paint heads of exposed fasteners to match background.
- B. Isolate from dissimilar metals to prevent electrolytic action.

### **3.3 FIELD QUALITY CONTROL**

- A. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
  1. Correct any work found defective or not complying with contract document requirements including buckling or bowing due to improper installation and touch up of minor scratches and spots at no additional cost to the Owner.

### **3.4 CLEANING**

- A. General:
  1. Clean exposed panel surfaces promptly after installation in accordance with manufacturer's instructions.
- B. Waste Management:
  1. Dispose of waste in provided waste receptacles (dumpsters) as specified in Section 01 7400.

**END OF SECTION**

**BLANK PAGE**

**SECTION 07 6322****STEEL FASCIA****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install metal fascia as described in Contract Documents.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. ASTM International:
    - a. ASTM A653/A653M-13, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
    - b. ASTM A792/A792M-10, 'Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process'.
    - c. ASTM E84-13a, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.

**1.3 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Manufacturer's literature or cut sheet for products furnished.
- B. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Warranty Documentation:
      - 1) Final, executed copy of Warranty.

**1.4 QUALITY ASSURANCE**

- A. Regulatory Agency Sustainability Approvals:
  - 1. Fire Characteristics Performance Requirement:
    - a. Meet requirements of ASTM E84 Class A fire rating.
- B. Qualifications:
  - 1. Installer:
    - a. Minimum three (3) years experience with installations of comparable quality, scope, similar size, and complexity before bidding.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery And Acceptance Requirements:
  - 1. Materials shall be delivered in original, unopened packages with labels intact.
  - 2. Inspect delivered material for damage.
- B. Storage And Handling Requirements:
  - 1. Stack panels on pallets or above ground, covered with weathertight and ventilated covering. Prevent condensation build-up or moisture entrapment in materials.

2. Store panels not in contact with other materials that might cause staining, denting or other surface damage.

## 1.6 WARRANTY

- A. Manufacturer Warranty:
  1. Manufacturer's standard warranty against manufacturer defects.
  2. Manufacturer's written thirty five (35) year warranty on paint finish against cracking, peeling, blistering, chalk, and color change.

## PART 2 - PRODUCTS

### 2.1 ASSEMBLIES

- A. Manufacturers:
  1. Type One Acceptable Manufacturers Of Metal:
    - a. AEP / Span, Dallas, TX [www.aep-span.com](http://www.aep-span.com).
    - b. ATAS Aluminum Products, Allentown, PA [www.atas.com](http://www.atas.com).
    - c. CMG – Coated Metals Group, Denver, CO [www.cmgmetals.com](http://www.cmgmetals.com).
    - d. Drexel Metals, LLC, Ivyland, PA [www.drexmet.com](http://www.drexmet.com).
    - e. Fabral, Lancaster, PA [www.fabral.com](http://www.fabral.com).
    - f. Firestone Metal Products, Anoka, MN [www.unaclad.com](http://www.unaclad.com).
    - g. MBCI, Houston, TX [www.mbc.com](http://www.mbc.com).
    - h. Metal Sales Manufacturing Corp, Sellersburg, IN [www.mtlsales.com](http://www.mtlsales.com).
    - i. O'Neal Flat Rolled Metals (member of O'Neal Industries), Brighton, CO [www.ofrmetals.com](http://www.ofrmetals.com).
    - j. Petersen Aluminum Corp, Elk Grove, IL [www.pac-clad.com](http://www.pac-clad.com).
    - k. Ryerson, Chicago, IL [www.ryerson.com](http://www.ryerson.com).
    - l. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Materials: Minimum **24 ga**, hot-dipped galvanized to meet requirements of ASTM A653/A653M, 1.25 oz/sq ft or galvalume meeting requirements of ASTM A792/A792M AZ50, 50 ksi and complete with accessories recommended by Manufacturer for proper installation.
- C. Fabrication: Fascia may either be shop-fabricated using metal from a specified manufacturer, or a factory-fabricated standard system from a specified manufacturer.
- D. Finishes:
  1. Face coating polyvinylidene Fluoride (PVF<sub>2</sub>) Resin-base finish (Kynar 500 or Hylar 5000) for coil coating components containing 70 percent minimum PVF<sub>2</sub> in resin portion of formula. Thermo-cured two coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
  2. Reverse side coating thermo-cured system consisting of corrosion inhibiting epoxy primer applied over properly pre-treated metal.
  3. Color as selected by Architect from Manufacturer's standard colors.

### 2.2 ACCESSORIES

- A. Fastening Devices: Galvanized steel screws.
- B. Continuous Soffit Vent:
  1. Type Two Acceptable Products:
    - a. Aluminum **8.8 sq in** net free ventilation per **lineal foot**. Width: **2 inches**. Color: white or brown.
      - 1) Mastic VAS70 Vent-A-Strip (Model 70) by Mastic Home Exteriors by Ply Gem Chicago, IL [www.mastic.com/](http://www.mastic.com/).

- b. Aluminum 9.9 sq in net free ventilation per lineal foot. Width: 2-1/4 inches. Color: white or brown.
  - 1) Mastic VAS79 Vent-A-Strip (Model 79) by Mastic Home Exteriors by Ply Gem Chicago, IL [www.mastic.com/](http://www.mastic.com/).
- c. Equal as approved by Architect before installation. See Section 01 6200.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- A. Verification Of Conditions:
  - 1. Examine substrate and verify framing is suitable for installation of fascia.
  - 2. Notify Architect of unsuitable conditions in writing.
    - a. Do not install fascia over unsuitable conditions.
    - b. Commencement of Work by installer is considered acceptance of substrate.

#### **3.2 INSTALLATION**

- A. Conceal fasteners except where details might require a minimum number to be exposed. Paint heads of exposed fasteners to match background.
- B. Install with slip joints at each end. Screw to substrate through pre-drilled, over-size holes.
- C. Isolate from dissimilar metals not part of fascia system to prevent electrolytic action.

#### **3.3 FIELD QUALITY CONTROL**

- A. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
  - 1. Correct any work found defective or not complying with contract document requirements including buckling or bowing due to improper installation and touch up of minor scratches and spots at no additional cost to the Owner.

#### **3.4 CLEANING**

- A. General:
  - 1. Clean exposed panel surfaces promptly after installation in accordance with manufacturer's instructions.
- B. Waste Management:
  - 1. Dispose of waste in provided waste receptacles (dumpsters) as specified in Section 01 7400.

**END OF SECTION**

**BLANK PAGE**

**SECTION 07 7123****MANUFACTURED GUTTERS AND DOWNSPOUTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install gutters and downspouts as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 07 9213: 'Elastomeric Joint Sealant', for quality of sealants for joints.

**1.2 REFERENCES**

- A. Reference Standard:
  - 1. Sheet Metal & Air Conditioning Contractors National Association Inc:
    - a. SMACNA Architectural Sheet Metal Manual, (7th edition 2012).

**1.3 SUBMITTALS**

- A. Action Submittals:
  - 1. Shop Drawings: Show gutter cross-section, mounting method, gauge of metal, expansion joint design and locations, and downspout locations minimum.

**PART 2 - PRODUCTS****2.1 ASSEMBLIES**

- A. Manufacturers:
  - 1. Type Two Acceptable Manufacturers of Metal:
    - a. ATAS Aluminum Products, Allentown, PA [www.atas.com](http://www.atas.com).
    - b. CMG – Coated Metals Group, Denver, CO [www.cmgmetals.com](http://www.cmgmetals.com).
    - c. Fabral, Jackson, GA [www.fabral.com](http://www.fabral.com).
    - d. Firestone Metal Products, Anoka, MN [www.unaclad.com](http://www.unaclad.com).
    - e. MBCI, Houston, TX [www.mbc.com](http://www.mbc.com).
    - f. Metal Sales Manufacturing Corp, Sellersburg, IN [www.mtsales.com](http://www.mtsales.com).
    - g. O'Neal Flat Rolled Metals (member of O'Neal Industries), Brighton, CO [www.ofrmetals.com](http://www.ofrmetals.com).
    - h. Petersen Aluminum Corp, Elk Grove, IL [www.pac-clad.com](http://www.pac-clad.com).
    - i. Reynolds Metals Company, Richmond, VA [www.rmc.com](http://www.rmc.com).
    - j. Ryerson, Chicago, IL [www.ryerson.com](http://www.ryerson.com).
    - k. Equal as approved by Architect before installation. See Section 01 6200.
- B. Materials
  - 1. Steel:
    - a. Downspouts: Rectangular, 26 ga 0.0217 inches - galvanized steel including necessary elbows.
    - b. Gutters: 24 ga 0.0276 inches galvanized steel.
    - c. Brackets: 22 ga 0.0336 inches galvanized steel or 26 ga 0.0217 inches double-hemmed minimum.
    - d. Brackets: 0.06 inch minimum aluminum.

2. Screws, Bolts, Nails, And Accessory Fasteners: Non-corrosive and of strength and type consistent with function.
  3. Downspouts, gutters, brackets, fasteners, and accessories shall be compatible material.
- C. Fabrication:
1. Fabricate in accordance with SMACNA Architectural Manual recommendations, where applicable.
  2. Cross-sectional configuration of gutter shall match existing.
  3. Form accurately to details.
  4. Profiles, bends, and intersections shall be even and true to line.
  5. Provide matching prefinished metal spacers behind gutters to accommodate slope of fascia.
- D. Finishes:
1. Metal exposed to view shall have face coating of polyvinylidene Fluoride (PVF<sub>2</sub>) Resin-base finish (Kynar 500 or Hylar 5000) containing seventy (70) percent minimum PVF<sub>2</sub> in resin portion of formula.
    - a. Thermo-cured two (2) coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
    - b. Reverse side coating shall be thermo-cured system consisting of corrosion inhibiting epoxy primer applied over properly pre-treated metal.
  2. Color as selected by Architect from Manufacturer's standard colors.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Protection Of In-Place Conditions:
1. Before starting work, verify governing dimensions at building. Inspect for conditions that would prevent installation of specified system. Do not install over improper conditions.
  2. Insulate work from fascia as necessary to prevent electrolytic action.

### **3.2 INSTALLATION**

- A. Allow no more than **40 feet** between downspouts. Lap joints in downspouts **1-1/2 inches** minimum in direction of water flow.
- B. Furnish and install outlet tubes and gutter ends where required. Furnish and install expansion joints in runs exceeding **50 feet** and in runs that are restrained at both ends. Lap other joints in gutter **one inch** minimum, apply sealant in lap, and stainless steel rivet **one inch** on center maximum.

### **3.3 FIELD QUALITY CONTROL**

- A. Field Tests:
1. At completion of this work, block downspouts and flood gutters.
  2. Notify Architect two (2) working days before testing.
  3. Repair leaks and adjust for proper drainage.

### **3.4 CLEANING**

- A. Leave metals clean and free of defects, stains, and damaged finish.

**END OF SECTION**



**SECTION 07 7126****REGLETS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under this Section:
  - 1. Reglets.
- B. Related Requirements:
  - 1. Section under 04 2000 heading: Installation in masonry joints.
  - 2. Section under 07 3000 heading: Surface-mounted Installation.
  - 3. Section under 07 5000 heading: Surface-mounted Installation.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Galvanized Reglets:
  - 1. Type Two Acceptable Products:
    - a. Fry Springlock Reglets by Fry Reglet Corp, Alhambra, CA [www.fryreglet.com](http://www.fryreglet.com).
    - b. Equal as acceptable to Roofing System Manufacturer and approved by Architect before installation. See Section 01 6200.
    - c. Manufacturer and approved by Architect before installation. See Section 01 6200.

**PART 3 - EXECUTION: Not Used****END OF SECTION**

**BLANK PAGE**

**SECTION 07 7226****RIDGE VENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Ridge vent system consisting of:
    - a. Ridgevent Cover.
    - b. Splice Plate.
    - c. Metal Screen.
    - d. Intermittent Spacer Brackets.
    - e. Z-Brackets.
    - f. End Cap.
    - g. Deflector.
- B. Related Requirements:
  - 1. Section 07 3113: 'Asphalt Shingles' for ridge vent installed over Asphalt Shingle roofing.
  - 2. Section 07 9213: 'Elastomeric Joint Sealants'.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Balanced System: Equal amounts of intake net free area ventilation low at roof's edge or in soffit and exhaust net free area ventilation at or near the ridge.
  - 2. Bernoulli Effect: Phenomenon whereby low pressure resulting from wind passing over a structure or object creates pulling or lifting action.
  - 3. Exhaust Vent: Outlet or opening installed high on roof near ridge or in gable for purpose of ventilating underside of roof deck (attic space).
  - 4. External Wind Baffle: Built-in wing or lip on ridge vent that deflects wind up and over vent creating Bernoulli Effect that enhances airflow performance by pulling or lifting the air out of attic. It also deflects weather elements over vent away from attic.
  - 5. Intake Vent: Inlet or opening installed low at roof's edge or in soffit or under eave area for purpose of ventilating underside of roof deck (attic space).
  - 6. Net Free Area (NFA): Total unobstructed area (adjusted for insect screen, louvers and weather coverings) through which air can pass through a vent; generally measured in square inches. All non-powered vents have a Net Free Area rating.
  - 7. Stainless Steel: Stainless steels are alloys of iron to which at least 10 percent chromium has been added to increase corrosion resistance and will not rust when exposed to weather. To obtain greater corrosion resistance, more nickel and chromium are added to the alloy. Along with iron and chromium, all stainless steels contain some carbon to make it stronger.
    - a. Austenitic Stainless Steel: Most popular of the stainless steels because of their ductility, ease of working and good corrosion resistance.
  - 8. Vent: Any device installed in a roof, gable or soffit for purpose of ventilating underside of roof deck. Any outlet for air that protrudes through roof deck such as pipe or stack.
  - 9. Wind Uplift: Wind-induced forces on roof system or components in roof system. Wind uplift generally includes negative pressure component caused by wind being deflected around and across surfaces of building and positive pressure component from air flow beneath roof deck.
- B. Reference Standards:
  - 1. ASTM International:
    - a. ASTM A653/A653M-13, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.

- b. ASTM A792/A792M-10, 'Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process'.
  - c. ASTM B117-11, 'Standard Practice for Operating Salt Spray (Fog) Apparatus'.
  - d. ASTM C920-14, 'Standard Specification for Elastomeric Joint Sealants'.
  - e. ASTM G23
  - f. ASTM G152-13, 'Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials'.
- 2. International Building Code (IBC) (2006 code):
    - a. Chapter 12, 'Interior Environment':
      - 1) Section 1203, 'Ventilation':
        - a) 1203.2, 'Attic Spaces'.
    - b. Chapter 16, 'Structural Design'.
      - 1) Section 1609 'Wind Loads'.
        - a) 1609.3, 'Basic Wind Speed'.
- 3. International Code Council Evaluation Services (ICC-ES):
    - a. AC132, 'Acceptance Criteria For Attic Vents' (February 2010).

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
  - 1. Participate in pre-installation conference held jointly with Section 07 3113.
  - 2. In addition to agenda items specified in Section 01 3100, review following:
    - a. Review if Project is in high wind area.
    - b. Review Ridge Vent Manufacturers ventilation cutout requirements on roof deck and location of ventilation cutouts shown on Contract Documents.
- B. Sequencing:
  - 1. Coordinate installation with roof membrane.

### 1.4 SUBMITTALS

- A. Informational Submittals:
  - 1. Manufacturer Instructions:
    - a. Design details.
    - b. Published ridge vent installation instructions for R&I projects.
    - c. Storage and handling requirements.
- B. Informational Submittals:
  - 1. Certificates:
    - a. Manufacturer's Certificates of compliance showing products meet or exceed specified requirements.
  - 2. Tests And Evaluation Reports:
    - a. Manufacturer's test reports.
    - b. Wind speed coverage for warranted wind speed.
  - 3. Special Procedure Submittals:
    - a. Installer to fill out Attachment for Warranty Information to be given to Ridge Vent Manufacturer before Manufacture will issue Warranty.
- C. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Warranty Documentation:
      - 1) Final, executed copy of Warranty.

### 1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
  - 1. Ridge Vent System:

2. Wind Speed:
  - a. As required to meet local codes having jurisdiction.

B. Qualifications:

1. Manufacturer:
  - a. Company specializing in manufacturing products specified with this section with at least five (5) years experience and no known failures of specified product manufactured.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:

1. Deliver products job site in original unopened containers or wrappings.
2. Deliver materials in sufficient quantities to allow continuity of work.

B. Storage And Handling Requirements:

1. Storage Requirements:
  - a. Follow Manufacturer's instructions and precautions for storage of materials.
  - b. Protect materials from physical damage in a clean, dry, well vented, and protected location.
2. Handling Requirements:
  - a. Handle material so as to prevent damage.

## 1.7 WARRANTY

A. Manufacturer Warranty:

1. General:
  - a. Ridge vent system will provide calculated net free area (NFA) stated design.
  - b. Warranty starts at completion of installation.
  - c. Warranty covers replacement cost excluding labor and any costs involved with repairing or replacing other roofing or building materials.
2. Manufacturer's thirty (30) year warranty covering:
  - a. Kynar 500 paint and finish warranty covering color fade, chalk, and film integrity for ridge vent system.
3. Manufacturer's twenty (20) year warranty covering:
  - a. Ridge vent system to be free from defects that will affect its performance.
  - b. Ridge vent system will withstand winds up to **120 mph** average wind speed.
  - c. Ridge vent system will withstand snow load.

## PART 2 - PRODUCTS

### 2.1 SYSTEM

A. Manufacturers:

1. Category One VMR Products And Manufacturers. See Section 01 6200 for definitions of Categories:
  - a. Metal-Era Airflow Solutions, Waukesha, WI [www.metalera.com](http://www.metalera.com).
    - 1) Contact Information: Marlea Knox (800) 558-2162 [thechurch@metalera.com](mailto:thechurch@metalera.com).

B. Materials:

1. Description / Design Criteria:
  - a. Ridge Vent:
    - 1) Slope to Slope Version (Model HPSS):
      - a) Weather-proof and bug-proof ventilation system.
      - b) Withstand winds up to **120 mph** average wind speed.
      - c) Intermittent spacers at **12 inch** on center for snow load.
      - d) Provide net free area (NFA) requirements as determined by vented roof deck system and eave condition as indicated on Contract Drawings.

- 2) Slope to High Wall Version (Model HPSH):
    - a) Weather-proof and bug-proof ventilation system.
    - b) Withstand winds up to **120 mph** average wind speed.
    - c) Provide net free area (NFA) requirements as determined by vented roof deck system and eave condition as indicated on Contract Drawings.
  - 3) Net free area (NFA):
    - a) Net free area: **6 sq in** per lineal **foot**.
2. Components:
- a. Ridge vent system comprising of following:
    - 1) Cover plate **8 inch** wide at each joint over ridge vent cover.
    - 2) Continuous deflector with baffle.
    - 3) Continuous Z bracket with intermittent spacer at **12 inch** on center to supporting ridge cover.
    - 4) End cap / cover plate.
    - 5) Expanded metal support screen.
    - 6) Fasteners.
    - 7) Intermittent spacers at **12 inch** on center directly under ridge vent cover.
    - 8) Ridge vent cover in **12 feet** length.
  - b. Metal:
    - 1) **24 ga (0.0276 in)** minimum hot-dipped galvanized to meet requirements of ASTM A653/A653M, **1.25 oz per sq ft** or galvalume meeting requirements of ASTM A792/A792M AZ50.
    - 2) Aluminum: 0.040 inch, 0.050, 0.063 inch.
  - c. Expanded metal support screen:
    - 1) **0.050 inch** 3003-H14 formed aluminum with minimum of 48 percent open area.
  - d. Z brackets: **20 gauge (0.0396 in)** G90 galvanized steel.
  - e. Deflector: **24 ga (0.0276 in)** minimum.
- C. Finishes:
1. Ridge vent and accessories:
    - a. Polyvinylidene Fluoride (PV<sub>2</sub>) Resin-base finish (Kynar 500) for coil coating components containing seventy (70) percent minimum PVF<sub>2</sub> in resin portion of formula. Thermo-cured two coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
    - b. Approved Color: Medium Bronze.

## 2.2 ACCESSORIES

- A. Ridge Vent System:
1. End Caps, Cover Plates, and other accessories necessary for proper installation.
- B. Fasteners:
1. Ridge vent fastened to structure:
    - a. Fasteners shall be approved by Manufacturer and provide minimum pull out resistance of **240 lbf** into substrate when tested in accordance with TAS 105 test protocol.
    - b. New Buildings:
      - 1) #9 **1-1/2 inches** stainless steel screws.
      - 2) Provided by Manufacturer.
    - c. Existing Buildings:
      - 1) #9 **1-1/2 inches** stainless steel screws.
      - 2) Provided by Manufacturer.
      - or
      - 3) Fasteners provided by Installer consistent with manufacturer's instructions for each product that is suitable for substrate to which it is being installed.
    - d. No nailing permitted.
- C. Sealant:
1. Description:
    - a. Weathersealing expansion, contraction, perimeter, and other movement joint sealant.

2. Design Criteria:
  - a. As specified in Section 07 9213 'Elastomeric Joint Sealants'.
  - b. Meet following standards for Sealant:
    - 1) ASTM C920: Type S Grade NS, Class 25 (min) Use O.
    - 2) 100 percent silicone.
3. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
  - a. Dow Corning: 790 Silicone Building Sealant.
  - b. Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS2350 Silicone Elastomeric Sealant.
  - c. Tremco: Tremsil 600 Silicone Sealant.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification Of Conditions:
  1. Verify Ridge Vent Manufacturers ventilation cutout requirements on roof deck and location of ventilation cutouts shown on Contract Documents to verify correct location for all cutouts.
    - a. Make adjustments to ventilation cutouts if necessary before installation of ridge vent.
  2. Examine deck to determine if it is satisfactory for installation of ridge vent system.
    - a. Conditions include, but are not limited to, moisture on deck and protruding deck fasteners.
    - b. Verify substrate is dry, clean and free of foreign matter.
  3. Do not begin installation until substrates have been properly prepared.

### **3.2 PREPARATION**

- A. Surface Preparation:
  1. Clean roof sheathing, including removal of dirt, shingle nails, and debris, before installation of ridge vent system.

### **3.3 INSTALLATION**

- A. General:
  1. Schedule and execute work without exposing interior building areas to effects of inclement weather. Protect existing building and its contents against all risks.
- B. Ridge Vent:
  1. Install in accordance with IBC Section 1503.2 'Flashing'.
  2. Install in accordance and as shown with Manufacturer's installation instructions for assembly of components and attachment to roof deck:
  3. Use provided fasteners consistent with manufacturer's instructions, suitable for substrate to which it is being installed.
  4. Attach to roof/wall structure with stainless steel screws provided by Manufacturer at spacing required by Manufacturer. All nail heads and vent section joints shall be sealed with silicone sealant.
  5. Remove protective film before applying sealant.
  6. Apply sealants as per Manufacturer's installation instructions.

### **3.4 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

**3.5 CLEANING**

- A. General:
  - 1. Properly clean finished roof surface after completion.
- B. Waste Management:
  - 1. Disposal:
    - a. General:
      - 1) Remove debris resulting from work of this Section from roof and site. Dispose of or recycle all trash and excess material in manner conforming to current EPA regulations and local laws.

**END OF SECTION**

**ATTACHMENTS**



## WARRANTY INFORMATION

- Installer required to provide mandatory information to Ridge Vent Manufacturer to be included in Manufacturer Warranty as described in this specification to be included with Closing Submittals.
- Installer to contact Owner's Representative for following information to be included in warranty.

Description	Information Required	Notes
Name of Owner	( )	FM Group
Mailing Address	( )	FM Office Address
Property ID	( )	Property No.
Site Address	( )	Project Site Address
Date roof completion	( )	Date

Provide any addition data required from Ridge Vent Manufacturer as needed.

BLANK PAGE

**SECTION 07 8400****FIRESTOPPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install firestopping not involving penetrations as described in Contract Documents.
  - 2. Quality of firestopping materials and systems used for penetrations on Project, including submittal requirements.
- B. Related Requirements:
  - 1. Furnishing and installing of penetration firestopping specified under Section installing work penetrating structure.
  - 2. Section 05 4010: 'Cold-Formed Load-Bearing Metal Framing' for top runner firestop track in metal stud walls allowing partition heads to expand and contract with movement of structure.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. Firestop Contractors International Association (FCIA):
    - a. FCIA *'Manual of Practice'* (6th Edition).
- B. Definitions:
  - 1. Trade Terms Applicable to this Specification:
    - a. Annular space: Opening around a penetrating item.
    - b. Exposed Penetration Firestopping: Products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E84.
    - c. F Rating: The time period that the through-penetration firestop system limits spread of fire through penetration when tested in accordance with ASTM E814 or UL 1479.
    - d. Fire-Resistant Joint System: Assemblage of specific materials or products that are designed, tested and fire-resistance rated in accordance with either ASTM E1966 or UL 2079 to resist for prescribed period of time passage of fire through joints made in or between fire-resistance-rated assemblies.
    - e. Firestopping: Process whereby certain materials, some of them specially manufactured, are used to resist (or stop) spread of fire and its byproducts through openings made to accommodate penetrations in fire-rated walls, floors and floor/ceiling assemblies.
    - f. Intumescent Materials: Expand in volume when exposed to heat or flames exceeding specified temperature.
    - g. Joint: Linear opening in or between adjacent fire-resistance-rated assemblies that is designed to allow independent movement of building in any plane caused by thermal, seismic, wind or any other loading.
    - h. Membrane Penetration: Opening made through one side (wall, floor or ceiling membrane) of assembly.
    - i. Membrane-Penetration Firestop: Material, device or construction installed to resist for prescribed time period passage of flame and heat through openings in protective membrane in order to accommodate cables, cable trays, conduit, tubing, pipes or similar items.
    - j. Penetration - Opening created in membrane or assembly to accommodate penetrating items for electrical, mechanical, environmental, and communication systems.
    - k. Penetration Firestop System:
      - 1) Specific construction consisting of materials that protect opening around penetrating items to resist spread of fire and passage of smoke and other gases to resist passage of fire through penetrations for prescribed period of time. Penetration firestopping

systems shall be compatible with one another, with substrates forming openings, and with penetrating items if any. Tested in accordance with ASTM E814 or UL 1479.

- l. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at positive pressure differential of **0.01-inch wg**
    - 1) Fire-resistance-rated walls include, fire walls, fire-barrier walls, smoke-barrier walls, and fire partitions.
    - 2) F-Rating: Not less than the fire-resistance rating of constructions penetrated.
  - m. Penetrations in Horizontal Assemblies: Penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at positive pressure differential of **0.01-inch wg**
    - 1) Horizontal assemblies include floors, floor/ceiling assemblies, and ceiling membranes of following:
      - a) F-Rating: At least 1 hour, but not less than fire-resistance rating of constructions penetrated.
      - b) T-Rating: At least 1 hour, but not less than fire-resistance rating of constructions penetrated except for floor penetrations within cavity of wall.
  - n. Penetrations in Smoke Barriers: Penetration firestopping with ratings determined per UL 1479.
    - 1) L-Rating: Not exceeding **5.0 cfm/sq. ft.** of penetration opening at 0.30-inch wg (74.7 Pa) at both ambient and elevated temperatures.
  - o. T Rating: Time period that penetration firestop system, including penetrating item, limits maximum temperature rise to **325 deg F** above its initial temperature through penetration on nonfire side when tested in accordance with ASTM E814 or UL 1479.
  - p. Through Penetration: Opening that passes through entire assembly.
  - q. Through-Penetration Firestop System: Assemblage of specific materials or products that are designed, tested and fire-resistance rated to resist for prescribed period of time spread of fire through penetrations. F and T rating criteria for penetration firestop systems shall be in accordance with ASTM E814 or UL 1479. See definitions of 'F Rating' and 'T Rating'.
  - r. W-Rating: Penetration firestopping showing no evidence of water leakage when tested according to UL 1479.
- C. Reference Standards:
1. American Society For Testing And Materials:
    - a. ASTM E84-15b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
    - b. ASTM E119-15, 'Standard Test Methods for Fire Tests of Building Construction and Materials'.
    - c. ASTM E814-13a, 'Standard Test Method for Fire Tests of Penetration Firestop Systems'.
    - d. ASTM E1996-15, 'Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes'.
  2. International Building Code (IBC) (2006, 2009, 2012, 2015 IBC Code or latest edition available):
    - a. Chapter 7, 'Fire And Smoke Protection Features':
      - 1) Section 703, 'Fire-Resistance Ratings And Fire Tests':
  3. Underwriters Laboratories:
    - a. UL 'Fire Resistance Directory', current edition, contains listing of approved Penetration Firestop Systems:
      - 1) Through-penetration firestop devices.
      - 2) Fire resistance ratings.
      - 3) Through-penetrations firestop systems.
      - 4) Fill, void, or cavity material.
    - b. UL 263, 'Fire Tests of Building Construction and Materials' (14th Edition).
    - c. UL 723, 'Surface Burning Characteristics of Building Materials' (10th Edition).
    - d. UL 1479, 'Standard for Safety for Fire Tests of Through-Penetration Firestops' (4th Edition).
    - e. UL 2079, 'Tests for Fire Resistance of Building Joint Systems' (5th Edition).

### 1.3 ADMINISTRATIVE REQUIREMENTS

#### A. Coordination:

1. Coordinate construction of openings and penetrating items to ensure that firestopping assemblies are installed in compliance with specific requirements.
2. Coordinate sizes of sleeves, openings, core drilled holes, or cut openings to accommodate through-penetration firestop systems.

B. Sequencing:

1. Perform work of this section in proper sequence to prevent damage to firestop system and to ensure installation will occur prior to enclosing or concealing work. Firestopping shall precede finishing of gypsum board.
  - a. Do not conceal firestopping installations until inspection agency or authorities having jurisdiction, as required, have examined each installation.

## 1.4 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
  - a. Show each type of Penetration Firestop System to be used on Project with design approval reference number.
  - b. Identify locations where each type of Penetration Firestop System is to be installed.

## 1.5 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:

1. Conform to applicable building codes for fire resistance ratings.
2. Comply with installation requirements and protocol outlined in Firestop Contractors International Association 'FICIA' Manual of Practice' handbook.
3. Each Penetration Firestop System shall be UL/ULC listed for that type of penetration occurring on Project.
4. Ratings shall be in accordance with ASTM E814, UL 1479, or IBC Section 703, "Fire-Resistance Ratings And Fire Tests' as acceptable to local code authority.
  - a. Provide Firestop Systems with F Ratings not less than Fire-Resistance Rating of Constructions penetrated.
  - b. Provide Firestop Systems with T and F Ratings, as determined per ASTM E814.
  - c. Provide Joint Sealants with Fire-Resistance Ratings as determined per ASTM E119.
  - d. Provide Products with Flame-Spread values of less than 25 and smoke developed values of less than 450, as determined per ASTM E84.
  - e. Surface burning characteristics (per ASTM E84): 25 or less. Tested in accordance with UL 1479 or ASTM E814.

B. Qualifications:

1. Manufacturer Qualifications:
  - a. Company that specializes in manufacturing the type of products specified, with minimum of five (5) years of documented experience.
2. Installer Qualifications:
  - a. Installer who is certified and licensed or qualified by firestopping manufacturer as having been provided necessary training to install firestop products per specified requirements with not less than five (5) years of documented experience.
3. Upon request, submit documentation.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:

1. Deliver firestopping materials to Project Site in original, new unopened containers or packages bearing manufacturer's printed labels.

B. Storage And Handling Requirements:

1. Store and handle firestopping materials in compliance with manufacturers written instructions.
2. Protect materials from freezing or overheating and to prevent deterioration or damage due to moisture, temperature changes, contaminants or other causes.
3. Store materials off floor at temperatures between 40 deg F and 90 deg F or as re

## 1.7 FIELD CONDITIONS

### A. Ambient Conditions:

1. Temperature: Do not install firestopping materials when ambient or substrate temperatures are outside limits permitted by manufacturer of firestopping materials.
2. Humidity and Moisture: Do not install the Work of this Section under conditions that are detrimental to the application, curing, and performance of the materials.
3. Ventilation: Provide sufficient ventilation wherever firestopping materials are installed in enclosed spaces. Follow manufacturer's recommendations.

## 1.8 WARRANTY

### A. Manufacturer Warranty:

1. Firestop materials shall be free from cracking, checking, dusting, flaking, spalling, separation, and blistering for period of 10 years from Date of Substantial Completion. Reinstall or repair such defect or failures at no cost to Owner.

## PART 2 - PRODUCTS

### 2.1 SYSTEMS

#### A. Manufacturers:

1. Type Two Acceptable Manufacturers:
  - a. Members of International Firestop Council [www.firestop.org](http://www.firestop.org) and member in good standing.
  - b. Equal as approved by Architect before installation. See Section 01 6200.

#### B. Materials:

1. General:
  - a. Sealant, packing material, or collar system required by Firestop Manufacturer for Firestop Penetration System to comply with listed design.
  - b. Primers, sleeves, forms, insulation, packing, stuffing, and accessories: Type required for tested assembly design.
2. Firestopping Assembly Requirements:
  - a. Head-of-Wall Firestopping at Joints Between Non-Rated Floor and Fire-Rated Wall: Use any system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of floor or wall, whichever is greater.
  - b. Floor-to-Floor, Wall-to-Wall, and Wall-to-Floor Joints, Except Perimeter, Where Both Are Fire-Rated: Use any system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
  - c. Through Penetration Firestopping: Use any system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
3. Firestopping System:
  - a. Any material meeting requirements.
4. Firestop Tracks (Metal Stud Framing):
  - a. Metal Stud Manufacturer's top runner manufactured to allow partition heads to expand and contract with movement of structure while maintaining continuity of fire-resistance-rated assembly by factory applied cured intumescent fire stop material affixed to steel profile; in thickness not less than indicated for studs and in width to accommodate depth of studs.
    - 1) Type Two Acceptable Products:

- a) BlazeFrame Deflection Track by ClarkDietrich Buiding Systems.
- b) Equal as approved by Architect before bidding. See Section 01 6200.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification Of Conditions:
  - 1. Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
  - 2. Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, scale, laitance, rust, release agents, water repellents, and any other substances that may inhibit optimum adhesion.
  - 3. Verify ducts, piping, equipment, and other similar items that would interfere with application of firestopping shall be in place.
  - 4. Do not commence Work until unsatisfactory conditions have been corrected.
    - a. Commencement of installation constitutes acceptance of conditions and responsibility for satisfactory performance.

### **3.2 PREPARATION**

- A. Protection Of In-Place Conditions:
  - 1. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
  - 2. Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work. Remove tape as soon as it is possible to do so without disturbing firestopping seal with substrates.
- B. Surface Preparation:
  - 1. Clean out openings, control, and expansion joints immediately before installation of through-penetration firestopping. Comply with recommendations of firestopping manufacturer and the following requirements:
    - a. Remove foreign materials from surfaces of openings and joint substrates, and from penetrating items that could interfere with adhesion of firestopping.
    - b. Clean opening and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
    - c. Remove laitance and form release agents from concrete.
    - d. Do not apply firestopping materials to surfaces which have been previously painted or treated with sealer, curing compound, water repellent, or other similar coating, unless application has been accepted by manufacturer of firestopping products.
    - e. Install damming materials, as recommended by sealant manufacturer, to hold sealant in place.
  - 2. Priming:
    - a. Prime substrates where recommended by firestopping manufacturer using manufacturer's recommended products and methods.
    - b. Confine primers to areas of bond. Do not allow spillage and migration onto exposed surfaces.
    - c. Apply prime coat in compliance with manufacturer's instructions.

### **3.3 INSTALLATION**

- A. General:
  - 1. Install firestopping in accordance with Manufacturer's instructions for installation of firestopping products.

2. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
3. Do not cover installed firestopping until inspected by authority having jurisdiction.

### **3.4 PROTECTION**

- A. Protect surfaces adjacent to through-penetration firestops with suitable covering 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 that would be caused by cleaning methods used to remove smears from firestopping materials.
- B. Protect firestopping during and after curing period from contact with contaminating substances, or damage resulting from adjacent Work.

### **3.5 CLEANING**

- A. Clean off excess fill materials and sealants adjacent to penetrations by methods and cleaning materials recommended by manufacturers of firestopping products and of products in which penetrations occur.

**END OF SECTION**



**SECTION 07 9213****ELASTOMERIC JOINT SEALANTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install sealants not specified to be furnished and installed under other Sections.
  - 2. Quality of sealants to be used on Project not specified elsewhere, including submittal, material, and installation requirements.
- B. Related Requirements:
  - 1. Removing existing sealants specified in Sections where work required.
  - 2. Furnishing and installing of sealants is specified in Sections specifying work to receive new sealants.
- C. Products Furnished But not Installed Under This Section:
  - 1. Interior Ceramic Tile Joint Sealants:
- D. Related Requirements:
  - 1. Section 09 3013: 'Ceramic Tiling'.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. American Architectural Manufacturers Association (AAMA):
    - a. 'Voluntary Specifications and Test Methods for Sealants'.
  - 2. ASM International:
    - a. 'Adhesives and Sealants', Volume 3, ASM International Handbook Committee, (May 1999).
    - b. Committee C24 on Building Seals and Sealants for various Specifications, Guides, Test Methods, and Practices related to sealant specifying and application.
    - c. Committee E6 on Building Performance for various Specifications, Guides, Test Methods, and Practices related to sealant use with air barriers, vapor retarders, and exterior enclosure systems and materials.
  - 3. The Adhesive and Sealing Council, Inc. (ASC) / Sealant, Waterproofing & Restoration Institute (SWR Institute):
    - a. 'Sealants: The Professional's Guide'.
    - b. 'Joint Sealants, Whole Building Design Guide'.
- B. Definitions:
  - 1. Adhere: To cause two surfaces to be held together by adhesion.
  - 2. Adhesive: An adhesive, as defined by The American Society for Testing and Materials (ASTM), is 'a substance capable of holding materials together by surface attachment'.
  - 3. Caulk: Caulks have variety of definitions but are generally recognized as materials used in applications where only minor elastomeric properties are needed.
  - 4. Elastomer: Rubbery material which returns to approximately its original dimensions in short time after relatively large amount of deformation.
  - 5. Flow: Movement of adhesive during bonding process before adhesive is set.
  - 6. Joint: Location at which two substrates are held together with layer of adhesive.
  - 7. Primer: Coating applied to surface, prior to application of an adhesive, to improve performance of the bond.
  - 8. Sealant. Sealants are generally used in applications where elastic properties are needed while adhesives are generally used in applications where bonding strength and rigidity are needed.

- With technology advancements both sealants and adhesives can be used interchangeably depending on applications performance requirements.
9. Sealant Types and Classifications:
    - a. ASTM Specifications:
      - 1) Type:
        - a) Type S: Single-component sealant.
        - b) Type M: Multi-component sealant.
      - 2) Grade:
        - a) Grade P: Pourable or self-leveling sealant used for horizontal traffic joints.
        - b) Grade NS: Non-sag or gunnable sealant used for vertical and non-traffic joints.
      - 3) Classes: Represent movement capability in percent of joint width.
        - a) Class 100/50: Sealant that, when tested for adhesion or cohesion under cyclic movement shall withstand of at least 100 percent increase and decrease of at least 50 percent of joint width as measured at time of application.
        - b) Class 50: Sealant that, when tested for adhesion or cohesion under cyclic movement shall withstand increase and decrease of at least 50 percent of joint width as measured at time of application.
        - c) Class 25: Sealant that, when tested for adhesion or cohesion under cyclic movement shall withstand increase and decrease of at least 25 percent of joint width as measured at time of application.
        - d) Class 12: Sealant that, when tested for adhesion and cohesion under cyclic movement shall withstand increase and decrease of at least 12 percent of joint width as measured at time of application.
      - 4) Use:
        - a) T (Traffic): Sealant designed for use in joints in pedestrian and vehicular traffic areas such as walkways, plazas, decks and parking garages.
        - b) NT (Non-Traffic): Sealant designed for use in joints in non-traffic areas.
        - c) I (Immersion): Sealant that meets bond requirements when tested by immersion (Immersion rated sealant applications require primer).
        - d) M (Mortar): Sealant that meets bond requirements when tested on mortar specimens.
        - e) G (Glass): Sealant that meets bond requirements when tested on glass specimens.
        - f) A (Aluminum): Sealant that meets bond requirements when tested on aluminum specimens.
        - g) O (Other): Sealant that meets bond requirements when tested on substrates other than standard substrates, being glass, aluminum, mortar.
    - b. Federal Specifications:
      - 1) Type:
        - a) Type I: Self-leveling, pour grade.
          - (1) Compound which has sufficient flow to give smooth level surface when applied in horizontal joint at 40 deg F.
        - b) Type II: Non-sag, gun grade
          - (1) Compound which permits application in joints on vertical surfaces without sagging (slumping) at temperatures 40 deg F and 122 deg F
        - c) Type NS: Non-sag, gun grade.
          - (1) Non-sag shall be a compound which permits application in joints on vertical surfaces without sagging (slumping) at temperatures between -20 deg F and 122 deg F.
      - 2) Class:
        - a) Class A: Compounds resistant to 50 percent total joint movement (includes Type I and Type II).
          - (1) Capable of resisting compression-extension cycling of plus and minus 25 percent of nominal half inch width.
        - b) Class B: Compounds resistant to 25 percent total joint movement (includes Type I and Type II).
          - (1) Capable of resisting compression-extension cycling of plus and minus 12 1/2 percent of nominal half inch width.
  10. Shelf Life: Period of time, usually beginning with date of manufacture, during which stored adhesive will remain effective or useful.

11. Silicone: Any member of family of polymeric products whose molecular backbone is made up of alternating silicon and oxygen atoms and which has pendant hydrocarbon groups attached to silicon atoms. Used primarily as a sealant. Offers excellent resistance to water and large variations in temperature (minus 100 deg F to + 600 deg F)
12. Stability: Ability of material to remain unchanged.
13. Storage Life: Period of time during which packaged adhesive can be stored under specified temperature conditions and remain suitable for use.
14. Substrate: Material upon surface of which an adhesive-containing substance is spread for any purpose, such as bonding or coating.
15. Surface Preparation: Physical and /or chemical preparation of substrate to render it suitable for adhesive joining. Same as substrate preparation or pre-bond preparation.
16. Toxicity: Material shall have no adverse effect on health of personnel when used for its intended purpose.

C. Reference Standards:

1. American Association of State and Highway Transportation Officials:
  - a. AASHTO T 132-87(2013), 'Standard Method of Test for Tensile Strength of Hydraulic Cement Mortars'.
2. ASTM International:
  - a. ASTM C639-01(2011), 'Standard Test Method for Rheological (Flow) Properties of Elastomeric Sealants'.
  - b. ASTM C661-15, 'Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer'.
  - c. ASTM C679-03(2009), 'Standard Test Method for Tack-Free Time of Elastomeric Sealants'.
  - d. ASTM C719-14, 'Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle)'.
  - e. ASTM C793-05(2010), 'Standard Test Method for Effects of Laboratory Accelerated Weathering on Elastomeric Joint Sealants'.
  - f. ASTM C794-15a, 'Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants'.
  - g. ASTM C920-14a, 'Standard Specification for Elastomeric Joint Sealants'.
  - h. ASTM C1135-00(2011), 'Standard Test Method for Determining Tensile Adhesion Properties of Structural Sealants'.
  - i. ASTM C1184-14, 'Standard Specification for Structural Silicone Sealants'.
  - j. ASTM C1193-13, 'Standard Guide for Use of Joint Sealants'.
  - k. ASTM C1248-08(2012), 'Standard Test Method for Staining of Porous Substrate by Joint Sealants'.
  - l. ASTM C1330-02(2013), 'Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants'.
  - m. ASTM C1481-12 'Standard Guide for Use of Joint Sealants with Exterior Insulation & Finish Systems (EIFS)'.
  - n. ASTM D412-06(2013), 'Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension'.
  - o. ASTM D2202-00(2014), 'Standard Test Method for Slump of Sealants'.
  - p. ASTM D2240-05(2010), 'Standard Test Method for Rubber Property-Durometer Hardness'.
  - q. ASTM D5893-10, 'Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements'.
  - r. ASTM E119-14, 'Standard Test Methods for Fire Tests of Building Construction and Materials'.
3. Federal Specifications:
  - a. Federal Specification TT-S-001543A (CON-NBS), 'Sealing Compound: Silicone Rubber Base (for Calking, Sealing & Glazing in Buildings and Other Structures)' (9 Jun 1971).
  - b. TT-S-00230C (CON-NBS), 'Sealing compound: Elastomeric Type, Single Component (For Calking, Sealing, And Glazing In Buildings And Other Structures.' (2 Feb 1970).
4. Government Services Administration (GSA), Commercial Item Descriptions (CID):
  - a. GSA CID A-A-272A, 'Sealing Compound: Silicone Rubber Base (For Caulking, Sealing, and Glazing in Buildings and Other Structures)'.
  - b. GSA CID A-A-1556, 'Sealing Compound Elastomeric Type, Single Component (For Caulking, Sealing, and Glazing in Buildings and Other Structures)'.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Scheduling:
  - 1. Schedule work so waterproofing, water repellents and preservative finishes are installed after sealants, unless sealant manufacturer approves otherwise in writing.
  - 2. Ensure sealants are cured before covering with other materials.

**1.4 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.
    - b. Manufacturer's literature for each Product.
    - c. Schedule showing joints requiring sealants. Show also backing and primer to be used.
- B. Informational Submittals:
  - 1. Certificates:
    - a. Manufacturer's Certificate:
      - 1) Certify products are suitable for intended use and products meet or exceed specified requirements.
      - 2) Certificate from Manufacturer indicating date of manufacture.
  - 2. Manufacturers' Instructions:
    - a. Manufacturer's installation recommendations for each Product.
    - c. Manufacturer's installation for completing sealant intersections when different materials are joined. Manufacturer's installation for removing existing sealants and preparing joints for new sealant.

**1.5 QUALITY ASSURANCE**

- A. Qualifications:
  - 1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten (10) years documented experience.
  - 2. Applicator Qualifications:
    - a. Company specializing in performing work of this section.
    - b. Provide if requested, reference of projects with minimum three (3) years documented experience, minimum three (3) successfully completed projects of similar scope and complexity, and approved by manufacturer.
    - c. Designate one (1) individual as project foreman who shall be on site at all times during installation.
- B. Preconstruction Testing:
  - 1. Pre-construction testing is not required when sealant manufacturer can furnish data acceptable to Architect based on previous testing for materials matching those of the Work.
- C. Mockups:
  - 1. Provide mockups including sealant and joint accessories to illustrate installation quality and color if requested by Architect or Project Manager.
    - a. Incorporate accepted mockup as part of Work.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery and Acceptance Requirements:
  - 1. Deliver and keep in original containers until ready for use.
  - 2. Inspect for damage or deteriorated materials.

**B. Storage and Handling Requirements:**

1. Handle, store, and apply materials in compliance with applicable regulations and material safety data sheets (MSDS).
2. Handle to prevent inclusion of foreign matter, damage by water, or breakage.
3. Store in a cool dry location, but never under **40 deg F** or subjected to sustained temperatures exceeding **90 deg F** or as per Manufacturer's written recommendations
4. Do use sealants that have exceeded shelf life of product.

**1.7 FIELD CONDITIONS****A. Ambient Conditions:**

1. Do not install sealant during inclement weather or when such conditions are expected. Allow wet surfaces to dry.
2. Follow Manufacturer's temperature recommendations for installing sealants.

**1.8 WARRANTY****A. Manufacturer Warranty:**

1. Signed warranties against adhesive and cohesive failure of sealant and against infiltration of water and air through sealed joint for period of three (3) years from date of Substantial Completion.
  - a. Manufacturer's standard warranty covering sealant materials.
  - b. Applicator's standard warranty covering workmanship.

**PART 2 - PRODUCTS****2.1 SYSTEMS****A. Manufacturers:**

1. Manufacturer Contact List:
  - a. Dow Corning Corp., Midland, MI [www.dowcorning.com](http://www.dowcorning.com).
  - b. Franklin International, Inc. Columbus, OH [www.titebond.com](http://www.titebond.com).
  - c. GE Sealants & Adhesives (see Momentive Performance Materials Inc.).
  - d. Laticrete International Inc., Bethany, CT [www.laticrete.com](http://www.laticrete.com).
  - e. Momentive Performance Materials Inc. (formally GE Sealants & Adhesives), Huntersville, NC [www.ge.com/silicones](http://www.ge.com/silicones).
  - f. Sherwin-Williams, Cleveland, OH [www.sherwin-williams.com](http://www.sherwin-williams.com).
  - g. Sika Corporation, Lyndhurst, NJ [www.sikaconstruction.com](http://www.sikaconstruction.com) or Sika Canada Inc, Pointe Claire, QC [www.sika.ca](http://www.sika.ca).
  - h. Tremco, Beachwood, OH [www.tremcosealants.com](http://www.tremcosealants.com) or Tremco Ltd, Toronto, ON (800) 363-3213.

**B. Materials:**

1. Design Criteria:
  - a. Compliance: Meet or exceed requirements of these standards:
    - 1) ASTM C920: Elastomeric joint sealant performance standard.
    - 2) ASTM C639 or ASTM D2202: Flow (sag or slump).
    - 3) ASTM C661 or ASTM D2240: Durometer hardness (shore A).
    - 4) ASTM C679 or ASTM C794: Tack free time (peel strength).
    - 5) ASTM C719: Joint movement capability.
    - 6) ASTM 793: Effects of accelerated weathering.
    - 7) ASTM C1135 or ASTM D412: Tensile adhesion strength.
    - 8) ASTM C1184: Structural silicone sealants.
    - 9) ASTM C1248: Staining.
    - 10) ASTM D412: Modulus.

- 11) ASTM D5893: Silicone Joint Sealant for Concrete Pavements.
  - 12) Federal Specification TT-S-001543A.
  - 13) Federal Specification TT-S-00230C.
  - 14) GSA CID A-A-272A.
  - 15) GSA CID A-A-1556.
  - b. Comply with Manufacturer's ambient condition requirements.
  - c. Sealants must meet Manufacturer's shelf-life requirements.
  - d. Sealants must adhere to and be compatible with specified substrates.
  - e. Sealants shall be stable when exposed to UV, joint movements, and particular environment prevailing at project location.
  - f. Primers (Concrete, stone, masonry, and other nonporous surfaces typically do not require a primer. Aluminum and other nonporous surfaces except glass require use of a primer. Installer Option to use Adhesion Test to determine if primer is required or use primer called out in related sections):
    - 1) Adhesion Test:
      - a) Apply silicone sealant to small area and perform adhesion test to determine if primer is required to achieve adequate adhesion. If necessary, apply primer at rate and in accordance with Manufacturer's instructions. See 'Field Quality Control' in Part 3 of this specification for Adhesive Test.
    - 2) If Primer required, shall not stain and shall be compatible with substrates.
    - 3) Allow primer to dry before applying sealant.
2. Sealants At Exterior Building Elements:
- a. Description:
    - 1) Weathersealing expansion, contraction, perimeter, and other movement joints which may include all or part of the following for project:
      - a) Aluminum entrance perimeters and thresholds.
      - b) Connections.
      - c) Door frames.
      - d) Joints and cracks around windows.
      - e) Louvers.
      - f) Masonry.
      - g) Wall penetrations.
      - h) Other joints necessary to seal off building from outside air and moisture.
  - b. Design Criteria:
    - 1) Meet following standards for Sealant:
      - a) ASTM C920: Type S, Grade NS, Class 50 Use NT, M, G, A.
    - 2) Limitations:
      - a) Do not use below-grade applications.
      - b) Do not use on surfaces that are continuously immersed or in contact with water.
      - c) Do not use on wet, damp, frozen or contaminated surfaces.
      - d) Do not use on building materials that bleed oils, plasticizers or solvents, green or partially vulcanized rubber gaskets or tapes.
    - 3) Color:
      - a) Architect to select from Manufacturer's standard colors.
      - b) Match building elements instead of window (do not use white that shows dirt easily).
  - c. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - 1) Dow Corning:
      - a) Primer: 1200 Prime Coat.
      - b) Sealant: 791 Silicone Weatherproofing Sealant.
    - 2) Momentive Performance Materials (formerly, GE Sealants & Adhesives):
      - a) Primer: SS4044 Primer.
      - b) Sealant: GE SCS2000 SilPruf Silicone Sealant & Adhesive.
    - 3) Tremco:
      - a) Primer:
        - (1) Metal surface: No. 20 primer.
        - (2) Porous surfaces: No. 23 primer.
      - b) Sealant: Spectrum 1 Silicone Sealant.
3. Sealants At Exterior Sheet Metal And Miscellaneous:
- a. Description:

- 1) Weathersealing expansion, contraction, perimeter, and other movement joints which may include all or part of the following for project:
  - a) Flashings.
  - b) Gutters.
  - c) Penetrations in soffits and fascias.
  - d) Roof vents and flues.
  - e) Lightning protection components.
- b. Design Criteria:
  - 1) Meet following standards for Sealant:
    - a) ASTM C920: Type S Grade NS, Class 25 (min) Use NT, M, G, A and O.
  - 2) Limitations:
    - a) Do not use below-grade applications.
    - b) Do not use on surfaces that are continuously immersed or in contact with water.
    - c) Do not use on wet, damp, frozen or contaminated surfaces.
    - d) Do not use on building materials that bleed oils, plasticizers or solvents, green or partially vulcanized rubber gaskets or tapes.
  - c. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - 1) Dow Corning: 790 Silicone Building Sealant.
    - 2) Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS2350 Silicone Elastomeric Sealant.
    - 3) Tremco: Tremsil 600 Silicone Sealant.
4. Sealants At Expansion Joints in Exterior Concrete:
  - a. Expansion Joints:
    - 1) Design Criteria:
      - a) Meet following standards for Sealant:
        - (1) ASTM C920: Type S, Grade NS, Class 100/50 Use T, NT, M, G, A, and O.
    - 2) Sealant required at expansion for following areas:
      - a) Between entryway slabs and building foundations.
      - b) Between sidewalks and building foundations.
      - c) Miscellaneous vertical applications.
    - 3) Sealant NOT required at expansion joints for following areas:
      - a) Within aprons and where aprons abut building foundations and sidewalks.
      - b) Within mowstrips and where mowstrips abut building foundations and sidewalks.
      - c) Within sidewalks.
    - 4) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - a) Dow Corning:
        - (1) Primer: 1200 Prime Coat.
        - (2) Sealant: 790 Silicone Building Sealant.
      - b) Sika:
        - (1) Primer: Sikasil Primer-2100.
        - (2) Sealant: Sikasil-728 NS Non-Sag Silicone Sealant.
  - b. Penetrations thru Concrete Walls:
    - 1) Design Criteria:
      - a) Meet following standards for Sealant:
        - (1) ASTM C920: Type S, Grade NS, Class 100/50 Use T, NT, M, G, A, and O.
    - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - a) Dow Corning:
        - (1) Primer: 1200 Prime Coat.
        - (2) Sealant: 790 Silicone Building Sealant.
      - b) Sika:
        - (1) Primer: Sikasil Primer-2100.
        - (2) Sealant: Sikasil-728 NS Non-Sag Silicone Sealant.
5. Sealants At Flat Drainage Exterior Concrete Structures:
  - a. Expansion Joints and Control Joints:
    - 1) Description:
      - a) One component (part) self-leveling silicon material that cures to ultra-low modulus silicone rubber upon exposure to atmospheric moisture.
      - b) Cured silicone rubber remains flexible over entire temperature range expected in pavement applications.
    - 2) Design Criteria:

- a) Sealant is required at following areas:
    - (1) Within flat drainage structures and at joints between flat drainage structures and other concrete elements.
  - b) Meet following standards for Sealant: Self-leveling: ASTM D-5893; ASTM C-920, Type S, Grade P, Class 100/50; Use T, M, G, A, O.
  - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a) Dow Corning:
      - (1) Primer: 1200 Prime Coat.
      - (2) Sealant: 890-SL Silicone Building Sealant.
    - b) Sika:
      - (1) Primer: Primer: Sikasil Primer-2100.
      - (2) Sealant: Sikasil-728 SL Self-leveling Silicone Sealant.
6. Sealants At Curbs And Gutters:
- a. Expansion Joints and Control Joints:
    - 1) Description:
      - a) Effective for sealing transverse contraction and expansion joints, longitudinal, center line and shoulder joints in Portland cement concrete.
      - b) One component (part) non-sag silicone material that cures to low modulus, silicone rubber upon exposure to atmospheric moisture. May be applied over wide temperature range.
    - 2) Design Criteria:
      - a) Expansion joint sealant is required in following areas:
        - (1) Within curbs and gutters at approved layout locations.
      - b) Meet following standards for Sealant: Non-sag: ASTM C-920: Type S, Grade NS, Class 100/50, Use T, NT.
    - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - a) Dow Corning:
        - (1) Primer: 1200 Prime Coat.
        - (2) Sealant: 888 Silicone Joint Sealant.
      - b) Sika:
        - (1) Primer: Primer: Sikasil Primer-2100.
        - (2) Sikasil-728 NS Non-Sag Silicone Sealant.
7. General Interior Sealants:
- a. General:
    - 1) Inside jambs and heads of exterior door frames.
    - 2) Both sides of interior door frames.
    - 3) Inside perimeters of windows.
    - 4) Miscellaneous gaps between substrates.
  - b. Design Criteria:
    - 1) Meet ASTM C920, Type S, Grade NS, NT, and Class 25 test requirements.
    - 2) 100 percent silicone sealant.
  - c. Non-Paintable Sealant (Installer Option A):
    - 1) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
      - a) Dow Corning: Tub, Tile, And Ceramic Silicone Sealant.
      - b) Laticrete: Latasil Silicone Sealant.
      - c) Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS2800 SilGlaze II Silicone Sealant.
      - d) Sherwin Williams: White Lightning Silicone Ultra Low Odor Window and Door Sealant.
      - e) Tremco: Tremsil 200 Silicone Sealant.
      - f) Franklin International: Titebond 2601 (White) 2611 (Clear) 100% Silicone Sealant.
  - d. Paintable Sealant (Installer Option B):
    - 1) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
      - a) Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS7000 Paintable Silicone Sealant.
8. Sealants For Interior Joints:
- a. General:
    - 1) Countertops and backsplash to wall.
    - 2) Sinks and lavatories to countertops.
    - 3) Joints between plumbing fixtures and other substrates



- b. Interior Ceramic Tile Joints are furnished in Section 07 9213 and installed in Section 09 3013 'Ceramic Tiling' including the following:
  - 1) Ceramic tile inside corners.
  - 2) Ceramic tile and paver tile joints.
- c. Description:
  - 1) One-part acetoxycure silicone sealant with fungicides to resist mold and mildew.
- d. Design Criteria:
  - 1) Meet ASTM C920, Type S, Grade NS, NT, and Class 25 test requirements.
  - 2) 100 percent silicone sealant.
- e. Color: As selected by Architect from Manufacturer's standard colors.
- f. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
  - 1) Dow Corning: Tub, Tile, And Ceramic Silicone Sealant.
  - 2) Laticrete: Latasil Tile and Stone Silicone Sealant.
  - 3) Momentive Performance Materials (formerly, GE Sealants & Adhesives): GE SCS1700 Sanitary Silicone Sealant.
  - 4) Tremco: Tremsil 200 Silicone Sealant.

## 2.2 ACCESSORIES

- A. Bond Breaker Tape:
  - 1. Pressure sensitive tape as by Sealant Manufacturer to suit application.
  - 2. Provide tape to prevent adhesion to joint fillers or joint surfaces at back of joint and allow sealant movement.
- B. Joint Backing:
  - 1. Comply with ASTM C1330.
  - 2. Flexible closed cell, non-gassing polyurethane or polyolefin rod or bond breaker tape as recommended by Sealant Manufacturer for joints being sealed.
  - 3. Oversized 25 to 50 percent larger than joint width.
- C. Joint Cleaner:
  - 1. Non-corrosive and non-staining type as recommended by Sealant Manufacturer, compatible with joint forming materials.
- D. Masking Tape:
  - 1. Non-staining, non-absorbent tape product compatible with joint sealants and adjacent joint surfaces.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification Of Conditions:
  - 1. Examine substrate surfaces and joint openings are ready to receive Work.
    - a. Verify each sealant is compatible for use with joint substrates.
    - b. Verify joint surfaces are clean and dry.
    - c. Ensure concrete surfaces are fully cured.
  - 2. Sealants provided shall meet Manufacturer's shelf-life requirements.
  - 3. Notify Architect of unsuitable conditions in writing.
    - a. Do not proceed until unsatisfactory conditions are corrected.
  - 4. Commencement of Work by installer is considered acceptance of substrate.

### 3.2 PREPARATION

- A. Surface Preparation:

1. Remove existing joint sealant materials where specified.
    - a. Clean joint surfaces of residual sealant and other contaminants capable of affecting sealant bond to joint surface using manufacturer's recommended joint preparation methods.
    - b. Repair deteriorated or damaged substrates as recommended by Sealant Manufacturer to provide suitable substrate. Allow patching materials to cure.
  2. Surfaces shall be clean, dry, free of dust, oil, grease, dew, frost or incompatible sealers, paints or coatings that may interfere with adhesion. Prepare substrates in accordance with Manufacturer's instructions:
    - a. Porous surfaces: Clean by mechanical methods to expose sound surface free of contamination and laitance followed by blasting with oil-free compressed air.
    - b. Nonporous surfaces: Use two-cloth solvent wipe in accordance with ASTM C1193. Allow solvent to evaporate prior to sealant application.
    - c. High-pressure water cleaning: Exercise care that water does not enter through failed joints.
    - d. Primers:
      - 1) Primers enhance adhesion ability.
      - 2) Use of primers is not a substitution for poor joint preparation.
      - 3) Primers should be used always in horizontal application where there is ponding water.
  3. Field test joints in inconspicuous location.
    - a. Verify joint preparation and primer required to obtain optimum adhesion of sealants to joint substrate.
    - b. When test indicates sealant adhesion failure, modify joint preparation primer, or both and retest until joint passes sealant adhesion test.
  4. Masking: Apply masking tape as required to protect adjacent surfaces and to ensure straight bead line and facilitate cleaning.
- B. Joints:
1. Prepare joints in accordance with ASTM C1193.
    - a. Clean joint surfaces of contaminants capable of affecting sealant bond to joint surface using Manufacturer's recommended instructions for joint preparation methods.
    - b. Remove dirt, dust, oils, wax, paints, and contamination capable of affecting primer and sealant bond.
    - c. Clean concrete joint surfaces to remove curing agents and form release agents.
- C. Protection:
1. Protect elements surrounding the Work of this section from damage or disfiguration.

### 3.3 APPLICATION

- A. General:
1. Apply silicone sealant in accordance with Manufacturer's instructions.
  2. Do not use damaged or deteriorated materials.
  3. Install primer and sealants in accordance with ASTM C1193 and Manufacturer's instructions.
  4. Apply primer where required for sealant adhesion.
  5. Install sealants immediately after joint preparation.
  6. Do not use silicone sealant as per the following:
    - a. Apply caulking/sealant at temperatures below 40 deg F.
    - b. Below-grade applications.
    - c. Brass and copper surfaces.
    - d. Materials bleeding oils, plasticizers, and solvents.
    - e. Structural glazing and adhesive.
    - f. Surfaces to be immersed in water for prolonged time.
- B. Joint Backing:
1. Install joint backing to maintain sealant joint ratios recommended by Manufacturer.
  2. Install without gaps, twisting, stretching, or puncturing backing material. Use gage to ensure uniform depth to achieve correct profile, coverage, and performance.
  3. Rod for open joints shall be at least 1-1/2 times width of open joint and of thickness to give solid backing. Backing shall fill up joint so depth of sealant bite is no more than 3/8 inch deep.

- C. Bond Breaker:
  - 1. Install bond breaker where joint backing is not used or where backing is not feasible.
    - a. Apply bond-breaker tape in shallow joints as recommended by Sealant Manufacturer.
- D. Sealant:
  - 1. Apply sealant with hand-caulking gun with nozzle of proper size to fit joints. Use sufficient pressure to insure full contact to both sides of joint to full depth of joint. Apply sealants in vertical joints from bottom to top.
  - 2. Fill joint opening to full and proper configuration.
  - 3. Apply in continuous operation.
  - 4. Tool joints immediately after application of sealant if required to achieve full bedding to substrate or to achieve smooth sealant surface. Tool joints in opposite direction from application direction, i.e., in vertical joints, from the top down. Do not 'wet tool' sealants.
  - 5. Depth of sealant bite shall be **1/4 inch** minimum and **1/2 inch** maximum, but never more than one half or less than one fourth joint width.
- E. Caulk gaps between painted or coated substrates and unfinished or pre-finished substrates. Caulk gaps larger than **3/16 inch** between painted or coated substrates.

### 3.4 TOLERANCES

- A. Provide joint tolerances in accordance with Manufacturer's printed instructions.

### 3.5 FIELD QUALITY CONTROL

- A. Adhesion Test (Installer Option to use adhesion test to determine if primer is required).
  - 1. Perform adhesion tests in accordance with Manufacturer's instructions and ASTM C1193, Method A, Field-Applied Sealant joint Hand-Pull Tab:
    - a. Perform five (5) tests for first **1,000 linear feet** of applied silicone sealant and one (1) test for each **1,000 linear feet** seal thereafter or perform one (1) test per floor per building elevation minimum.
    - b. For sealants applied between dissimilar materials, test both sides of joints.
  - 2. Sealants failing adhesion test shall be removed, substrates cleaned, sealants re-installed, and re-testing performed.
  - 3. Maintain test log and submit report to Architect indicating tests, locations, dates, results, and remedial actions.

### 3.6 CLEANING

- A. Remove masking tape and excess sealant.
- B. Clean adjacent materials, which have been soiled, immediately (before setting) as recommended by Manufacturer.
- C. Waste Management: Dispose of products in accordance with manufacturer's recommendation.

## END OF SECTION

**BLANK PAGE**

**SECTION 07 9219****ACOUSTICAL JOINT SEALANTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Quality of sealants to be used at perimeters of and penetrations through acoustically insulated walls and associated ceilings.
- B. Related Requirements:
  - 1. Section 09 2900: Furnishing and installing of acoustical sealants.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. American Architectural Manufacturers Association (AAMA):
    - a. "Voluntary Specifications and Test Methods for Sealants".
  - 2. ASM International:
    - a. "Adhesives and Sealants", Volume 3, ASM International Handbook Committee, May 1999.
    - b. Committee C24 on Building Seals and Sealants for various Specifications, Guides, Test Methods, and Practices related to sealant specifying and application.
    - c. Committee E6 on Building Performance for various Specifications, Guides, Test Methods, and Practices related to sealant use with air barriers, vapor retarders, and exterior enclosure systems and materials.
  - 3. The Adhesive and Sealing Council, Inc. (ASC) / Sealant, Waterproofing & Restoration Institute (SWR Institute):
    - a. "Sealants: The Professional's Guide".
    - b. "Joint Sealants, Whole Building Design Guide".
- B. Definitions:
  - 1. Adhesion: Bonding forces between two different materials (e.g. between an adhesive and substrate).
  - 2. Adhesive: An adhesive, as defined by The American Society for Testing and Materials (ASTM), is "a substance capable of holding materials together by surface attachment".
  - 3. Adhesive Failure: Loss of adhesion between adhesive and substrate. Adhesive pulls cleanly away from substrate.
  - 4. Caulk: Caulks have a variety of definitions but are generally recognized as materials used in applications where only minor elastomeric properties are needed.
  - 5. Primer: Coating applied to surface, prior to application of an adhesive, to improve performance of bond.
  - 6. Sealant. Sealants are generally used in applications where elastic properties are needed while adhesives are generally used in applications where bonding strength and rigidity are needed. With technology advancements both sealants and adhesives can be used interchangeably depending on the applications performance requirements.
  - 7. Sealant Types and Classes:
    - a. Federal Specifications:
      - 1) Type I: Self-leveling, pour grade.
      - 2) Type II: Non-sag, gun grade.
      - 3) Type NS: Non-sag, gun grade.
      - 4) Class A: +25 percent, -25 percent expansion – contraction.
    - b. ASTM Specifications:
      - 1) Type S: Single-component sealant.
      - 2) Type M: Multi-component sealant.

- 3) Grade P: Pourable or self-leveling sealant for joints on horizontal surfaces.
  - 4) Grade NS: Non-sag or gunnable sealant for joints in vertical surfaces.
  - 5) Class 25: Sealant that, when tested for adhesion or cohesion under cyclic movement shall withstand increase and decrease of at least 25 percent of joint width as measured at time of application.
  - 6) Class 12: Sealant that, when tested for adhesion and cohesion under cyclic movement shall withstand increase and decrease of at least 12 percent of joint width as measured at time of application.
  - 7) T: Sealant designed for use in joints in pedestrian and vehicular traffic areas such as walkways, plazas, decks and parking garages.
  - 8) NT: Sealant designed for use in joints in non-traffic areas.
  - 9) M: Sealant will remain adhered to mortar.
  - 10) G: Sealant will remain adhered to glass.
  - 11) A: Sealant will remain adhered to aluminum.
  - 12) O: Sealant will remain adhered to substrates other than glass, aluminum, mortar.
8. Shelf Life: Usable storage time of material. Most adhesives have shelf-life of 6 to 12 months. Shelf-life of an adhesive may be increased by refrigeration and is usually shortened by exposure to heat.
  9. Stability: Compound in original unopened container shall be stable for at least six months when stored at temperature not exceeding 80 degrees F. (26.7 degrees C.).
  10. Toxicity: Material shall have no adverse effect on health of personnel when used for its intended purpose.

C. Reference Standards:

1. ASTM International:
  - a. ASTM C834-10, 'Standard Specification for Latex Sealants'.
  - b. ASTM C919-12, 'Standard Practice for Use of Sealants in Acoustical Applications'.
  - c. ASTM C1193-12, 'Standard Guide for Use of Joint Sealants'.
  - d. ASTM E84-12c, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
  - e. ASTM E90-09, 'Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements'.
2. Underwriters Laboratories, Inc.:
  - a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials; Tenth Edition September 10 2008.' (Revision: September 13, 2010).'

### 1.3 SUBMITTALS

A. Action Submittals:

1. Product Data:
  - a. Manufacturer's literature for each Product.

B. Informational Submittals:

1. Certificates:
  - a. Manufacturer's Certificate:
    - 1) Certify products are suitable for intended use and products meet or exceed specified requirements.
    - 2) Certificate from Manufacturer indicating date of manufacture.
2. Manufacturers' Instructions:
  - a. Manufacturer's installation recommendations for each Product.

### 1.4 QUALITY ASSURANCE

A. Regulatory Agency Sustainability Approvals:

1. Surface-Burning Characteristics:
  - a. Class A flame spread rating in accordance with ASTM E84 or UL 723 Type 1.
    - 1) Class A (Flame spread index 0-25; Smoke-developed index 0-450).

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
  - 1. Deliver and keep in original containers until ready for use.
  - 2. Inspect for damage or deteriorated materials.
- B. Storage And Handling Requirements:
  - 1. Handle to prevent inclusion of foreign matter, damage by water, or breakage.
  - 2. Store in cool, dry location, and at temperatures never under 40 deg F nor exceeding 80 deg F.

## 1.6 FIELD CONDITIONS

- A. Ambient Conditions:
  - 1. Do not apply caulking at temperatures below 40 deg F.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Sealants:
  - 1. Design Criteria:
    - a. Meet requirements of ASTM C834.
    - b. Meet Class A flame spread rating.
  - 2. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a. OSI Pro-Series SC-175 Draft & Acoustical Sound Sealant by OSI Sealants Inc, Mentor, OH [www.osisealants.com](http://www.osisealants.com).
    - b. QuietZone Acoustic Caulk by Owens Corning, Toledo, OH [www.owenscorning.com](http://www.owenscorning.com).
    - c. Acoustical Sealant by Tremco, Beachwood, OH [www.tremcosealants.com](http://www.tremcosealants.com) or Toronto, ON (800) 363-3213.
    - d. Acoustical Sound Sealant by Titebond
    - e. Acoustical Sealant by U S Gypsum, Chicago, IL [www.usg.com](http://www.usg.com).

### 2.2 ACCESSORIES

- A. Bond Breaker: Pressure sensitive tape recommended by Sealant Manufacturer to suit application.
- B. Joint Backing:
  - 1. Flexible closed cell polyurethane or polyolefin rod or bond breaker tape as recommended by Sealant Manufacturer for joints being sealed.
  - 2. Oversized 25 to 50 percent larger than joint width.
- C. Joint Cleaner: Non-corrosive and non-staining type, recommended by Sealant Manufacturer, compatible with joint forming materials.
- D. Masking Tape: Pressure sensitive tape recommended by Sealant Manufacturer to suit application.
- E. Primer: Non-staining type, type, recommended by Sealant Manufacturer to suit application.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification Of Conditions:

1. Examine substrate surfaces and joint openings are ready to receive Work.
2. Sealants provided shall meet Manufacturer's shelf-life requirements.
3. Notify Architect of unsuitable conditions in writing.
  - a. Do not proceed until unsatisfactory conditions are corrected.
4. Commencement of Work by installer is considered acceptance of substrate.

### 3.2 PREPARATION

- A. Surface Preparation:
  1. Prepare joints in accordance with ASTM C1193 and Manufacturer's instructions.
  2. Clean joint surfaces to remove dirt, dust, oils, wax, paints, and other contamination capable of affecting primer and sealant bond.
  3. Protect elements surrounding the Work of this section from damage or disfiguration. Apply masking tape to adjacent surfaces when required to prevent damage to finishes from sealant installation.
- B. Surface Preparation:
  1. Clean joint surfaces of residual sealant and other contaminants capable of affecting sealant bond to joint surface.
  2. Surfaces shall be clean, dry, and free of dust, oil, grease, dew, or frost.

### 3.3 INSTALLATION

- A. General:
  1. Do not use damaged or deteriorated materials.
  2. Install primer and sealants in accordance with ASTM C1193 and Manufacturer's instructions where required for sealant adhesion.
  3. Install sealants immediately after joint preparation.
  4. Do not apply caulking/sealant at temperatures below 40 deg F.
- B. Joint Backing:
  1. Rod for open joints shall be at least 1-1/2 times width of open joint and of thickness to give solid backing. Backing shall fill up joint so depth of sealant bite is no more than 3/8 inch deep.
  2. Apply bond-breaker tape in shallow joints as recommended by Sealant Manufacturer.
- C. Install at perimeter joints and mechanical and electrical penetrations in sound insulated rooms. Apply sealant with hand-caulking gun with nozzle of proper size to fit joints. Use sufficient pressure to insure full contact to both sides of joint to full depth of joint.
- D. Tool joints immediately after application of sealant if required to achieve full bedding to substrate or to achieve smooth sealant surface.
- E. Depth of sealant bite shall be 1/4 inch minimum and 1/2 inch maximum, but never more than one half or less than one fourth joint width.

### 3.4 FIELD QUALITY CONTROL

- A. Inspection:
  1. Examine sealant joints to verify compliance with Contract Document requirements.
- B. Non-Conforming Work. Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
  1. Sealant material found to be contaminated or damaged or inadequate preparation of substrate results in deficiencies in joint sealant adhesion is considered defective or not complying with Contract Document requirements.



2. Correct any work found defective or not-complying with Contract Document requirements at no additional cost to Owner.

### **3.5 CLEANING**

- A. General:
  1. Remove sealant from adjacent surfaces in accordance with Sealant Manufacturer and Substrate Manufacturer recommendations as work progresses.
  2. Remove masking tape and any other foreign material.
  3. Clean adjacent materials that have been soiled immediately (before setting) as recommended by Manufacturer.
- B. Waste Management: Dispose of products in accordance with Sealant Manufacturer's recommendation.

**END OF SECTION**

**BLANK PAGE**

**SECTION 08 0601****HARDWARE GROUP AND KEYING SCHEDULES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install door hardware and keying as described in Contract Documents.

**1.2 REFERENCES**

- A. Definitions:
1. Access Door Exit Device: See Exit Device.
  2. Acoustic Seal: Attached to door to reduce external noise. Perimeter seals reduce potential for flanking noise, a term used to describe leakage of a sound across a barrier.
  3. Active Door (or leaf): In paired or double doors, hinged door leaf that opens first and the one to which the lock is applied.
  4. Astragal: Molding or strip whose purpose is to cover or close gap between edges of pair of doors. Astragals provide a weather or sound seal, minimize passage of light or retard passage of smoke or flame.
    - a. Overlapping Astragal: One-piece astragal attached to one door only and overlapping other door when in closed position.
    - b. Split Astragal: Two-piece astragal, one piece of which is surface mounted on each door and provided with means of adjustment to abut other piece and provide a seal.
  5. Builders Hardware Manufacturer's Association (BHMA) Hardware Functions:
    - a. F75 Passage Latch: Latch bolt operated by lever from either side at all times.
    - b. F76 Privacy Lock: Latch bolt operated by lever from either side. Outside lever locked by push button inside and unlocked by emergency key from outside or rotating lever from inside.
    - c. F81 Office Door Lock: Dead locking latch bolt operated by lever from either side, except when outside lever is locked by turn button in inside lever. When outside lever is locked, latch bolt is operated by key in outside lever or by rotating inside lever. Turn button must be manually rotated to unlock outside lever.
    - d. F84 Classroom Deadlock: Dead locking latch bolt operated by lever from either side, except when outside lever is locked, latch bolt is operated by key in outside lever or by rotating inside lever.
    - e. F86 Utility Space Door Lock: Dead locking latch bolt operated by key in outside lever or by rotating inside lever. Outside lever is always fixed.
    - f. F91 Store Door Lock: Deadlocking latch operated by either lever. Key in either lever locks / unlocks both levers.
    - g. F109 Entrance Lock: Turn/push button locking: Pushing and turning button disengages outside lever, requiring using of key until button is manually unlocked. Push-button locking: Pushing button disengages outside lever until unlocked by key or by turning inside lever. Disengages outside spindle from latch when locked.
    - h. E2142 Deadbolt: Dead bolt operated by key from either side. Bolt automatically dead locks when fully thrown.
    - i. E2152 Deadbolt: Dead bolt operated by key from outside and turn unit from inside. Bolt automatically dead locks when fully thrown.
  6. Change Key: Key that operates only one cylinder or one group of keyed alike cylinders in a keying system.
  7. Closer: Device or mechanism to control closing of swing door. May be overhead or floor mounted and either exposed or concealed.

8. Coordinator: Device or mechanism which controls order of closing of pair of swing doors; used with doors equipped with overlapping astragals and certain panic and fire exit hardware which requires inactive leaf to close before active leaf.
9. Cylinder: Cylindrical-shaped assembly (complete operating unit) containing tumbler mechanism and keyway (plug, shell, tumblers, springs and actuating device), into which key is inserted to operate lock and can only be actuated by correct key.
  - a. Mortise: Threaded surface which screws directly into a lock case, with a cam engaging lock mechanism.
  - b. Rim: Mounted on surface of door independently of lock, usually by screws from reverse side, and engaging with lock mechanism by means of tailpiece or metal extension.
10. Deadbolt (of a lock): Lock bolt having no spring action nor bevel, and which is operated by key or turn piece.
11. Dummy Trim: Trim only, without lock; usually used on inactive door in pair of doors.
12. Dust-Proof Strike: Strike with spring plunger that completely fills bolt hole when bolt is not projected.
13. Emergency Egress Exit Device: See Exit Device.
14. Exit Device: Latching mechanism for swinging doors designed to be operable in direction of egress travel and to provide exiting for occupants in emergency. Latching mechanism release through pressure on touch or cross bar mortised or mounted on push side of door. There are two classifications: Panic Exit Hardware and Fire Exit Hardware, and three types within each classification:
  - a. Mortise Type: Lock mechanism mortised into edge of door or concealed with door.
  - b. Rim Type: Lock mechanism mounted on interior face of door.
  - c. Vertical Rod: Surface or concealed, having latches in or on top and/or bottom of door and activated by cross bar through rod linkage extending vertically on or in lock stile of door.
15. Fire Exit Hardware: Metal device attached to back of door frame jamb at its base, to secure frame to the floor, may be either fixed or adjustable in height. See Exit Device.
16. Flush Bolt: Rods or bolts that are mounted flush with edge or face of inactive door to lock door to frame at head and/or sill. Flush bolt mounted in edge is operated by means of recessed lever. May be manual or automatic.
17. Grand Master Key: Key that operates locks in several groups, each of which has its own master key.
18. Handleset: Term describing lock trim with handle and thumbpiece on exterior of door, and knob/lever on interior.
19. Hardware: Any mechanism which is designed to perform operable function in use of door and frame.
20. Hinge: Two plates joined together by pin and attached to door and its frame whereby door is supported and is enabled to swing or move.
21. Holder: Device that holds door open at one or more selected positions.
22. Inactive Door (or leaf): Leaf of pair of doors that does not contain lock, but is bolted when closed, and to which strike is fastened to receive latch or bolt of active door.
23. Kick Plate: Protective plate applied on lower rail of door to prevent door from being marred.
24. Latch Bolt: Beveled spring bolt, usually operated when either knob or lever is turned, or when thumbpiece which operates handleset is pushed down.
25. Latchset: Non-locking device which contains only a latch bolt, a means of operating said latch and all required trim.
26. Leaf (of pair of doors): One of two doors forming pair of doors.
27. Lever Handle: Bar-like grip which is rotated about horizontal axis at one of its ends to operate a latch.
28. Lockset: Lock, complete with trim, such as knobs, escutcheons or handles.
29. Low-Energy Swing Door Operators: Device that operates swing door that opens or helps open door automatically, waits then closes it at reduced speed to levels deemed safe for disabled users. Commonly referred to as a Handicap door operator.
30. Master Key: Key that operates all master keyed locks or cylinders in group, each lock or cylinder usually operated by its own change key.
31. Mullion: Fixed or movable post dividing opening vertically.
32. Panic Exit Hardware: Hardware similar to Exit Hardware, but which has been tested and labeled or use only on emergency exit doors which are not fire doors. See Exit Device.
33. Passage Function: Knob or lever set most commonly used in hallways where locking feature is not required.

34. Pivot: Hinging device embodying fixed pin and single joint.
35. Pull: Handle of grip designed for attachment to door to facilitate opening and closing.
36. Push: Plate applied to lock stile to protect door against soiling and wear.
37. Single Cylinder Entrance Handleset: Key operates deadbolt from outside; turnpiece operates deadbolt from the inside.
38. Single Dummy: Knob/lever surface mounted on interior or exterior of door which does not turn any mechanism.
39. Silencer: Small piece of resilient material attached to stop on door frame to cushion closing of door.
40. Smoke Gasket: Brush seal used on doors to reduce passage of smoke and gasses.
41. Stop: Device to limit swing or movement of door at certain point.
42. Threshold: Strip fastened to floor beneath door, usually required to cover joint where two types of floor material meet.
43. Thumbpiece or Thumbturn: Lock trim component which typically is used to lock deadbolt from interior side of door.
44. Turnpiece: Small knob, lever or tee turn with spindle attached for operating deadbolt of lock or mortise bolt. Also termed Thumb Turn. Used only on single cylinder operations.
45. Weatherstrip: Material or device applied to door edges or to inner door frame edges to close clearance opening and minimize or restrict passage of air, moisture, sound, smoke, and/or dirt.

B. Reference Standards:

1. Builders Hardware Manufacturer's Association (BHMA):
  - a. BHMA A156.1, 'Butts and Hinges'.
  - b. BHMA A156.16, 'Auxiliary Hardware'.
  - c. BHMA A156.18, 'Materials and Finishes'.
  - d. BHMA A156.2, 'Bored and Preassembled Locks and Latches'.
  - e. BHMA A156.21, 'Thresholds'.
  - f. BHMA A156.22, 'Door Gasketing and Edge Seal Systems'.
  - g. BHMA A156.3, 'Exit Devices'.
  - h. BHMA A156.4, 'Door Controls - Closers'.
  - i. BHMA A156.5, 'Auxiliary Locks and Associated Products'.
  - j. BHMA A156.6, 'Architectural Trim'.
  - k. BHMA A156.7, 'Template Hinge Dimensions'.
  - l. BHMA A156.8, 'Door Controls – Overhead Stops and Holders'.

### 1.3 DELIVERY, STORAGE, AND HANDLING

A. Delivery And Acceptance Requirements:

1. Materials shall be delivered in original, unopened packages with labels intact.

## PART 2 - HARDWARE GROUPS

### 2.1 STOREFRONT ENTRY DOORS

A. Single Doors:

1. **Group ST1:**
  - a. 1 set: Pivots.
  - b. 1 set: Weatherstrip.
  - c. 1 each: Closer.
  - d. 1 each: Exit Door Exit Device.
  - e. 1 each: Kick Plate.
  - f. 1 each: Stop.
  - g. 1 each: Threshold.

## 2.2 EXTERIOR DOORS

- A. Single Exterior Doors:
  - 1. **Group 3:**
    - a. 1 set: Weatherstrip.
    - b. 1 each: Closer.
    - c. 3 each: Hinges.
    - d. 1 each: Lockset Function F86.
    - e. 1 each: Stop.
    - f. 1 each: Threshold.

## 2.3 INTERIOR DOORS

- A. Single Interior Doors:
  - 1. **Group 21:**
    - a. 1 set: Smoke Gaskets.
    - b. 1 each Closer.
    - c. 3 each: Hinges.
    - d. 1 each: Latchset, Function F75.
    - e. 1 each: Stop.
  - 2. **Group 27:**
    - a. 1 set: Smoke Gaskets.
    - b. 1 each: Acoustic Seal.
    - c. 1 each: Closer.
    - d. 3 each: Hinges.
    - e. 1 each: Lockset Function F81.
    - f. 1 each: Stop.
    - g. 1 each: Threshold.
  - 3. **Group 27A:**
    - a. 1 set: Smoke Gaskets.
    - b. 1 each: Acoustic Seal.
    - c. 1 each: Closer.
    - d. 3 each: Hinges.
    - e. 1 each: Latchset Function F76.
    - f. 1 each: Stop.
    - g. 1 each: Threshold.
  - 4. **Group 29A:**
    - a. 1 set: Smoke Gaskets.
    - b. 1 each: Acoustic Seal.
    - c. 1 each: Closer.
    - d. 3 each: Hinges.
    - e. 1 each: Kick Plate.
    - f. 1 each: Lockset Function F75
    - g. 1 each: Stop.
    - h. 1 each: Threshold.
  - 5. **Group 30A:**
    - a. 1 set: Smoke Gaskets.
    - b. 1 each: Closer.
    - c. 1 each: Exit Device.
    - d. 3 each: Hinges.
    - e. 1 each: Kick Plate.
    - f. 1 each: Stop.

**2.4 KEYING SCHEDULE****A. Meetinghouse Keying Schedule:****1. Clerk's Offices:**

Key	Stamped	Amount	Doors Operated by Key
XAA5	CLK 1	3	Key AA5 will also open XAA1.

a. Keys to Stake President's Office will also open Clerk's Office,

**2. Mechanical And Utility Rooms:**

Key	Stamped	Amount	
XAA13	MECH	2	

**3. Stake President's Office:**

Key	Stamped	Amount	Doors Operated by Key
AA15	STK PR	5	Key AA15 will also open XAA5, XAA12, XAA13 and XAA16.

**4. Remaining Stake Suite Doors excluding Exterior Door:**

Key	Stamped	Amount	Doors Operated by Key
XAA16	STK	20	Key AA16 will also open XAA1.

a. Keys to Stake President's Office will open Stake Suite doors.

5. Provide interior keying system that includes Master Key and Change Key levels. Pin locks so pins in Master Keys are two numbers minimum different between Master Keys and associated change keys. Provide six AA Master Keys.

**END OF SECTION**

**BLANK PAGE**



**SECTION 08 1213****HOLLOW METAL FRAMES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Hollow metal frames.
- B. Related Requirements:
  - 1. Section 06 2024: 'Door, Frame, And Finish Hardware Installation' for installation.
  - 2. Section 08 4113: 'Aluminum-Framed Entrances And Storefronts' for aluminum entry frames.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. American Architectural Manufacturers Association / Window & Door Manufacturers Association / Canadian Standards Association:
    - a. AAMA/WDMA/CSA 101/I.S.2/A440-11, 'North American Fenestration Standard/Specification for windows, doors, and skylights'.
  - 2. ASTM International:
    - a. ASTM A568/A568M-13a, 'Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
    - b. ASTM A653/A653M-13, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
  - 3. Steel Door Institute:
    - a. SDI A250.8-2003(R2008), 'Standard Steel Doors and Frames'.
    - b. SDI A250.11-2012, 'Recommended Erection Instructions for Steel Frames'.

**1.3 SUBMITTALS**

- A. Informational Submittals:
  - 1. Copy of SDI A250.11.

**PART 2 - PRODUCTS****2.1 MANUFACTURED UNITS**

- A. Suppliers:
  - 1. Category One Approved VMR Suppliers. See Section 01 6200 for definitions of Categories and Section 01 4301 for Qualification Requirements:
    - a. Architectural Building Supply, Salt Lake City, UT Russ Farley Phone (800) 574-4369 FAX 801-484-6817 e-mail [russef@absdoors.com](mailto:russef@absdoors.com).
    - b. Beacon Metals Inc, Salt Lake City, UT Jared Butler Phone (801) 486-4884, Cell (435) 216-2297, FAX 801-485-7647, e-mail [Jared@beacon-metals.com](mailto:Jared@beacon-metals.com).
- B. Manufacturers:
  - 1. Category One Approved Manufacturers. See Section 01 6200 for definitions of Categories.
    - a. Any current member of Steel Door Institute.
  - 2. Cold rolled furniture steel.
    - a. Interior Frames: 16 ga..

- b. Exterior Frames: **14 ga.**
  - 3. Provide labeled frame to match fire rating of door.
  - 4. Finish:
    - a. Use one of following systems:
      - 1) Prime surfaces with rust inhibiting primer.
      - 2) Galvanize.
  - 5. Anchors: **16 US ga** minimum meeting UL or other code acceptable requirements for door rating involved.
- C. Fabrication:
- 1. General Requirements:
    - a. Frames shall be welded units. Provide temporary spreader on each welded frame.
    - b. Provide Manufacturer's gauge label for each item.
    - c. Make breaks, arrises, and angles uniform, straight, and true. Accurately fit corners.
  - 2. Frame width dimension:
    - a. Fabricate frame **1/8 inch wider** than finished wall thickness as described in Contract Documents.
  - 3. Provide mortar guards at strikes and hinges.
  - 4. Anchors:
    - a. Provide three jamb anchors minimum for each jamb. On hinge side, install one anchor at each hinge location. On strike side, install one anchor at strike level and anchors at same level as top and bottom hinges. Tack weld anchors on frames intended for installation in framed walls.
    - b. Frames installed before walls are constructed shall be provided with extended base anchors in addition to other specified anchors.
    - c. Anchor types and configurations shall meet wall conditions.

**PART 3 - EXECUTION: Not Used****END OF SECTION**

**SECTION 08 1313****HOLLOW METAL DOORS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Hollow metal doors.
- B. Related Requirements:
  - 1. Section 06 2024: 'Door, Frame, And Finish Hardware Installation' for door installation.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. National Association of Architectural Metal Manufacturers (NAAMM):
    - a. HMMA 810-09, 'Hollow Metal Manual'.
    - b. HMMA 860-09, 'Hollow Metal Door and Frames'.
  - 2. Steel Door Institute:
    - a. SDI-108, 'Recommended Selection and Usage Guide for Standard Steel Doors'.
- B. Reference Standards:
  - 1. American Architectural Manufacturers Association / Window & Door Manufacturers Association / Canadian Standards Association:
    - a. AAMA/WDMA/CSA 101/I.S.2/A440-11, 'North American Fenestration Standard/Specification for windows, doors, and skylights'.
  - 2. ASTM International:
    - a. ASTM A568/A568M-13a, 'Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for'.
    - b. ASTM A653/A653M-13, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
    - c. ASTM C1036-11e, 'Standard Specification for Flat Glass'.
    - d. ASTM C1048-12e, 'Standard Specification for Heat-Treated Flat Glass—Kind HS, Kind FT Coated and Uncoated Glass'.
  - 3. Steel Door Institute:
    - a. SDI A250.8-2003(R2008), 'Standard Steel Doors and Frames'.

**PART 2 - PRODUCTS****2.1 MANUFACTURED UNITS**

- A. Suppliers:
  - 1. Category One Approved VMR Suppliers. See Section 01 6200 for definitions of Categories and Section 01 4301 for Qualification Requirements:
    - a. Architectural Building Supply, Salt Lake City, UT Russ Farley Phone (800) 574-4369 FAX 801-484-6817 e-mail [russf@absdoors.com](mailto:russf@absdoors.com).
    - b. Beacon Metals Inc, Salt Lake City, UT Jared Butler Phone (801) 486-4884, Cell (435) 216-2297, FAX 801-485-7647, e-mail [Jared@beacon-metals.com](mailto:Jared@beacon-metals.com).
- B. Manufacturers:
  - 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
    - a. Any current member of Steel Door Institute.

- C. Doors:
  - 1. Meet one of following requirements:
    - a. Meet requirements of Steel Door Institute ANSI / SDI A250.8.
    - b. Commercial grade steel meeting requirements of ASTM A568/A568M, Class 1:
      - 1) Grade I for interior doors, Grade II for exterior doors.
      - 2) Model 1 Full Flush or Model 2 Seamless designs at Manufacturer's option.
      - 3) Type F, G, or L as required.
      - 4) Finish:
        - a) Interior doors primed or galvanized as per ASTM A653/A653M.
        - b) Exterior doors galvanized and primed as per ASTM A653/A653M.
  - 2. Insulation: Insulate doors at exterior of main building sufficient to provide U-value of 0.10 maximum.
- D. Fabrication:
  - 1. General:
    - a. Mortise and reinforce doors for hinges and locks.
    - b. Reinforce doors for closers and other surface applied hardware.
    - c. Drill and tap on job.
    - d. Seams along vertical edges of door need not be filled.
    - e. Do not extend hinge cut out full width of door unless fill strip is inserted, weld filled, and ground smooth so no seam appears on back face plate.

## 2.2 SOURCE QUALITY CONTROL

- A. Tests:
  - 1. Verification of Performance:
    - a. Label each door as conforming to above required standards.

## PART 3 - EXECUTION: Not Used

**END OF SECTION**

**SECTION 08 1429****FLUSH WOOD DOORS: Factory-Finished, Clear****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Factory-finished flush wood doors.
- B. Related Requirements:
  - 1. Section 06 2024: 'Door, Frame, And Finish Hardware Installation' for installation.
  - 2. Section 06 4114: 'Wood-Veneer-Faced Architectural Cabinets' for cabinet doors.
  - 3. Section 06 4817: 'Fire-Rated Wood Door Frames'.
  - 4. Section 09 9324: 'Interior Clear-Finished Hardwood'.

**1.2 REFERENCES**

- A. Abbreviations And Acronyms:
  - 1. AWS: Architectural Woodwork Standards (formerly AWI).
  - 2. FD: Fire-resistant core, fire-resistant materials assembled to stiles and rails according to methods prescribed by the testing agency to meet rigorous smoke, flame, and pressure tests.
  - 3. FD-5: Core with 2 layers on each side.
  - 4. ME: Matching edges, i.e., vertical edges same as decorative faces.
  - 5. PC: Particleboard core, solid core door with stiles and rails bonded to the core and abrasive planed flat prior to the application of the faces.
  - 6. PC-5: Core with 2 layers on each side.
- B. Association Publications:
  - 1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada, 46179 Westlake Drive, Suite 120, Potomac Falls, VA [www.awinet.org](http://www.awinet.org).
    - a. Architectural Woodwork Standards (AWS), 2nd Edition, 2014.
- C. Definitions:
  - 1. Adhesive, Type I (fully waterproof): Forms a bond that will retain practically all of its strength when occasionally subjected to a thorough wetting and drying; bond shall be of such quality that specimens will withstand shear and the two-cycle boil test specified in ANSI/HPVA HP (latest edition).
  - 2. Book-Match: Matching between adjacent veneer leaves on one panel face. Every other piece of veneer is turned over so that the adjacent leaves are "opened" as two pages in a book. The fibers of the wood, slanting in opposite directions in the adjacent leaves, create a characteristic light and dark effect when the surface is seen from an angle.
  - 3. Core: The material (typically, veneer, lumber, particleboard, medium-density fiberboard, or a combination of these) on which an exposed surface material (typically, veneer or HPDL) is applied.
  - 4. Core, Solid: The innermost layer or section in flush door construction. Typical constructions are as follows:
    - a. Core, Mineral: A fire-resistant core material generally used in wood doors requiring fire ratings of 3/4 hours or more.
    - b. Particleboard - A solid core of wood or other lignocellulose particles bonded together with a suitable binder, cured under heat, and pressed into a rigid panel in a flat-platen press.
  - 5. Face Veneer: The outermost exposed wood veneer surface of a veneered wood door, panel, or other component exposed to view when the project is completed.

6. Fire-rated: Fire-retardant particleboard with an Underwriters' Laboratory (UL) stamp for Class 1 fire rating (Flame Spread 20, Smoke Developed 25). Fire-rated doors are available with particleboard and mineral cores for ratings up to 1-1/2 hours.
7. Fire-rated Door: A door made of fire-resistant material that can be closed to prevent the spread of fire and can be rated as resisting fire for 20 minutes (1/3 hour), 30 minutes (1/2 hour), 45 minutes (3/4 hour) (C), 1 hour (B), or 1-1/2 hours (B). The door must be tested and carry an identifying label from a qualified testing and inspection agency.
8. Flitch: A hewn or sawn log made ready for veneer production or the actual veneer slices of one half log, kept in order, and used for the production of fine plywood panels.
9. Grade: Unless otherwise noted, this term means Grade rules for Economy, Custom, and/or Premium Grade.
  - a. Custom Grade: Typically specified for and adequately covers most high-quality architectural woodwork, providing a well-defined degree of control over a project's quality of materials, workmanship, or installation.
  - b. Premium Grade: The highest Grade available in both material and workmanship where the highest level of quality, materials, workmanship, and installation is required.
10. Plain Slicing: Most commonly used for hardwood plywood. The log is cut in half, and one half is placed onto a carriage and moved up and down past a fixed knife to produce the veneers. Veneer is sliced parallel to the pith of the log and approximately tangent to the growth rings to achieve flat-cut veneer. Each piece is generally placed in a stack and kept in order. One half log, sliced this way, is called a "flitch."
11. Running Match: Each panel face is assembled from as many veneer leaves as necessary. Any portion left over from one panel may be used to start the next.
12. Stile-and-Rail Construction: A technique often used in the making of doors, wainscoting, and other decorative features for cabinets and furniture. The basic concept is to capture a panel within a frame, and in its most basic form it consists of five members: the panel and the four members that make up the frame. The vertical members of the frame are called stiles, while the horizontal members are known as rails.

D. Reference Standards:

1. American Architectural Manufacturers Association / Window & Door Manufacturers Association / Canadian Standards Association:
  - a. AAMA/WDMA/CSA 101/I.S.2/A440-11, 'North American Fenestration Standard/Specification for windows, doors, and skylights'.
2. ASTM International:
  - a. ASTM C1036-11, 'Standard Specification for Flat Glass'.
  - b. ASTM C1048-12, 'Standard Specification for Heat-Treated Flat Glass—Kind HS, Kind FT Coated and Uncoated Glass'.
3. Consumer Products Safety Commission (CPSC):
  - a. CPSC 16 CFR 1201 Consumer Product Safety Commission Part 1201 – 'Safety Standard for Architectural Glazing Materials'.
4. Hardwood, Plywood, and Veneer Association:
  - a. HPVA HP-1-2009 'Standard for Hardwood and Decorative Plywood'.
5. International Building Code (IBC):
  - a. 715.4, 'Fire Door and Shutter Assemblies'. (2012).
6. National Fire Protection Association:
  - a. NFPA 80, 'Standard for Fire Doors and Other Opening Protectives' (2016 Edition).
  - b. NFPA 101: 'Life Safety Code' (2015 Edition).
  - c. NFPA 252: 'Fire Tests of Door Assemblies' (2012 Edition).
7. National Particleboard Association / Composite Panel Association:
  - a. NPA A208.1-2009, 'Particleboard'.
8. Underwriters Laboratories, Inc.
  - a. UL 9, 'Fire Tests of Window Assemblies' (8th Edition ).
  - b. UL 10B, 'Fire Tests of Door Assemblies' (10th Edition).

### 1.3 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:

- a. Schedule showing type of door at each location. Included shall be size, veneer, core type, fire rating, hardware prep, openings, blocking, etc.
    - b. Indicate factory finish color and type.
  2. Samples:
    - a. Interior Hardwood for Transparent Finish:
      - 1) Before performing work of this Section, prepare Control Sample, to match sample available from Owner, to be used as finishing standard for interior clear finished hardwood as specified in Section 09 9324.
      - 2) Design Criteria:
        - a) Provide **8 inch by 10 inch** sample of Red Oak to match Owner provided stain color selected for Project.
        - b) Control Sample will be used as performance standard for evaluating finish provided.
- B. Informational Submittals
1. Test And Evaluation Reports:
    - a. Submit copies of fire tests showing accessories and configurations necessary for rated double doors to achieve ratings.
  2. Source Quality Control Submittals:
    - a. Samples:
      - 1) Interior Hardwood for Transparent Finish:
        - a) Owner will provide Control Sample from project for finish.
- C. Closeout Submittals:
1. Include following information in Operations And Maintenance Manuals specified in Section 01 7800:
    - a. Record Documentation:
      - 1) Manufacturers Documentation:
        - a) Manufacturer's product literature on doors and factory finish.
        - b) Maintenance and repair instructions.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
1. Deliver in clean truck and, in wet weather, under cover.
  2. Deliver to building site only after plaster, cement, and taping compound are completed and dry and after interior painting operations have been completed.
  3. Individually wrap in polyethylene bags for shipment and storage.
- B. Storage And Handling Requirements:
1. Store doors in a space having controlled temperature and humidity range between 25 and 55 percent.
  2. Store flat on level surface in dry, well ventilated space.
  3. Cover to keep clean but allow air circulation.
  4. Do not subject doors to direct sunlight, abnormal heat, dryness, or humidity.
  5. Handle with clean gloves and do not drag doors across one another or across other surfaces.
  6. Leave shipping bag on door after installation until immediately before substantial completion inspection.
  7. Doors have been acclimated to the field conditions for a minimum of 72 hours before installation is commenced.

#### 1.5 WARRANTY

- A. Manufacturer Warranty:
1. Manufacturer's standard full door warranty for lifetime of original installation.
    - a. Warranty shall include finishing, hanging, and installing hardware if manufacturing defect was discovered after door was finished and installed.

- b. Warranty to include defects in materials including following:
  - 1) Delaminating in any degree.
  - 2) Warp or twist of **1/4 inch** or more in door panel at time of one-year warranty inspection.
  - 3) Telegraphing of core assembly: Variation of **1/100 inch** or more in **3 inch** span.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURED UNITS

- A. Suppliers:
  - 1. Category One Approved VMR Suppliers. See Section 01 6200 for definitions of Categories and Section 01 4301 for Qualification Requirements:
    - a. Architectural Building Supply, Salt Lake City, UT, Russ Farley, Phone (800) 574-4369, FAX 801-484-6817, e-mail [russf@absdoors.com](mailto:russf@absdoors.com).
    - b. Beacon Metals Inc, Salt Lake City, UT, Don Gottsredson, Phone (801) 486-4884, Cell (801) 667-0378, FAX 801-485-7647, e-mail [Don@beacon-metals.com](mailto:Don@beacon-metals.com).
- B. Manufacturers:
  - 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
    - a. Graham Wood Doors, Mason City, IA.
    - b. Marshfield Door Systems Inc, Marshfield, WI.
    - c. VT Industries, Holstein, IA.
- C. Wood Doors:
  - 1. Type: AWS PC-5ME or FD-5ME.
  - 2. Grade: AWS Premium, except face veneer.
  - 3. Fully Type I Construction: Adhere all glue lines with Type I adhesive, including veneer lay-up.
  - 4. Face Veneer:
    - a. Plain sliced Red Oak meeting requirements of AWS Grade A, **1/50 inch** thick minimum immediately before finishing.
    - b. Face veneers shall be running book matched.
  - 5. Core:
    - a. Fully bonded to stiles and rails and sanded as a unit before applying veneers.
    - b. Non-Rated And Fire-rated, AWS FD 1/3:
      - 1) 32 lb density meeting requirements of ANSI A208.1 Mat Formed Wood Particle Board, Grade 1-L-1 minimum.
      - 2) Stiles:
        - a) **1-3/8 inches** deep minimum before fitting.
        - b) Stile face to be hardwood matching face veneer material, thickness manufacturer's standard.
      - 3) Rails:
        - a) **1-1/8 inches**.
        - b) Manufacturer's option.
    - c. Fire-Rated, AWS FD 3/4, 1, and 1-1/2:
      - 1) Mineral as standard with approved Manufacturer with inner blocking, **5 inches** wide minimum, for closers, flush bolts, and exit devices.
      - 2) Stiles And Rails:
        - a) Sizes of stiles and rails to be Manufacturer's standard meeting fire rating, and incorporating solid hardwood stile face.
        - b) Stiles for pairs of mineral core doors shall be of material and configuration meeting required fire rating without use of metal astragal or edge.
  - 6. Factory Glazing:
    - a. Glazing:
      - 1) Fire-rated, Safety-rated glass ceramic.
      - 2) Meet US Consumer Product Safety Commission safety rating (CPSC 16 CFR 1201).
      - 3) Meets UL 10C, UBC 7-2 and UBC 7-4.
    - b. Lite Kit:



- 1) Design Criteria:
    - a) Fire-rated, pre-finished, fire-rated wood veneer frames.
  - 2) Dimensions:
    - a) Doors: **6 inch** wide by **24 inches** high cutout opening) security view window with bottom of opening located **51 inches** above finish floor and side located **6 inches** from strike edge of door.
  - 3) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
    - a) Profile W6 by Marshfield.
    - b) Profile VT1 by VT Industries.
- D. Fabrication:
1. Doors shall be factory-machined. Coordinate with Section 08 1213 and Sections under 08 7000.
  2. Provide doors requiring lites with factory- or shop-installed lites and stops to match fire rating of door.
- E. Finishes:
1. Factory Finishing:
    - a. Applied by Door Manufacturer before leaving factory.
    - b. Performance / Design Criteria:
      - 1) Finish factory-finish to match Owner selected sample as specified in Section 09 9324.
    - c. Match existing Project Color Scheme:
      - 1) Control Sample provided by Owner:
        - a) Control Sample will be existing wood item from Project.
    - d. Finish: AWS Finish System TR-6 Catalyzed Polyurethane Premium Grade for unfilled, open-grain woods.

## 2.2 SOURCE QUALITY CONTROL

- A. Inspections:
1. Verification of Performance:
    - a. Doors shall have following information permanently affixed on top of door:
      - 1) Manufacturer:
      - 2) Door designation or model.
      - 3) Veneer species.
      - 4) Factory finish.
  2. Clear Finished Hardwood:
    - a. Color matches Owner provided sample specified in Section 09 9324.
    - b. Conform to National Fire Protection Standards, NFPA 80, for fire-rated doors.
      - 1) Required fire-rated doors shall bear approved labels of UL, Warnock Hersey International, or other code acceptable agency.
      - 2) Machining for hardware shall be complete before application of label.

## PART 3 - EXECUTION: Not Used

## END OF SECTION

**BLANK PAGE**

**SECTION 08 4113****ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install aluminum storefront entry and window systems, including hardware, glazing, and caulking, as described in Contract Documents and including the following:
    - a. Low energy swinging operators for ADA compliance.
- B. Related Requirements:
  - 1. Section 01 1100: Cores for High Security Cylinders are excluded from Contract and provided by Owner. This specification establishes quality of materials and installation of those items for information of Contractor, Architect, and Owner's Representatives.
  - 2. Section 06 1100: 'Wood Framing':
    - a. Pre-installation conference held jointly with Section 08 4113.
  - 3. Section 07 9213: Quality of sealants.
  - 4. Section 08 8100: Quality of glass glazing.
  - 5. Section 28 1316: 'Access Control System':
    - a. Coordination and location of pull string inside storefront door mullion for electric strike and

**1.2 REFERENCES**

- A. Association Publications:
  - 1. American Architectural Manufacturers Association (AAMA):
    - a. AAMA SFM 1-14, 'Aluminum Store Front and Entrance Manual'.
    - b. AAMA 501-05, 'Methods of Test for Exterior Walls'.
    - c. AAMA 506-11, 'Voluntary Specifications for Impact and Cycle Testing of Fenestration Products'.
    - d. AAMA 609 & 610-15, 'Cleaning and Maintenance Guide for Architecturally Finished Aluminum' (combined documents).
    - e. AAMA 611-14, 'Voluntary Standards for Anodized Architectural Aluminum'.
    - f. AAMA 701/702-11, 'Voluntary Specification for Pile Weatherstripping and Replaceable Fenestration Weatherseals'.
    - g. AAMA 800-10, 'Voluntary Specifications and Test Methods for Sealants'.
    - h. AAMA 2603-13, 'Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels'.
    - i. AAMA 2604-13, 'Voluntary Specification, Performance Requirements and Test Procedures for High Performing Organic Coatings on Aluminum Extrusions and Panels'.
    - j. AAMA 2605-13, 'Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels'.
  - 2. Glass Association of North America (GANA):
    - a. *'Glazing Manual'*.
  - 3. National Association of Architectural Metal Manufacturers (NAAMM):
    - a. Metal Finishes Manual for Architectural and Metal Products.
- B. Definitions:
  - 1. Activation Device: Device that, when actuated, sends electrical signal to door operator to open door.
  - 2. Exit Device: Door locking mechanism designed to be always operable from interior by pressure on crash bar or lever.
  - 3. Deadbolt: Lock in which a bolt is moved by means of key or thumb turn, and is positively stopped in its projected position.

4. Door Closer: Device or mechanism to control door during its opening and closing cycle; may be overhead or floor mounted, and either exposed or concealed.
5. Glass Surface:
  - a. Insulated glass unit:
    - 1) Surface 1: Exterior surface of outer lite.
    - 2) Surface 2: Interspace-facing surface of outer lite.
    - 3) Surface 3: Interspace-facing surface of inner lite.
    - 4) Surface 4: Interior surface of inner lite.
  - b. Monolithic glass:
    - 1) Surface 1: Exterior surface.
    - 2) Surface 2: Interior surface.
6. Hinge: Hardware device by means of which a door is suspended in its frame, allowing it to swing.
7. Pull Hardware: Fixed handle or grip used to pull door open.
8. Push Hardware: Fixed bar or plate used to push door open.
9. Safety Device:
  - a. Device that prevents door from opening or closing, as appropriate.
10. Sweep Strip:
  - a. Weatherstrip mounted at top or bottom exterior edge of swing door.
11. Threshold:
  - a. Lower horizontal member of door frame set on floor and extends from jamb to jamb.

C. Reference Standards:

1. American National Standards Institute / Builders Hardware Manufacturers Association:
  - a. ANSI/BHMA A156.1-2013, 'Butts & Hinges'.
  - b. ANSI/BHMA A156.3-2008, 'Exit Devices'.
  - c. ANSI/BHMA A156.4-2013, 'Door Controls-Closers'.
  - d. ANSI/BHMA A156.5-2014, 'Cylinders and Input Devices for Locks'.
  - e. ANSI/BHMA A156.6-2010, 'Architectural Door Trim'.
  - f. ANSI/BHMA A156.18-2012, 'Materials and Finishes'.
  - g. ANSI/BHMA A156.19-2013, 'Power Assist and Low Energy Power Operated Doors'.
  - h. ANSI/BHMA A156.21-2014, 'American National Standard for Thresholds'.
  - i. ANSI/BHMA A156.30-2014, 'American National Standard for High Security Cylinders'.
  - j. ANSI/BHMA A156.36-2010, 'American National Standard for Auxiliary Locks'.
2. ASTM International:
  - a. ASTM B209-14, 'Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate'.
  - b. ASTM B221-14, 'Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes'.
  - c. ASTM B456-11, 'Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium'.
  - d. ASTM B633-13, 'Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel'.
  - e. ASTM C1184-14, 'Standard Specification for Structural Silicone Sealants'.
  - f. ASTM E283-04(2012), 'Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen'.
  - g. ASTM E330/E330M-14, 'Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference'.
  - h. ASTM E331-00(2009), 'Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference'.
  - i. ASTM E1996-14a, 'Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes'.
  - j. ASTM E2112-07, 'Standard Practice for Installation of Exterior Windows, Doors and Skylights'.
  - k. ASTM F588-14, 'Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact'.
3. International Building Code (IBC):
  - a. Chapter 10, 'Means of Egress'.
  - b. Chapter 16, 'Structural Design'.
    - 1) Section 1609 'Wind Loads'.
      - a) 1609.3, 'Basic Wind Speed'.

4. International Code Council / American National Standards Institute:
  - a. ICC / ANSI A117.1-2009, 'Accessible and Usable Buildings and Facilities'.
5. National Fenestration Rating Council (NFRC):
  - a. NFRC 100-2014, 'Procedure for Determining Fenestration Product U-factors'.
6. National Fire Protection Association / American National Standards Institute:
  - a. NFPA 101-2015, 'Life Safety Code'.

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
  1. Participate in pre-installation conference as specified in Section 06 1100.
    - a. Schedule pre-installation conference one (1) week before scheduled installation of storefront system.
    - b. In addition to requirements of Section 01 3100, review following:
      - 1) Review rough opening requirements:
        - a) New additions:
          - (1) Make certain rough openings are within tolerances required for installation of factory-fabricated frames.
          - (2) These dimensions have been agreed upon between Owner and Manufacturer and are shown on Standard Plan Drawings.
      - 2) Review installation scheduling, coordination, placement of doors.
      - 3) Review low-energy door operator location and requirements.
      - 4) Review delivery, storage, and handling requirements.
      - 5) Review 'Examination' requirements before sliding door installation.
      - 6) Review 'Finish' door and hardware requirements.
      - 7) Review 'Protection' responsibilities.
      - 8) Review 'Cleaning' responsibilities.
      - 9) Review safety issues.

### 1.4 SUBMITTALS

- A. Action Submittals:
  1. Product Data:
    - a. Manufacturer's literature.
      - 1) Storefront entry system.
      - 2) Low-energy door operator.
    - b. Color and finish.
  2. Shop Drawings:
    - a. Clearly mark components to identify their location in Project.
    - b. Show locations, sizes, etc, of hardware reinforcing.
- B. Informational Submittals:
  1. Qualification Statement:
    - a. Installer:
      - 1) Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
  1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Operations and Maintenance Data:
      - 1) Maintenance, adjustment, and repair instructions.
    - b. Warranty Documentation:
      - 1) Final, executed copy of Warranty.
        - a) Storefront warranty.
        - b) Storefront closers.
        - c) Low-energy door operator.
    - c. Record Documentation:
      - 1) Manufacturers documentation:

- a) Manufacturer's literature or cut sheets for storefront system and for each item of hardware.
- b) Manufacturer's literature of cut sheets for low-energy door operators.
- c) Color and finish selections.
- d) Parts lists.

## 1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
  - 1. Storefront System Performance Requirements:
    - a. Provide test reports from AAMA accredited laboratories certifying performances if requested:
      - 1) Air Leakage: Meet requirements of ASTM E283.
      - 2) Limit air leakage through assembly to **0.06 CFM/min/sq ft** of wall area at **6.24 PSF** as measured in accordance with ASTM E283.
      - 3) Water Resistance: No water leakage when measured in accordance with ASTM E331 with static test pressure of **8PSF** as defined by AAMA 501.
      - 4) Dynamic Water Resistance: No water leakage, when measured in accordance with AAMA 501 with dynamic test pressure of **8 PSF**.
      - 5) Limit mullion wind load deflection of L/175 with full recovery of glazing materials, when measured in accordance with ASTM E330/E330M.
      - 6) System shall not deflect more than **1/8 inch** at center point, or **1/16 inch** at enter point of horizontal member, once dead load points have been established.
      - 7) System shall accommodate expansion and contraction movement due to surface temperature differential of **180 deg F**.
      - 8) Seismic testing shall conform to AAMA recommended static test method for evaluating performance of curtain walls and storefront wall systems due to horizontal displacements associated with seismic movements and building sway.
  - 2. Provide wind load and impact testing by testing laboratory when required by local codes and jurisdictions:
- B. Qualifications: Requirements of Section 01 4301 applies, but not limited to following:
  - 1. Manufacturer Qualifications:
    - a. Provide aluminum entrances and storefront systems produced by firm experienced in manufacturing systems that are similar to those indicated for this project and have record of successful in service performance.
  - 2. Fabricator Qualifications:
    - a. Provide aluminum entrances and storefront systems fabricated by a firm experienced in producing systems that are similar to those indicated for this Project, and have record of successful in service performance.
    - b. Fabricator shall have sufficient production capacity to produce components required without causing delay in progress of the Work.
  - 3. Installer Qualifications:
    - a. Minimum three (3) years experience in storefront installations.
    - b. Minimum five (5) satisfactorily completed projects of comparable quality, similar size, and complexity in past three (3) years before bidding.
    - c. Upon request, submit documentation.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
  - 1. Deliver all parts of door, together with hardware, in original, unopened packages with labels intact to Project at same time.
- B. Storage And Handling Requirements:
  - 1. Store in clean, dry location, indoors in Manufacturer's unopened packaging until ready for installation and in accordance with Manufacturer's instructions.

2. Stack framing components in a manner that will prevent bending and avoid significant or permanent damage.
3. Protect materials and finish from damage during storage, handling and installation.

## 1.7 WARRANTY

- A. Manufacturer Warranty:
  1. Storefront Entrances:
    - a. Manufacturer's Warranty to be free of defects in material and workmanship.
    - b. Manufacturer's Warranty against deterioration or fading.
    - c. Manufacturer's Lifetime Warranty for Door Construction for normal use.
  2. Closers:
    - a. Closer Manufacturer's standard warranty, 10 years minimum.

## PART 2 - PRODUCTS

### 2.1 ASSEMBLIES

- A. Manufacturers:
  1. Category One VMR Approved Manufacturers. See Section 01 6200 for definitions of Categories:
    - a. Arcadia Inc., Vernon CA [www.arcadiainc.com](http://www.arcadiainc.com).
      - 1) Contact Information: Ken Martinek, (602) 734-5327 [kmartinek@arcadiainc.com](mailto:kmartinek@arcadiainc.com).
    - b. Kawneer North America, Norcross, GA, [www.kawneer.com/kawneer/north\\_america](http://www.kawneer.com/kawneer/north_america).
      - 1) Contact Information: Paul Cannon, West Valley City, UT (801) 201-1080, FAX 801-768-4588 [paul.cannon@alcoa.com](mailto:paul.cannon@alcoa.com).
- B. General:
  1. In addition to requirements shown or specified, comply with:
    - a. Applicable provisions of AAMA SFM 1, 'Aluminum Store Front and Entrance Manual' for design, materials, fabrication and installation of component parts.
- C. Design Criteria:
  1. Storefront System suitable for outside or inside glazing.
- D. Materials:
  1. Framing Components and Accessories:
    - a. Aluminum Extrusions:
      - 1) 6063-T6 aluminum alloy or meet requirements of ASTM B221, alloy GS 10a T6.
    - 2) Anchors, Clips, and Accessories:
      - a) Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated (properly isolated steel from aluminum).
    - 3) Fasteners:
      - a) Aluminum, nonmagnetic stainless steel or other materials to be non-corrosive and compatible with aluminum window members, trim hardware, anchors, and other components.
    - 4) Glazing Gasket:
      - a) Compression-type design with replaceable extruded EPDM rubber.
    - 5) Reinforcing Members:
      - a) Aluminum, nonmagnetic stainless steel, or nickel/chrome-plated steel complying with ASTM B456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B633 for SC 3 severe service conditions or other suitable zinc coating; provide sufficient strength to withstand design pressure indicated.
    - 6) Sills:

- a) Match height of door bottoms.
  - 7) Sealant:
    - a) Structural Sealant meeting requirements of ASTM C1184 for fabrication within storefront system:
      - (1) Permanently elastic, non-shrinking, and non-migrating type for joint size and movement.
      - (2) Single-component neutral-curing silicone formulation compatible with system components specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in aluminum-framed systems indicated.
      - (3) Color: Black.
    - b) Joint Sealants used at perimeter of storefront framing system: Elastomeric Sealant as specified in Section 07 9213.
  - 8) Tolerances:
    - a) Tolerances for wall thickness and other cross-sectional dimensions of storefront members in compliance with AA Aluminum Standards and Data.
  - b. Storefront Framing System:
    - 1) Brackets and Reinforcements:
      - a) Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.
    - 2) Fasteners and Accessories:
      - a) Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.
    - 3) Perimeter Anchors:
      - a) When steel anchors are used, provide insulation between steel material and aluminum material to prevent galvanic action.
  - c. Finish:
    - 1) Match doors.
  - d. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - 1) Non-Thermal, 2 inch Sightline:
      - a) Double Stack header at exterior doors only if shown on Contract Drawings.
      - b) Single Glazed:
        - (1) AR450 by Arcadia.
        - (2) Trifab VG 450 by Kawneer.
      - c) Double Glazed:
        - (1) AG451 by Arcadia.
        - (2) Trifab VG 451 by Kawneer.
2. Manually Operated Doors:
- a. Aluminum:
    - 1) 6063-T6 aluminum alloy or meet requirements of ASTM B221, alloy GS 10a T6.
  - b. Stiles:
    - 1) 3-1/2 inches by 1-3/4 inches by 0.125 inches thick nominal.
  - c. Top Rails:
    - 1) 3-1/2 inches by 1-3/4 inches by 0.125 inches thick nominal.
  - d. Bottom Rails:
    - 1) 10 inches minimum by 1-3/4 inches by 0.125 inches thick nominal.
  - e. Construction:
    - 1) Manufacturer's standard.
  - f. Glazing Stops:
    - 1) Snap-in type with neoprene bulb-type glazing. Units shall be glazed from exterior side.
  - g. Weatherstripping:
    - 1) Neoprene bulb-type.
    - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - a) Peri-Plus Seal (PPS) by Arcadia.
      - b) Sealair by Kawneer.
  - h. Framing System Gaskets and Sealants:
    - 1) Manufacturer's standard, recommended by manufacturer for joint type:
    - 2) Sealants: As specified in Framing Components and Accessories.
  - i. Factory Finishing:



- a) Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; clear coating 0.40 mils to 0.70 mils thick) complying with AAMA 611.
  - j. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - 1) Non-Thermal:
      - a) MS362 Medium Stile by Arcadia.
      - b) 350 Medium Stile by Kawneer.
  - k. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - 1) Single Glazed:
      - a) MS362IP Medium Stile by Arcadia.
      - b) 350 IR by Kawneer.
3. Glazing:
- a. Glazing as specified in Section 08 8100: 'Glass Glazing'.
  - b. Glazing Gaskets:
    - 1) Compression-type design with replaceable extruded EPDM rubber.
  - c. Spacers and Setting Blocks: Elastomeric.
  - d. Bond-Breaker (Sealer) Tape: Standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.
  - e. Glazing Sealant:
    - 1) Structural Sealant meeting requirements of ASTM C1184:
      - a) Permanently elastic, non-shrinking, and non-migrating type for joint size and movement.
      - b) Single-component neutral-curing silicone formulation compatible with system components specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in aluminum-framed systems indicated.
      - c) Color: Black.
    - 2) Weather Sealant:
      - a) ASTM C 920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O; single-component neutral-curing formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weather seal sealant, and aluminum-framed-system manufacturers for this use.
      - b) Color: Match structural sealant.
4. Hardware:
- a. Hinging:
    - 1) Top and bottom offset, ball bearing pivots per door leaf.
  - b. Overhead Door Closers:
    - 1) Provide parallel arms on closers unless door position requires otherwise.
    - 2) Where possible, closers shall allow for 180 degree opening and not be used as stop. Provide Cush-N-Stop or equivalent arm where wall stop cannot be used.
    - 3) Adjust closers to provide maximum opening force as required by governing code authority.
    - 4) Closers shall have following features:
      - a) Adjustable sweep speed.
      - b) Adjustable backcheck.
      - c) Non-handed, non-sized.
      - d) Cush arm by LCN or equal by Norton.
    - 5) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
      - a) Surface mounted:
      - b) 4041 Series parallel arm by LCN.
      - c) 7500 Series Parallel arm by Norton.
  - c. Exit Devices:
    - 1) Entry Doors:
      - a) Operation:
        - (1) Entry shall be by key. Device shall be locked by cylinder from outside. Key shall be removable when cylinder is in locked or unlocked position.
        - (2) Dogging operation shall be by manufacturer's accessible thumbturn cylinder function.

- (3) Exterior Trim: Lever Handle or Pull equal to Kawneer CO-9 or Arcadia OPR-9.
  - (4) Types: Rim Type. Provide type of strike that will allow installation of specified panic devices on storefront system specified.
  - 2) Color:
    - a) Equivalent to clear anodized.
  - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a) Apex Series by Precision.
    - b) 80 Series by Sargent.
    - c) 98 or 99 Rim Series by Von Duprin.
  - d. Thresholds:
    - 1) Exterior:
      - a) Design Criteria: Meet handicap accessibility requirements.
      - b) Exterior to Carpet Tile: Similar to Pemko 273 Profile.
  - e. Sweep Strips:
    - 1) Class Two Quality Standard:
      - a) Entrance Manufacturer's standard (cover cap with no exposed fasteners).
      - b) Pemko 293100 N8.
  - f. Push / Pulls:
    - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - a) PBR and OPR-9 by Arcadia.
      - b) Kawneer CP and CO-9, clear anodized.
  - g. High Security Cylinders And Cores:
    - 1) Medeco cores with Level Six HUK-IC keying system with special Church keyway:
      - a) Church And Factory Authorized Distributors:
        - (1) Intermountain Lock & Supply Co, 3106 South Main, Salt Lake City, UT:
          - (a) Utah: (800) 662-5941.
          - (b) Other: (800) 453-5386.
          - (c) FAX: (801) 485-7205.
        - (2) Clark Security Products, 135 West 2950 South, Salt Lake City, UT:
          - (a) Local: (801) 487-3227.
          - (b) Other: (800) 453-6430.
          - (c) FAX: (801) 487-3254.
  - h. Kick Plates:
    - 1) Push side of Door only.
    - 2) 10 inches high by width of door less 3/4 inch on each side.
    - 3) Material: 0.050 inch thick Stainless Steel.
    - 4) Type Two Acceptable Manufacturers:
      - a) Glynn-Johnson, Indianapolis, IN [www.glynn-johnson.com](http://www.glynn-johnson.com).
      - b) Hager, St Louis, MO (800) 255-3590 or (314) 772-4400 [www.hagerhinge.com](http://www.hagerhinge.com).
      - c) Ives, Wallingford, CT [www.iveshardware.com](http://www.iveshardware.com).
      - d) Rockwood Manufacturing Co, Rockwood, PA [www.rockwoodmfg.com](http://www.rockwoodmfg.com).
      - e) Equal as approved by Architect before bidding. See Section 01 6200.
- E. Fabrication:
- 1. Construction shall meet Manufacturer's recommendations.
  - 2. Fabricate components that, when assembled, have following characteristics:
    - a. Profiles sharp, straight, and free of defects or deformations.
    - b. Accurately fit joints; make joints flush, hairline and weatherproof.
    - c. Means to drain water passing joints, condensation within framing members, and moisture migrating within system to exterior.
    - d. Physical and thermal isolation of glazing from framing members.
    - e. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
    - f. Provisions for field replacement of glazing.
    - g. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
    - h. Framing members shall be internally reinforced and secured at head and sill as necessary for structural performance requirements and for hardware attachment.

3. Fabricate in factory to dimensions required to fit framed openings detailed on Contract Documents. Joints shall be tightly closed.
4. Mortise in manner to give maximum hardware-door connection strength and neatness of appearance. Adequately reinforce with back plates or rivnuts to hold pivots and closers.
5. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
6. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.
7. Storefront Framing: Fabricate components for assembly using manufactures standard installation instructions.
8. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

F. Hardware Finishes:

1. Finishes for steel, brass, or bronze hardware items shall be satin chromium plated.
2. Materials other than steel, brass, or bronze shall be finished to match the appearance of satin chromium plated.

## PART 3 - EXECUTION

### 3.1 INSTALLERS

- A. Performance Standard Installers: See Section 01 6200 for definitions of Categories. See Section 01 4301 and 'Quality Assurance' in Part 1 'General' for Installer Qualifications of this specification:
1. General Contractor responsible for Installer(s), verification of qualifications, and performance. Contact VMR Approved Manufacturer's Representative specified in Part 2 'Products' of this specification for potential installers if desired.

### 3.2 EXAMINATION

- A. Verification Of Conditions:
1. Verify that framed openings comply with Contract Document requirements.
  2. Verify floor is level across entire width of automatic door opening.
  3. Verify sill conditions are level and/or sloped away from openings as specified.
  4. Verify wall framing is dry, clean, sound, and free of voids and offsets, construction debris, sharp edges or anything that will prevent a successful installation of storefront system.
  5. Notify Architect and Owner in writing if framed openings are not as agreed upon.
    - a. Do not install storefront entry and window frames until deficiencies in framed openings have been corrected to allow installation of standard entries and windows.
    - b. Commencement of Work by installer is considered acceptance of substrate.

### 3.3 INSTALLATION

- A. General:
1. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
  2. All installation shall be in accordance with manufacturer's published recommendations and in accordance with approved shop drawings.
  3. Do not install damaged components. Fit frame joints tight, free of burrs and distortion. Rigidly secure non-movement joints.
  4. Isolate metal surfaces in contact with incompatible metal or corrosive substrates, including wood, by applying sealer tape to prevent electrolytic action.
- B. Set plumb, square, level, and in correct alignment and securely anchor to following tolerances:
1. Variation from plane: Limit to **1/8 inch** in **12 feet** ; **1/4 inch** over total length.
  2. Offset from Alignment: For surfaces abutting in line, limit offset to **1/16 inch**.

3. Offset at Corners: For surfaces meeting at corner, limit offset to **1/32 inch**.
  4. Diagonal measurements: Limit difference between diagonal measurements to **1/8 inch**.
  5. Sidelites: Line up horizontal rail in sidelight with door rail.
- C. Install doors without warp of rack. Adjust doors and hardware to provide 90 degree operation, tight fit at contact points and smooth operation.
- D. Install exterior window units with through wall sill flashing.
- E. Thresholds:
1. Accurately cut thresholds to fit profile of storefront frame. Bed exterior thresholds in specified sealant at contact points with floor and make watertight.
- F. Sealants:
1. Apply in accordance with Section 07 9213 'Elastomeric Joint Sealant' requirements.
  2. Caulk joints between frames and walls, both interior and exterior to provide weather tight installation.
- G. Glazing Characteristics:
1. Exterior Storefront Doors And Sidelights Opening Into Foyers And Corridors:
    - a. Clear interior pane and Clear exterior pane with Low E treatment on surface 2.

### 3.4 FIELD QUALITY CONTROL

- A. Field Tests And Inspections:
1. Pull test doors to ensure security of opening.
  2. Make all necessary final adjustments to attain normal operation of each door and its mechanical hardware.
- B. Non-Conforming Work:: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
1. Correct any work found defective or not complying with contract document requirements including removal and replacement of glass that has been broken, chipped, cracked, abraded, or damaged during construction period at no additional cost to the Owner.

### 3.5 ADJUSTING

- A. Adjust swing doors for proper operation after glazing entry. After repeated operation of completed installation, re-adjust door for optimum operating condition and safety if required.

### 3.6 PROTECTION

- A. During Installation:
1. Installer's Responsibility:
    - a. During installation, all adjacent work shall be protected from damage.
- B. After Installation:
1. General Contractor's Responsibility:
    - a. Institute protective measures required throughout remainder of construction period to ensure that aluminum entrances and storefronts will be without damage or deterioration, other than normal weathering, at time of acceptance.

### 3.7 CLEANING

- A. General:

1. Installer's Responsibility:
  - a. Follow Manufacturer's written recommendations for cleaning and maintenance or guidelines of AAMA 609 & 610 'Cleaning and Maintenance Guide for Architecturally Finished Aluminum' (combined documents). Avoid damaging protective coatings and finishes.
  - b. Clean glass and aluminum surfaces, inside and out, promptly after installation. Remove excess glazing and sealant compounds, dirt, and other substances. Exercise care to avoid damage to coatings.
  - c. Remove nonpermanent labels, protective films, and clean surfaces following recommended procedures.
    - 1) Do NOT remove permanent ANSI/AAMA/CSA or NFRC labels.
- B. Waste Management:
  1. Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**BLANK PAGE**

**SECTION 08 5113****ALUMINUM WINDOWS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Install window units as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 01 7800: 'Closeout Submittals'.
  - 2. Section 06 2001: 'Common Finish Carpentry Requirements' for Installation of window units.
  - 3. Section 07 9213: 'Elastomeric Joint Sealants' for quality of sealants and backer rods.
  - 4. Section 08 4113: 'Aluminum-Framed Entrances and Storefronts' for fixed storefront windows.
  - 5. Section 08 8100: 'Glass Glazing' for quality of glass.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. American Architectural Manufacturers Association:
    - a. AAMA 611-14, 'Voluntary Standards for Anodized Architectural Aluminum'.
    - b. AAMA 701/702-11, 'Voluntary Specifications for Pile Weatherstripping and Replaceable Fenestration Weatherseals'.
    - c. AAMA 711-13, Voluntary Specification for Self-Adhering Flashing Used for Installation of Exterior Wall Fenestration Products, American Architectural Manufacturers Association.
    - d. AAMA 851-09, 'Fenestration Sealants Guide for Windows, Window Walls and Curtain Walls'.
    - e. AAMA 902-14, 'Voluntary Specification for Sash Balances'.
    - f. AAMA 910-10, 'Life Cycle Specifications and Test Methods for AW Class Architectural Windows and Doors'.
    - g. AAMA 1302.5-76, 'Voluntary Specifications for Forced-Entry Resistant Aluminum Prime Windows'.
    - h. AAMA 1503-09, 'Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections'.
    - i. AAMA 2603-15, 'Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels'.
    - j. AAMA 2604-13, 'Voluntary Specification, Performance Requirements and Test Procedures for High Performing Organic Coatings on Aluminum Extrusions and Panels'.
    - k. AAMA 2605-13, 'Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels'.
  - 2. Fenestration Manufacturers Association / American Architectural Manufacturers Association:
    - a. FMA/AAMA100-12, 'Standard Practice for the Installation of Windows with Flanges or Mounting Fins in Wood Frame Construction'.
  - 3. National Fenestration Rating Council, Greenbelt, MD:
    - a. NFRC 100-2014, 'Procedure for Determining Fenestration Product U-factors.
    - b. NFRC 200-2010, 'Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence'.
- B. Definitions:
  - 1. Air Leakage: Flow of air which passes through fenestration products.
  - 2. Fenestration: Openings in or on the building envelope, such as windows, doors, secondary storm products (SSPs) curtain walls, storefronts, roof windows, tubular daylighting devices (TDDs), sloped glazing, and skylights, designed to permit the passage of air, light, or people.
  - 3. Muntins: Decorative profile that divides a lite of glass or panel into smaller sections.

4. Obscure Glass: Adds privacy where window coverings are impractical or undesirable. Various colors and texture patterns provide translucent or semi-opaque effect. May be tempered for use where safety glass is required.
5. Water Penetration: Measurement of the resistance of a fenestration product to the passage of water.

C. Reference Standards:

1. American Architectural Manufacturers Association / Window & Door Manufacturers Association / Canadian Standards Association:
  - a. AAMA/WDMA/CSA 101/I.S.2/A440-11, 'North American Fenestration Standard/Specification for windows, doors, and skylights'.
2. ASTM International:
  - a. ASTM E90-09, 'Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements'.
  - b. ASTM E330/E330M-14, 'Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference'.
  - c. ASTM E331-00(2009), 'Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference'.
  - d. ASTM E1996-14a, 'Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes'.
  - e. ASTM E2112-07, 'Standard Practice for Installation of Exterior Windows, Doors and Skylights'.
  - f. ASTM F588-14, 'Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact'.
3. International Code Council (ICC):
  - a. AC38, 'Water-Resistive Barriers' (Approved January 2013).
  - b. AC148, 'Flexible Flashing Materials' (Approved April 2015).

### 1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conference:

1. Participate in pre-installation conference.
2. Schedule conference before scheduled installation of aluminum windows.
3. In addition to agenda items specified in Section 01 3100, review following:
  - a. Review Installation scheduling, coordination, and placement of windows.
  - b. Review Manufacturer's installation requirements to assure issuance of Manufacturer's warranty.
  - c. Before installing windows, review Manufacturer's submitted installation requirements and install first window, including flashing and sealant, to demonstrate standard for installation of remaining windows.

### 1.4 SUBMITTALS

A. Action Submittals:

1. Product Data:
  - a. Manufacturer's literature or cut sheet.
  - b. Literature on glazing.
  - c. Color and finish selection.
  - d. Manufacturer's published installation instructions for windows, flashing, and sealants.
2. Shop Drawings: Submit before beginning framing. Show rough opening requirements.

B. Informational Submittals:

1. Manufacturer Instructions:
  - a. Manufacturer's published installation instructions for windows, flashing, and sealants.

C. Closeout Submittals:

1. Include following in Operations And Maintenance Manual specified in Section 01 7800:



- a. Warranty Documentation:
  - 1) Include copy of final, executed warranty.

## 1.5 QUALITY ASSURANCE

- A. Certifications:
  - 1. Confirmation of ICC report for flashing.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
  - 1. Materials shall be delivered in original, unopened packages with labels intact.
  - 2. Examine and report damaged materials to Architect and/or Owner immediately.
- B. Storage And Handling Requirements:
  - 1. Provide secure location protected from the weather and other trades.
  - 2. Store window units in an upright position in clean and dry storage area above ground and protect from weather.

## 1.7 WARRANTY

- A. Special Warranty:
  - 1. Provide written non-prorated Manufacturer's warranty including:
    - a. Ten (10) years for seal failure.
    - b. Two (2) years for failure of operating hardware.
    - c. Two (2) years on stress cracks related to fabrication or installation problems.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURED UNITS

- A. Manufacturers:
    - 1. Type One Acceptable Manufacturers:
      - a. Thermal Windows, Tulsa, Oklahoma:
        - 1) Contact Information:
          - a) General: Phone (918) 663-7580, [www.thermalwindows.com](http://www.thermalwindows.com).
          - b) Primary Contact: Seth Patterson (800) 259-7580  
[www.spatterson@thermalwindows.com](mailto:www.spatterson@thermalwindows.com).
      - b. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Manufactured Window Units:
  - 1. Performance Standard (Single Hung Window):
    - a. Single Hung: Series 500.
  - 2. Material:
    - a. Aluminum to be of proper alloy for commercial window construction.
    - b. Extruded sections to be 6063-T5 aluminum alloy.
  - 3. Frame:
    - a. Main frame members to be nominal thickness as required by ANSI/AAMA 101.
      - 1) Main frame to be 2-5/8 inch in depth.
    - b. Main frames members to be extruded aluminum with a structural thermal barrier of high density low thermal conductivity polyurethane, poured and de-bridged.
  - 4. Assembly:
    - a. Main frame to be a mechanically joined construction.

- b. Corner joints to be "seam sealed" with quality grade of sealant meeting requirements of AAMA 851.
  - c. All screws at joints of sash and main frame shall be secured into integral screw ports.
  - 5. Glazing:
    - a. Factory glazed with butyl glazing tape and snap in extruded aluminum glazing bead containing vinyl insert.
    - b. Insulated glass units to be 1 inch overall thickness with two panes of double strength glass, separated by 3/4 inch air space.
    - c. Insulated glass units shall meet requirements of ASTM E2190, Class "A".
  - 6. Factory Finishing:
    - a. Clear Anodized Aluminum Finish (match existing):
      - 1) Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; clear coating 0.40 mils (0.01016 mm) to 0.70 mils (0.01778 mm) thick complying with AAMA 611.
- C. Design Criteria (Single Hung):
- 1. Performance:
    - a. Comply with minimum test requirements of AAMA/WDMA/CSA 101 for classification of specified window in following:
      - 1) Meet classification FW-C30 for AAMA/WDMA/CSA 101:
        - a) Minimum Test Size: 56 x 91 inches
        - b) Minimum Design Pressure: 30 lbf/sq ft .
        - c) Deflection at Design Pressure: (Reported).
        - d) Minimum Structural Pressure: 45 lbf/sq ft
        - e) Minimum Water Pressure: 4.5 lbf/sq ft
        - f) Air Leakage Resistance: 0.3 cfm/sq ft at 1.6 lbf/sq ft
      - or
      - 2) Meet classification Class CW-C30-PG35-H for AAMA/WDMA/CSA 101:
        - a) Minimum Test Size: 56 x 91 inches
        - b) Minimum Design Pressure: 30 lbf/sq ft .
        - c) Deflection at Design Pressure: L/175.
        - d) Minimum Structural Pressure: 45 lbf/sq ft
        - e) Minimum Water Pressure: 4.5 lbf/sq ft
        - f) Air Leakage Resistance: 0.3 cfm/sq ft at 1.6 lbf/sq ft
    - b. Structural: Meet requirements of ANSI/AAMA 101 I.S.2/A440 DH-C45 specification.
    - c. Thermal: Meet the requirements of AAMA 1503 CRF 57/50.
    - d. NFRC: Meet requirements of NFRC 100 and NFRC 200.
    - e. Forced Entry: Meet requirements for AAMA 1302.5 and ASTM F588 Load Identification Level 30.
    - f. Sound Transmission Class: Meet requirements of ASTM E90.
  - 2. Material:
    - a. Aluminum to be of proper alloy for commercial window construction.
    - b. Extruded sections to be 6063-T5 aluminum alloy.
  - 3. Frame:
    - a. Main frame and sash members to be nominal thickness as required by ANSI/AAMA 101.
      - 1) Main frame to be 2-5/8 inch in depth.
    - b. Horizontal sash members to be hollow extrusions.
    - c. Main frames and sash members to be extruded aluminum with a structural thermal barrier of high density low thermal conductivity polyurethane, poured and de-bridged.
  - 4. Locks:
    - a. Consist of cam latch at interlocking meeting rail along with an independent spring loaded latch for sash.
  - 5. Balances:
    - a. Sash will be balanced by field adjustable spirally wound spring sash balances attached to the main frame by pivot sash shoes of nylon.
    - b. Balances shall hold the sash stationary in any position along full range of sash travel.
    - c. Where weight of sash requires, double sash balances will be used. Balances shall meet the requirements of AAMA 902.
    - d. along full range of sash travel.
    - e. Balances shall meet the requirements of AAMA 902.

6. Weatherstripping:
    - a. Weatherstripping shall be 0.250 polypile with mylar fins conforming to AAMA 701/702, Specification for Pile Weatherstrip.
    - b. Weatherstripping shall be doubled at all points of contact of the sash and main frames and at the interlocking meeting rail.
    - c. A dual vinyl bulb seal will be used at the sill.
  7. Assembly:
    - a. Main frame to be a mechanically joined construction.
    - b. Corner joints to be "seam sealed" with quality grade of sealant meeting requirements of AAMA 851.
    - c. The sash shall be assembled with two screws at each corner.
    - d. All screws at joints of sash and main frame shall be secured into integral screw ports.
  8. Glazing:
    - a. Glass in the operable sash to be factory glazed with marine (wrap around) reusable vinyl glazing channel.
    - b. Fixed upper lite to be inside glazed, using rigid vinyl glazing bead.
    - c. Insulated glass units to be **7/8 inch overall** thickness with two panes of double strength glass, separated by **5/8 inch air** space.
    - d. Insulated glass units shall meet requirements of ASTM E2190, Class "A".
  9. Operation:
    - a. The lower sash is operable and will raise for ventilation.
    - b. The lower sash is equipped with release latch so that it will tilt in for cleaning and is removable from the interior for ease of maintenance.
- D. Glazing Requirements:
1. Glazing Characteristics:
    - a. Obscure interior pane with pattern on surface 3 and Clear exterior pane with Low E treatment on surface 2.

## 2.2 ACCESSORIES

- A. Flashing:
1. Self-adhesive rubberized asphalt with protective sheet and ICBO report.
  2. Type Two Acceptable Products:
    - a. Flexwrap by duPont Tyvek, Wilmington, DE [www.tyvek.com](http://www.tyvek.com).
    - b. Eternabond, Mundelein, IL [www.eternabond.com](http://www.eternabond.com).
    - c. FortiFlash 20 mil by Fortifiber, Reno, NV [www.fortifiber.com](http://www.fortifiber.com).
    - d. Vycor Self-Adhered Flashing by Grace Construction Products, Cambridge, MA [www.na.graceconstruction.com](http://www.na.graceconstruction.com).
    - e. Optiflash B-20 by Covalence Coated Products, Homer, LA [www.covalencecoatedproducts.com](http://www.covalencecoatedproducts.com).
    - f. BR20XL or Ice & Water Guard Window Sealing Tapes by Protecto Wrap, Denver, CO [www.protectowrap.com](http://www.protectowrap.com).
    - g. Rufco-Shield Window & Door Flashing by Raven Industries, Sioux Falls, SD [www.ravenind.com](http://www.ravenind.com).
    - h. Equal as approved by Architect before installation. See Section 01 6200.
- B. Anchoring Devices:
1. Aluminum or stainless steel.
  2. Other corrosion-resistant or insulated anchors as specifically approved by Architect in writing before use.

## 2.3 SOURCE QUALITY CONTROL

- A. Identification:
1. When delivered to Project site, windows shall bear permanent label stating model of window and Manufacturer's name, or AAMA label.

**PART 3 - EXECUTION****3.1 EXAMINATION**

- A. Evaluation And Assessment:
  - 1. Openings:
    - a. Examine openings for adequacy in allowing successful installation and operation.
    - b. Verify openings are prepared to specified dimensions and are plumb and level.
  - 2. Notify Architect in writing of inadequate conditions.
    - a. Do not install windows until conditions have been corrected.
  - 3. Commencement of Work by installer is considered acceptance of substrate.

**3.2 PROTECTION**

- A. Protect aluminum window surfaces from adjacent work as necessary.

**3.3 INSTALLATION**

- A. Review Manufacturer's printed installation instructions before installing windows and flashing.
- B. Install windows after installation of air infiltration barrier. Integrate air infiltration barrier, flashing, and sealants as required to provide weather tight installation.
- C. Set window frame plumb, level, and in alignment.
  - 1. Secure window properly in opening.
- D. Apply specified sealant between window frame and building wall as specified in Section 07 9213.
  - 1. Trim off excess sealant.
- E. Avoid direct contact between aluminum and adjacent steel work by insulating with materials equal to 3M's EC 1202 tape if materials are in pressure contact or with bituminous paint if pressure between surfaces cannot be maintained.

**3.4 FIELD QUALITY CONTROL**

- A. Field Inspections:
  - 1. Notify Architect when windows are to be delivered to Project site to allow opportunity for Architect's inspection before installation.
  - 2. After installation of windows and before installation of exterior wall finish, inspect windows and compare to installation standard accepted at Pre-Installation Conference.
- B. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
  - 1. Correct any work found defective or not complying with contract document requirements at no additional cost to the Owner.

**3.5 ADJUSTING**

- A. Single Hung Windows:
  - 1. After windows are in place, installer shall adjust hardware and ventilators to operate smoothly and be weather tight when closed.

**3.6 CLEANING**

- A. After installation, clean interior and exterior metal surfaces of windows and accessories of mortar, plaster, paint, and other contaminants. Maintain protection and provide final cleaning.

**END OF SECTION**

**SECTION 08 7101****COMMON FINISH HARDWARE REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. General requirements for finish hardware related to architectural wood and hollow metal doors.
- B. Related Requirements:
  - 1. Section 06 2024: 'Door, Frame, And Finish Hardware Installation' for installation of hardware.
  - 2. Section 06 4114: 'Wood-Veneer-Faced Architectural Cabinets' for architectural woodwork hardware.
  - 3. Section 08 0601: 'Hardware Group and Keying Schedules'.
  - 4. Section 08 4113: 'Aluminum-Framed Entrances and Storefronts' for storefront hardware.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. Builders Hardware Manufacturers Association (BHMA), 355 Lexington Avenue, 15th Floor, New York, NY 10017-6603, Tel: 212-297-2122 Fax: 212-370-9047, [www.buildershardware.com](http://www.buildershardware.com).
- B. Reference Standards:
  - 1. American National Standards Institute / Builders Hardware Manufacturers Association:
    - a. ANSI/BHMA A156.1-2013, 'Butts & Hinges'.
    - b. ANSI/BHMA A156.3-2008, 'Exit Devices'.
    - c. ANSI/BHMA A156.4-2013, 'Door Controls-Closers'.
    - d. ANSI/BHMA A156.5-2014, 'Cylinders and Input Devices for Locks'.
    - e. ANSI/BHMA A156.6-2010, 'Architectural Door Trim'.
    - f. ANSI/BHMA A156.12-2013, 'Interconnected Locks & Latches'.
    - g. ANSI/BHMA A156.13-2012, 'Mortise Locks & Latches, Series 1000'.
    - h. ANSI/BHMA A156.18-2012, 'Materials and Finishes'.
    - i. ANSI/BHMA A156.19-2013, 'Power Assist and Low Energy Power Operated Doors'.
    - j. ANSI/BHMA A156.21-2014, 'American National Standard for Thresholds'.
    - k. ANSI/BHMA A156.30-2014, 'American National Standard for High Security Cylinders'.
    - l. ANSI/BHMA A156.36-2010, 'American National Standard for Auxiliary Locks'.
  - 2. International Code Council / American National Standards Institute:
    - a. ICC / ANSI A117.1-2009, 'Accessible and Usable Buildings and Facilities'.
  - 3. Underwriters Laboratories (UL):
    - a. UL 10B, 'Fire Tests of Door Assemblies'.
    - b. UL 10C, 'Positive Pressure Fire Tests of Door Assemblies'.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Hardware Templates:
    - a. Provide hardware templates to Sections 08 1213, 08 1313, and 08 1429 within fourteen (14) days after Architect approves hardware schedule.
    - b. Supply necessary hardware installation templates to Section 06 2024 before pre-installation conference.

## 1.4 SUBMITTALS

- A. Action Submittals:
  - 1. Product Data:
    - a. Manufacturer's cut sheets.
    - b. Two (2) copies of Manufacturer's installation, adjustment, and maintenance instructions for each piece of hardware. Include one (1) set in 'Operations And Maintenance Manual' and send one (1) set with hardware when delivered.
    - c. Copy of hardware schedule.
    - d. Written copy of keying system explanation.
  - 2. Shop Drawings:
    - a. Submit hardware schedule indicating hardware to be supplied.
    - b. Schedule shall indicate details such as proper type of strikeplates, spindle lengths, hand, backset, and bevel of locks, hand and degree opening of closer, length of kickplates, length of rods and flushbolts, type of door stop, and other necessary information necessary to determine exact hardware requirements.
- B. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Operations and Maintenance Data:
      - 1) Manufacturer's installation, adjustment, and maintenance instructions for each piece of hardware.
    - b. Record Documentation:
      - 1) Manufacturers documentation:
        - a) Manufacturer's literature and/or cut sheets.
        - b) Include keying plan and bitting schedule.

## 1.5 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Suppliers: Requirements of Section 01 4301 applies, but not limited to following:
    - a. Shall have two (2) years minimum experience in providing, detailing, scheduling, and installing builder's hardware and shall employ at least one full time DHI Architectural Hardware Consultant (AHC).

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Storage And Handling Requirements:
  - 1. Neatly and securely package hardware items by hardware group and identify for individual door with specified group number and set number used on Supplier's hardware schedule.
  - 2. Include fasteners and accessories necessary for installation and operation of finish hardware in same package.

## PART 2 - PRODUCTS

### 2.1 SUPPLIERS

- A. Category One VMR Approved Suppliers. See Section 01 6200 for definitions of Categories:
  - 1. Architectural Building Supply, Salt Lake City, UT, Russ Farley, Phone (800) 574-4369, FAX 801-484-6817, e-mail [russf@absdoors.com](mailto:russf@absdoors.com).
  - 2. Beacon Metals Inc, Salt Lake City, UT, Don Gottsredson, Phone (801) 486-4884, Cell (801) 667-0378, FAX 801-485-7647, e-mail [Don@beacon-metals.com](mailto:Don@beacon-metals.com).

**2.2 FINISHES**

- A. Hardware Finishes:
  - 1. Finishes for brass or bronze hardware items shall be:
    - a. ANSI / BHMA Finish Code 626.
      - 1) Description: Satin Chromium Plated.
      - 2) Base Metal: Brass. Bronze.
  - 2. Finishes for flat goods items may be:
    - a. ANSI / BHMA Finish Code 630.
      - 1) Description: Satin Stainless Steel.
      - 2) Base Metal: Stainless Steel (300 Series).
  - 3. Materials other than steel, brass, or bronze shall be finished to match appearance satin chromium plated, except flat goods which shall be satin stainless steel.

**2.3 FASTENERS**

- A. Fasteners shall be of suitable types, sizes and quantities to properly secure hardware. Fasteners shall be of same material and finish as hardware unless otherwise specified. Fasteners exposed to weather shall be non-ferrous or corrosion resisting steel.

**PART 3 - EXECUTION****3.1 PREPARATION**

- A. Before ordering materials, examine documents to be assured that material to be ordered is appropriate for substrate to which it is to be secured and will function as intended.

**END OF SECTION**

**BLANK PAGE**



**SECTION 08 7102****HANGING DEVICES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Hinges for flush wood and hollow metal doors.
- B. Related Requirements:
  - 1. Section 08 7101: Common Hardware Requirements.

**PART 2 - PRODUCTS****2.1 MANUFACTURED UNITS**

- A. Manufacturers:
  - 1. Manufacturer Contact List:
    - a. Hager Companies, St Louis, MO [www.hagerhinge.com](http://www.hagerhinge.com).
    - b. Ives, New Haven, CT [www.iveshardware.com](http://www.iveshardware.com).
    - c. McKinney, Scranton, PA [www.mckinneyhinge.com](http://www.mckinneyhinge.com).
    - d. PBB, Ontario, CA [www.pbbinc.com](http://www.pbbinc.com).
    - e. Stanley, New Britain, CT [www.stanleyworks.com](http://www.stanleyworks.com).
- B. Hinges:
  - 1. Sizes:
    - a. **1-3/4 inch** doors and fire-rated doors in metal frames:
      - 1) Standard: **4-1/2 inches by 4-1/2 inches**.
      - 2) Wide Throw: **4-1/2 inches** by width required.
    - b. **1-3/8 inch** wood or metal doors: **3-1/2 inches by 3-1/2 inches**.
  - 2. Use non-removable pins on exterior opening doors.
  - 3. Hinges on exterior doors shall be solid brass, plated to achieve specified finish.
  - 4. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a. Interior:
      - 1) Hager: BB 1279.
      - 2) Ives: 5BBI.
      - 3) McKinney: TA 2714.
      - 4) MacPro / McKinney: MPB79.
      - 5) PBB: BB81.
      - 6) Stanley: FBB 179.
    - b. Exterior:
      - 1) Hager: BB 1191.
      - 2) Ives: 5BBI.
      - 3) McKinney: TA 2314.
      - 4) PBB: BB21.
      - 5) Stanley: FBB 191.

**PART 3 - EXECUTION: Not Used****END OF SECTION**

**BLANK PAGE**

**SECTION 08 7103****SECURING DEVICES****PART 1 - GENERAL****1.1 SUMMARY**

1. Items for architectural wood or hollow metal doors:
  - a. Locksets and latchsets.
  - b. Deadbolts.
  - c. Cylinders.
  - d. Interior exit devices.
- B. Related Requirements:
  1. Section 08 7101: Common Hardware Requirements.
  2. Miscellaneous padlocks by local Church FM Group.

**1.2 REFERENCES**

- A. Definitions:
  1. Grade 1 Heavy Duty Key-In Lever Cylindrical Lockset:
    - a. Performance Features:
      - 1) Exceeds 1,000,000 ANSI cycles.
      - 2) Clutching mechanism standard.
      - 3) Thru-bolt design and heavy-duty spring tension provides longer performance life and prevents lever sag.
      - 4) ADA-compliant thumbturn.
      - 5) Mortise case is easily field reversible.
      - 6) Pre-assembled trims with spring-loaded spindles automatically adjust to door thickness.
      - 7) Partial security separator prevents spindle manipulation.
      - 8) Anti-friction throwbolt.
  2. Grade 2 Standard Duty Key-In Lever Cylindrical Lockset:
    - a. Performance Features:
      - 1) Exceeds 400,000 ANSI cycles.
      - 2) Single motion egress provides easy emergency exit.
      - 3) Full 1 inch throwbolt with saw resistant hardened steel roller pin.
      - 4) Anti-drill design deadbolt. Two (2) ball bearings inserted to prevent drill attacks.
      - 5) ADA-compliant thumbturn.

**1.3 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery And Acceptance Requirements:
  1. Standard Key Delivery:
    - a. Include change keys with hardware.

**PART 2 - PRODUCTS****2.1 MANUFACTURED UNITS**

- A. Manufacturers:
  1. Manufacturer List:
    - a. Best Locks by Stanley, Indianapolis IN [www.stanleysecuritysolutions.com](http://www.stanleysecuritysolutions.com).
    - b. Glynn-Johnson, Indianapolis, IN [www.glynn-johnson.com](http://www.glynn-johnson.com).
    - c. Hager, St Louis, MO [www.hagerhinge.com](http://www.hagerhinge.com).
    - d. Ives, New Haven, CT [www.iveshardware.com](http://www.iveshardware.com).

- e. Knappe & Vogt, Grand Rapids, MI [www.knappeandvogt.com](http://www.knappeandvogt.com).
  - f. Precision Hardware, Romulus, MI [www.precisionhardware.com](http://www.precisionhardware.com).
  - g. Rockwood, Manufacturing Co, Rockwood, PA [www.rockwoodmfg.com](http://www.rockwoodmfg.com).
  - h. Sargent, New Haven, CT [www.sargentlock.com](http://www.sargentlock.com).
  - i. Schlage, Colorado Springs, CO [www.schlage.com](http://www.schlage.com).
  - j. Von Duprin, Indianapolis, IN [www.vonduprin.com](http://www.vonduprin.com).
  - k. Yale Commercial Locks, Lenoir City, TN [www.yalecommercial.com](http://www.yalecommercial.com).
- B. General:
- 1. Backsets shall be **2-3/4 inches**.
  - 2. Furnish lead shields where required.
- C. Locksets And Latchsets:
- 1. Design Criteria:
    - a. Grade 2 Standard Duty Key-In Lever Cylindrical Lockset:
      - 1) ANSI/BHMA A156.12 Grade 2.
      - 2) Meet UL 10B fire tests.
      - 3) Meet UL 10C positive pressure fire tests.
      - 4) ADA Compliant ANSI A117.1 Accessibility Code.
  - 2. Lever Operated:
    - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - 1) Grade 2 Standard Duty Key-In Lever Cylindrical Locksets:
        - a) 7K Series Best Lock by Stanley standard cylinders - (I/C cores may be used when authorized by AEC).
        - b) 7 Line Series by Sargent.
        - c) AL Series by Schlage.
        - d) 5300LN by Yale.
- D. Standard Cylinders:
- 1. Provide cylinders for interior exit devices requiring cylinders.
  - 2. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a. Match Manufacturer of locksets.
- E. Exit Devices:
- 1. Use operable lever trim.
  - 2. Provide labeled hardware where required by local code authority.
  - 3. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a. Apex Series by Precision.
    - b. 80 Series by Sargent.
    - c. 99 or 98 Series by Von Duprin.
    - d. 7100 Series by Yale.
- F. Security Cables at Tie-Downs:
- 1. Flexible steel cable with permanent loop at each end:
    - a. Two each **6 foot** long, **7/16 inch** diameter.
    - b. Two each **6 foot** long, **5/16 inch** diameter.
    - c. Two each **4 foot** long, **5/16 inch** diameter.

## PART 3 - EXECUTION

### 3.1 CLOSE-OUT ACTIVITIES

- A. Owner's Instructions:
- 1. Before Final Acceptance Meeting, send master keys to **<Insert Person to Receive Keys>**.

**END OF SECTION**

**SECTION 08 7106****CLOSING DEVICES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Closers for flush wood doors and hollow metal doors.
- B. Related Requirements:
  - 1. Section 08 7101: 'Common Finish Hardware Requirements'.
  - 2. Section 08 7108: 'Stops And Holders'.

**1.2 SUBMITTALS**

- A. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Warranty Documentation:
      - 1) Manufacturer's final, executed copy of warranty.

**1.3 WARRANTY**

- A. Manufacturer Warranty:
  - 1. Manufacturer's Standard Warranty, five (5) years minimum.

**PART 2 - PRODUCTS****2.1 MANUFACTURED UNITS**

- A. Manufacturers:
  - 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
    - a. 7900 Series by Dorma Architectural Hardware, Reamstown, PA [www.dorma.com/usa](http://www.dorma.com/usa).
    - b. 1461 Series by LCN Closers, Princeton, IL [www.lcnclosers.com](http://www.lcnclosers.com).
    - c. 8501 Series by Norton Door Controls, Charlotte, NC [www.nortondoorcontrols.com](http://www.nortondoorcontrols.com).
    - d. 1431 Series by Sargent, New Haven, CT [www.sargentlock.com](http://www.sargentlock.com).
    - e. D-3550/D-3551 Series by Stanley, Indianapolis IN [www.stanlesecuritysolutions.com](http://www.stanlesecuritysolutions.com).
- B. Surface-Mounted Overhead Door Closers:
  - 1. Closers provided under this Section shall be from same Manufacturer.
  - 2. Provide parallel arms on closers unless door position in relation to adjacent wall requires otherwise. Provide covers.
- C. Surface-Mounted Overhead Door Closers:
  - 1. Closers provided under this Section shall be from same Manufacturer.
  - 2. Provide parallel arms on closers unless door position in relation to adjacent wall requires otherwise. Provide covers.
  - 3. Door Closers on doors that swing 180 degree as shown on Contract Documents:
    - a. Closers shall allow for 180 degree opening without engaging stop function. Wall stop or Floor stop is specified in Door Schedule and Section 08 7108, 'Stops And Holders'.
    - b. Closers shall have following features:
      - 1) Adjustable sweep speed.

- 2) Adjustable backcheck.
  - 3) Non-handed, non-sized.
- 4. Door Closers on doors that swing 90 degree as shown on Contract Documents:
  - a. Closers shall allow for 100 degree opening with engaging stop function.
  - b. Closers shall have following features:
    - 1) Adjustable sweep speed.
    - 2) Adjustable backcheck.
    - 3) Non-handed, non-sized.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Mount closers on stop side of door wherever conditions permit.
- B. Through-bolt hardware-to-door connections.

### **3.2 ADJUSTING**

- A. Adjust closers to provide maximum opening force as required by governing code authority and proper backcheck and sweep speed.

**END OF SECTION**

**SECTION 08 7107****PROTECTIVE PLATES AND TRIM****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Kick plates.
- B. Related Requirements:
  - 1. Section 08 7101: Common Hardware Requirements and VMR Suppliers.

**PART 2 - PRODUCTS****2.1 MANUFACTURED UNITS**

- A. Manufacturers:
  - 1. Type Two Acceptable Manufacturers:
    - a. Glynn-Johnson, Indianapolis, IN [www.glynn-johnson.com](http://www.glynn-johnson.com).
    - b. Hager, St Louis, MO (800) 255-3590 or (314) 772-4400 [www.hagerhinge.com](http://www.hagerhinge.com).
    - c. Ives, Wallingford, CT [www.iveshardware.com](http://www.iveshardware.com).
    - d. Rockwood Manufacturing Co, Rockwood, PA [www.rockwoodmfg.com](http://www.rockwoodmfg.com).
    - e. Equal as approved by Architect before installation. See Section 01 6200.
- B. Protective Plates:
  - 1. Material: 0.050 inch thick Stainless Steel.
  - 2. Sizes:
    - a. Kick Plates: 10 inches high by width of door less 3/4 inch on each side.

**PART 3 - EXECUTION: Not Used****END OF SECTION**

**BLANK PAGE**



**SECTION 08 7108****STOPS AND HOLDERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Supplied But Not Installed Under This Section:
  - 1. Door stops.
- B. Related Sections:
  - 1. Section 08 7101: Common Hardware Requirements.

**PART 2 - PRODUCTS****2.1 MANUFACTURED UNITS**

- A. Manufacturers:
  - 1. Manufacturer Contact List:
    - a. Glynn-Johnson, Indianapolis, IN [www.glynn-johnson.com](http://www.glynn-johnson.com).
    - b. Hager, St Louis, MO [www.hagerhinge.com](http://www.hagerhinge.com).
    - c. Ives, Wallingford, CT [www.iveshardware.com](http://www.iveshardware.com).
    - d. Rockwood Manufacturing Co, Rockwood, PA [www.rockwoodmfg.com](http://www.rockwoodmfg.com).
    - e. Sargent, New Haven, CT (800) 906-6606 or (203) 562-2151 [www.sargentlock.com](http://www.sargentlock.com).
- 1. Stops: Use wall type stops unless indicated otherwise on Door Schedule.
- 2. Provide model appropriate for substrate. Wall stops may be either cast or wrought.
- 3. Type Two Acceptable Products:
 

	Interior Wall	Exterior Wall	Floor Mount	Overhead.
b. Hager	236W	255W	243F	---
c. Ives	WS407CCV	WS447	FS438	---
d. Rockwood	409	474 / 475	440 / 441	---
e. Glynn Johnson	---	---	---	GJ 90S
f. Sargent	---	---	---	590S Series
g. Equal as approved by Architect before Installation.	See Section 01 6200.			

**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Interface With Other Work: When using overhead stops, coordinate installation with door closer and other door hardware.

**END OF SECTION**

**BLANK PAGE**

**SECTION 08 7109****ACCESSORIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Acoustical seals.
  - 2. Smoke Gaskets.
  - 3. Thresholds (metal) where required for wood doors and hollow metal doors.
  - 4. Weatherstripping for exterior hollow metal doors.
  - 5. Door bottoms/door sweeps.
- B. Related Requirements:
  - 1. Section 08 4113: 'Aluminum-Framed Entrances And Storefronts' for thresholds.
  - 2. Section 08 7101: 'Common Finish Hardware Requirements' for general finish hardware requirements and Approved Suppliers.
  - 3. Section 09 3013: 'Ceramic Tiling' for stone thresholds.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. American Architectural Manufacturers Association (AAMA):
    - a. AAMA 609 & 609-09, 'Cleaning and Maintenance Guide for Architecturally Finished Aluminum' (combined document).
    - b. AAMA 611-12, 'Voluntary Standards for Anodized Architectural Aluminum'.
    - c. AAMA 701/702-11, 'Voluntary Specification for Pile Weatherstripping and Replaceable Fenestration Weatherseals'.
  - 2. National Association of Architectural Metal Manufacturers (NAAMM):
    - a. AMP 500-06, 'Metal Finishes Manual' for Architectural and Metal Products.
- B. Reference Standards:
  - 1. American National Standards Institute / Builders Hardware Manufacturers Association:
    - a. ANSI / BHMA A156.18-2006, 'Materials and Finishes'.
    - b. ANSI / BHMA A156.21-2009, 'American National Standard for Thresholds'.
  - 2. International Code Council / American National Standards Institute:
    - a. ICC / ANSI A117.1-2009, 'Accessible and Usable Buildings and Facilities'.

**PART 2 - PRODUCTS****2.1 MANUFACTURED UNITS**

- A. Manufacturers:
  - 1. Manufacturer Contact List:
    - a. Hager, St Louis, MO [www.hagerhinge.com](http://www.hagerhinge.com).
    - b. NGP - National Guard Products, Memphis, TN [www.ngpinc.com](http://www.ngpinc.com).
    - c. Pemko Manufacturing, Ventura, CA [www.pemko.com](http://www.pemko.com).
- B. Acoustical Seals:
  - 1. Color as selected by Architect.
  - 2. Type One Acceptable Products:
    - a. Door Bottom for Wood Door:

- 1) 13VDkB by NGP.
    - 2) 211DV by Pemko.
  - b. Door Bottom for Metal Door:
    - 1) 779S-A by Hager.
    - 2) 35EV by NGP.
    - 3) 217AV by Pemko.
  - c. Equal as approved by Architect before bidding. See Section 01 6200.
- C. Smoke Gaskets:
  - 1. Color as selected by Architect.
  - 2. Type One Acceptable Products:
    - a. 726 by Hager.
    - b. 5050 by NGP.
    - c. PK55 by Pemko.
    - d. Equal as approved by Architect before bidding. See Section 01 6200.
- D. Thresholds:
  - 1. Type One Acceptable Products:
    - a. Interior Doors at Acoustic Seals, Approved Products:
      - 1) Carpet Both Sides:
        - a) 505S-DBA by Hager.
        - b) 414DKB by NGP.
        - c) 236D by Pemko.
    - b. Out swinging Exterior Doors, Approved Products:
      - 1) 560SV by Hager.
      - 2) 425 by NGP.
      - 3) 185AV by Pemko.
    - c. Equals as approved by Architect before bidding. See Section 01 6200.
- E. Weatherstripping:
  - 1. Type One Acceptable Products:
    - a. Finish: clear anodized aluminum.
    - b. Perimeter:
      - 1) 800S by Hager.
      - 2) A625A by NGP.
      - 3) 35041CP by Pemko.
    - c. Bottom:
      - 1) 750S CLR or 754S CLR by Hager.
      - 2) 198NA by NGP.
      - 3) 321CN by Pemko.
    - d. Equal as approved by Architect before bidding. See Section 01 6200.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install smoke gaskets and acoustical seals in manner to give continuous air-tight fit.
  - 1. Install smoke gaskets as per Manufacturer's installation requirements:
    - a. Hinge Jamb: Install smoke gaskets on jamb face of door frame so door will compress smoke gasket.
    - b. Header and Strike Jamb: Install smoke gaskets on face of stop of door frame so door will compress smoke gasket.
  - 2. Install acoustical seal with seal under door.

**END OF SECTION**

**SECTION 08 8100****GLASS GLAZING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Quality of glazing used in entries, doors, and windows.
- B. Related Requirements:
  - 1. Sections Under 08 1000 Heading: Furnishing and installing of flush wood door lites in new doors.
  - 2. Section 08 4113: Furnishing and installing of glazing in aluminum-framed storefront.
  - 3. Section 08 5113: Furnishing and installing of glazing in windows.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. Glass Association of North America (GANA):
    - a. *'Glazing Manual'*.
    - b. *'Laminated Glass Design Guide'*.
    - c. *'Engineering Standards Manual'*.
  - 2. The Insulating Glass Manufacturers Alliance (IGMA):
    - a. IGMA TB-3001 'Sloped Glazing Guidelines.
    - b. SIGMA TM-3000 'Glazing Guidelines for Sealed Insulating Glass Units'.
- B. Definitions:
  - 1. Airspace: Space between lites of insulating glass unit that contains dehydrated air or other inert specified gas.
  - 2. Emissivity: Ability of surface to absorb heat and to reflect it. Lower emissivity, the less room heat is absorbed and more heat is reflected back into the room.
  - 3. Glass Surface:
    - a. Insulated glass unit:
      - 1) Surface 1: Exterior surface of outer lite.
      - 2) Surface 2: Interspace-facing surface of outer lite.
      - 3) Surface 3: Interspace-facing surface of inner lite.
      - 4) Surface 4: Interior surface of inner lite.
    - b. Monolithic glass:
      - 1) Surface 1: Exterior surface.
      - 2) Surface 2: Interior surface.
  - 4. Insulation Glass: Two pieces of glass spaced apart and hermetically sealed to form single-glazed unit with air space between. Heat transmission through this type of glass may be as low as half that without air space. Also called double glazing, double pane, insulated unit, and thermal pane.
  - 5. Laminated Glass: Two or more sheets with inner layer of transparent plastic to which glass adheres if broken. Used for overhead, safety glazing, and sound reduction.
  - 6. Low-Emissivity Glass (Low-E): Reduces wintertime heat loss from interior with thin, almost colorless metallic coating that reflects heat back inside structure. Allows moderate solar heat gain while reducing harmful ultraviolet light in any season. Minimizes summertime air conditioning loss by reflecting radiated heat to outside. May be tempered for where safety glass is required. Available in single strength clear, gray and bronze (brown) color.
  - 7. and horizontal bars to divide windows into smaller lites of glass. Bars are termed muntin bars.

8. Obscure Glass: Adds privacy where window coverings are impractical or undesirable. Various colors and texture patterns provide translucent or semi-opaque effect. May be tempered for use where safety glass is required.
9. Shading Coefficient: Ratio of solar heat gain passing through a glazing system to solar heat gain that occurs under the same conditions if the window was made of clear, unshaded double strength glass. Lower SC number, the better solar control efficiency of glazing system.
10. Solar Absorptance: Percent of incident solar radiation that is absorbed by window film/glass system. Lower the number, the less solar radiation absorbed.
11. Solar Heat Gain Coefficient (SHGC): Ratio of total solar heat passing through a given window relative to the solar heat incident on the projected window surface at normal solar incidence. (Percentage of solar energy directly transmitted or absorbed and re-radiated into a building). Lower SHGC, the better it is able to reduce heat.
12. Solar Reflectance (R): Percent of incident solar radiation that is reflected by window film/glass system. Lower the number, the less solar radiation reflected.
13. Solar Transmittance (T): Percent of incident solar radiation that is transmitted through window film/glass system. Lower the number, the less solar radiation transmitted.
14. Tempered Glass: Glass strengthened through process of heating, creating tensile strength that causes glass to resist breakage, yet disintegrate into small pieces if break occurs. Tempered glass is type of safety glass.
15. Tinted Glass: Special type glass with additives, usually metallic particles that reduce passage of sunlight. Tinted glass can be bronze, gray, green or blue as well as other more exotic colors.
16. U-Factor: Overall heat transfer coefficient of glazing system. Measure of heat transfer that occurs through glazing system, and its outer and inner surfaces. This value is a function of temperature, and is expressed in BTU per square foot per hour per degree Fahrenheit (BTU/sq ft/hr deg F). Lower the U-Factor, the better insulation qualities of glazing system.
17. U-Value: Measurement of heat transfer through film due to outdoor/indoor temperature differences. Lower U-value, less heat transfers. When using performance data, the lower U-value, better insulating qualities of window film/glass system.
18. Ultraviolet Transmittance: Percent of ultraviolet light (UV) that is transmitted by window film/glass system. Lower the number, the less ultraviolet transmitted.
19. Visible Light Transmitted (VLT): Percent of total visible light (380-780 nanometers) that passes through glass. Lower the number, the less visible light transmitted.

C. Reference Standards:

1. American Architectural Manufacturers Association / Window & Door Manufacturers Association / Canadian Standards Association:
  - a. AAMA 800-10, 'Voluntary Specifications and Test Methods for Sealants'.
2. American National Standards Institute:
  - a. ANSI Z97.1-2009, 'Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test'.
3. ASTM International:
  - a. ASTM C1036-11, 'Standard Specification for Flat Glass'.
  - b. ASTM C1048-12, 'Standard Specification for Heat-Treated Flat Glass - Kind H, Kind FT Coated and Uncoated Glass'.
  - c. ASTM C1172-14, 'Standard Specification for Laminated Architectural Flat Glass'.
  - d. ASTM C1281-14, 'Standard Specification for Preformed Tape Sealants for Glazing Applications'.
  - e. ASTM E2190-10, 'Standard Specification for Insulating Glass Unit Performance and Evaluation'.
4. Consumer Products Safety Commission (CPSC):
  - a. 16 CFR, Part 1201 CAT 1 and 11, 'Safety Standard for Architectural Glazing Materials'.
5. National Fenestration Rating Council (NFRC):
  - a. NFRC 100-2014, 'Procedure for Determining Fenestration Product U Properties'.
  - b. NFRC 200-2014, 'Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence'.
  - c. NFRC 300-2014, 'Test Method for Determining Solar Optical Properties of Glazing Materials and Systems'.
6. National Fire Protection Association (NFPA):
  - a. NFPA 80 - 'Standard for Fire Doors and Other Opening Protectives' (2016 edition).
  - b. NFPA 252 - 'Fire Tests of Door Assemblies' (2012 edition).

- c. NFPA 257 - 'Fire Test for Window and Glass Block Assemblies' (2012 edition).

### 1.3 SUBMITTALS

- A. Action Submittals:
1. Product Data:
    - a. Manufacturer's data sheets for each glass product and glazing material.
    - b. 12 inch by 12 inch sample with color required for spandrel glass.
- B. Informational Submittals:
1. Qualification Statement:
    - a. Installer:
      - 1) Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Warranty Documentation:
      - 1) Final, executed copy of Warranty.

### 1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
1. Glazing shall meet applicable requirements of Federal Consumer Product Safety Standard 16 CFR 1201.
  2. Comply with published recommendations of glass product Manufacturers and organizations, except where more stringent requirements are indicated.
  3. Glazing for Fire-Rated Door and Window Assemblies:
    - a. Glazing tested per NFPA 252 and NFPA 257, as applicable, for assemblies complying with NFPA 80 and listed and labeled per requirements of authorities having jurisdiction.
- B. Qualifications:
1. Installer: Requirements of Section 01 4301 applies, but not limited to following:
    - a. Satisfactorily completed at least three (3) installations of similar size, scope, and complexity in each of past two (2) years and be approved by glass product Manufacturer before bidding.
    - b. Upon request, submit documentation.
- C. Certifications:
1. Labels showing strength, grade, thickness, type, and quality are required on each piece of glass.
  2. Manufacturers/Fabricators certifying products furnished comply with project requirements.
  3. Insulating-Glass Certification Program: Indicate compliance with requirements of Insulating Glass Certification Council on applicable glazing products.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
1. Follow Manufacturer's instruction for receiving, handling, and protecting glass & glazing materials to prevent breakage scratching, damage to seals, or other visible damage.
  2. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Storage And Handling Requirements:
1. Follow Manufacturer's instruction for storing and protecting glass & glazing materials.
  2. Store materials protected from exposure to harmful environmental conditions and at temperatures and humidity conditions recommended by Manufacturer.
  3. Protect edge damage to glass, and damage/deterioration to coating on glass.

## 1.6 FIELD CONDITIONS

### A. Ambient Conditions:

1. Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing material manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes.

## 1.7 WARRANTY

### A. Manufacturer Warranty:

1. Insulating Glass Warranty:
  - a. Manufacturer's standard form, signed by insulating-glass product Manufacturer/Fabricator, agreeing to replace insulating-glass units that exhibit failure of hermetic seal under normal use evidenced by obstruction of vision by dust, moisture, or film on interior surfaces of glass, for ten [10] years of date of installation.
2. Installer's Warranty:
  - a. Form acceptable to Owner, signed by glass product Installer, agreeing to replace glass products that deteriorate, or that exhibit damage or deterioration of glass or glazing products due to faulty installation, for two (2) years from date of installation.

## PART 2 - PRODUCTS

## 2.1 MATERIALS

### A. Manufacturers:

1. Manufacturer Contact List for Low E Glazing:
  - a. AGC Flat glass North America, Kingsport, TN [www.us.agc.com](http://www.us.agc.com).
  - b. Carlex (subsidiary of Central Glass Co., Ltd., Nashville, TN [www.carlex.com](http://www.carlex.com).
  - c. Guardian Industries Corp., Auburn Hills, MI [www.guardian.com](http://www.guardian.com).
  - d. Oldcastle BuildingEnvelope, Santa Monica, CA [www.oldcastlebe.com](http://www.oldcastlebe.com).
  - e. Pilkington North America Inc., Toledo, OH [www.pilkington.com](http://www.pilkington.com).
  - f. PPG Industries, Pittsburgh, PA [www.ppgglass.com](http://www.ppgglass.com).

### B. Design Criteria:

1. Glazing for Fire-Rated Door and Window Assemblies: Glazing tested per NFPA 252 and NFPA 257, as applicable, for assemblies complying with NFPA 80 and listed and labeled per requirements of authorities having jurisdiction.
2. Thickness: **1/8 inch** minimum, Double Strength (Insulated Glass).
3. Glazing shall have following characteristics:
  - a. Low-Emissivity (or Low E):
    - 1) Design Criteria:
      - a) Clear:
      - b) Meet requirements of ASTM C1036, Type I, Class I, Quality Q3.
      - c) Location: Surface 2.
    - 2) Type Two Low-Emissivity (or Low E) Acceptable Product:
      - a) Performance Standard:
        - (1) 70 percent Visible Light Transmission (VLT).
        - (2) 0.29 U-value winter.
        - (3) 0.27 U-value summer.
        - (4) 0.38 Solar Heat Gain Coefficient (SHGC).
        - (5) 0.44 Shading Coefficient.
        - (6) 11 percent Visible Light Reflectance.
      - b) Quality Standard:
        - (1) Cardinal LoE<sup>3</sup>-366.
        - (2) Solarban 70 XL.



- (3) Other low E glazing system standard with window manufacturer that meets or exceeds performance characteristics of specified glazing is acceptable as approved by Architect before bidding. See Section 01 6200.
    - 3) Acceptable Manufacturers:
      - a) AGC.
      - b) Guardian.
      - c) PPG Industries.
      - d) Equal as approved by Architect before bidding. See Section 01 6200.
  - b. Obscure:
    - 1) Design Criteria:
      - a) Meet requirements of ASTM C1036, Type II, Class I, Form 3, Quality Q8, Pattern - #62.
  - c. Glazing in Windows within 24 inches of Exterior Doors:
    - 1) Design Criteria:
      - a) Tempered.
      - b) Meet requirements of ASTM C1048, Kind FT, Condition A, Type I, Class I, Quality Q3.
- C. Storefront Glazing:
  - 1. Thickness: 1/4 inch.
  - 2. Glazing shall have following characteristics:
    - a. Low-Emissivity (or Low E):
      - 1) Design Criteria:
        - a) Clear.
        - b) Insulated Glass: 1 inch units with 1/2 inch airspace and two (2) 1/4 inch lites.
        - c) Meet requirements of ASTM C1036, Type I, Class I, Quality Q3.
        - d) Location: Surface 2.
      - 2) Type Two Low-Emissivity (or Low E) Acceptable Product:
        - a) Performance Standard:
          - (1) 64 percent Visible Light Transmission (VLT).
          - (2) 0.28 U-value winter.
          - (3) 0.26 U-value summer.
          - (4) 0.27 Solar Heat Gain Coefficient (SHGC).
          - (5) 0.32 Shading Coefficient.
          - (6) 12 percent Visible Light Reflectance.
        - b) Quality Standard:
          - (1) Cardinal LoE<sup>3</sup>-366.
          - (2) Solarban 70 XL.
          - (3) Equal product by Acceptable Manufacturer as approved by Architect before bidding. See Section 01 6200.
      - 3) Acceptable Manufacturers:
        - a) AGC.
        - b) Guardian.
        - c) PPG.
        - d) Equal as approved by Architect before bidding. See Section 01 6200.
    - b. Glazing Below Door Height:
      - 1) Design Criteria:
        - a) Tempered.
        - b) Meet requirements of ASTM C1048, Kind FT, Condition A, Type I, Class I, Quality Q3.
- D. Fabrication:
  - 1. Except where glass exceeds 66 inches in width, cut clear glass so any wave will run horizontally when glazed.
  - 2. Sealed, Insulating Glazing Units:
    - a. Double pane, sealed insulating glass units. Install at exterior windows and exterior aluminum-framed storefront.
    - b. Unit Thickness: 5/8 inch minimum, one inch maximum.
    - c. Type Seal:
      - 1) Metal-to-glass bond and separated by 1/2 inch dehydrated air space.

- 2) Use non-hardening sealants.
- d. Category Four Approved Fabricators. See Section 01 6200 for definitions of Categories.
  - 1) Members of Sealed Insulating Glass Manufacturer's Association.

## **2.2 ACCESSORIES**

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Glazing Tape: Butyl-based elastomeric tape with integral resilient tube spacer, 10 to 15 Shore A durometer hardness, black color, coiled on release paper; widths required for specified installation, complying with ASTM C1281 and AAMA 800 for application.

## **PART 3 - EXECUTION: Not Used**

## **END OF SECTION**

**SECTION 09 0503****FLOORING SUBSTRATE PREPARATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Coordination and scheduling of Owner Furnished Testing for Alkalinity and Concrete Moisture Testing of concrete slab as described in Contract Documents.
  - 2. Preparing floor substrate to receive flooring as described in Contract Documents.
  - 3. Remove existing carpet and prepare floor as described in Contract Documents.
  - 4. Perform building modifications and repairs to accommodate carpet and carpet base as described in Contract Documents.
- B. Related Requirements:
  - 1. Pre-Installation conferences held jointly with Section 09 0503 as described in Administrative Requirements on Part 1 of this specification section.
  - 2. Section 01 1200: 'Multiple Contract Summary'.
  - 3. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
  - 4. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
  - 5. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
  - 6. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
  - 7. Section 01 7800: 'Closeout Submittals'.
  - 8. Section 03 3111: 'Cast-In-Place Structural Concrete' for installation tolerances for concrete slabs.
  - 9. Section 09 6813: 'Tile Carpeting'.
  - 10. Section 09 6816: 'Sheet Carpeting'.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. American Concrete Institute, Farmington Hills, MI [www.concrete.org](http://www.concrete.org). Abstracts of ACI Periodicals and Publications.
    - a. ACI 302.2R-06, *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (August 15, 2006).
  - 2. International Concrete Repair Institute: '*ICRI Concrete Slab Moisture Testing Program*' Rosemont, IL [www.icri.org](http://www.icri.org).
    - a. ICRI Certification: 'Concrete Slab Moisture Testing Technician, Tier 2, Grade 1'.
- B. Definitions (Following are specifically referenced for testing):
  - 1. Accreditation: Process in which certification of competency, authority, or credibility is presented. Verify that laboratories have an appropriate quality management system and can properly perform certain test methods (e.g., ANSI, ASTM, and ISO test methods) and calibration parameters according to their scopes of accreditation.
  - 2. Approved: To authorize, endorse, validate, confirm, or agree to.
  - 3. Field Quality Control: Testing, Inspections, Special Testing and Special Inspections to assure compliance to Contract Documents.
  - 4. Inspection/Special Inspection: Inspection of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards:
    - a. Inspection: Not required by code provisions but may be required by Contract Documents.
    - b. Special Inspection: Required by code provisions and by Contract Documents.

- c. Inspection-Continuous: Full-time observation of the Work requiring inspection by approved inspector who is present in area where the Work is being performed.
- d. Inspection-Periodic: Part-time or intermittent observation of the Work requiring inspection by approved inspector who is present in area where the Work has been or is being performed and at completion of the Work.
- 5. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform particular construction operation, including installation, erection, application, and similar operations.
- 6. Observation: Visual observation of building / site elements or structural system by registered design professional for general conformance to approved construction documents at significant construction stages and at completion. Observation does not include or waive responsibility for performing inspections or special inspections.
- 7. Owner's Representative: Owner's Designated Representative (Project Manager or Facilities Manager) who will have express authority to bind Owner with respect to all matters requiring Owner's approval or authorization.
- 8. Preconstruction Testing: Tests and inspections that are performed specifically for Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- 9. Product Testing: Tests and inspections that are performed by testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- 10. Moisture Vapor Emission Rate (MVER): Anhydrous Calcium Chloride (CaCl<sub>2</sub>) Moisture Vapor Emission Test was developed to quantify amount of moisture vapor emission from concrete slab.
  - a. Test method to obtain quantitative value indicating rate of moisture vapor emission from concrete slab and if slab can receive floor covering by determination of rate of moisture vapor emitted from below-grade, on-grade, and above-grade (suspended) concrete floors.
  - b. Moisture vapor emitted from concrete slab is measured in pounds which is equivalent weight of water evaporating from 1000 ft<sup>2</sup> of concrete surface in 24 hour period.
  - c. Moisture vapor emission rate only reflects condition of concrete floor at time of test.
- 11. Outlier: Statistical observation or test data value which is far removed in value from others in the data set. An outlier may be an error in measurement which will distort interpretation of the data.
- 12. Relative Humidity (RH) Testing: Testing of concrete slabs is defined as ratio of actual amount of water vapor present in volume of air at given temperature to maximum amount that air could hold at that temperature, expressed as percentage.
  - a. Relative Humidity test method covers quantitative determination of percent relative humidity in concrete slabs for field or laboratory tests.
  - b. Moisture test results indicate moisture condition of slab only at time of test.
- 13. Quality Assurance: Testing, Inspections, Special Testing and Special Inspections provided for by Owner.
- 14. Quality Control: Testing, Inspections, Special Testing and Special Inspections provided for by Contractor.
- 15. Service Provider: Agency or firm qualified to perform required tests and inspections.
- 16. Source Quality Control Testing: Tests and inspections that are performed at source, i.e., plant, mill, factory, or shop.
- 17. Special Inspection: See Inspection.
- 18. Special Inspector: Certified individual or firm that implements special inspection program for project.
- 19. Special Test: See Test.
- 20. Test/Special Test: Field or laboratory tests to determine characteristics and quality of building materials and workmanship.
  - a. Test: Not required by code provisions but may be required by Contract Documents.
  - b. Special Test: Required by code provisions and by Contract Documents.
- 21. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
- 22. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
- 23. Verification: Act of reviewing, inspecting, testing, etc. to establish and document that product, service, or system meets regulatory, standard, or specification requirements.

C. Reference Standards:

- 1. ASTM International:

- a. ASTM F710-11, 'Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring'.
- b. ASTM F1869-11, 'Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride'.
- c. ASTM F2170-11, 'Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes'.

### 1.3 ADMINISTRATIVE REQUIREMENTS

#### A. Pre-Installation Conference:

1. Participate in pre-installation conference held jointly if possible for all related Division 09 6000 'Flooring' used for Project.
2. Participate in pre-installation conference held jointly if possible for all related Division 09 6000 'Flooring' and with Section 12 4843 Entrance Matting used for Project.
3. Schedule conference after substrate preparation and before installation of flooring system. (If more than one (1) flooring system is included for project, hold conference at same time if schedule permits).
4. Conference may be held at project site or other convenient site. Participants may also attend by video or audio conference if approved by Project Manager.
5. In addition to agenda items specified in Section 01 3100, review following:
  - a. Review condition of floor with regard to compliance with concrete installation tolerances and other work necessary to prepare floors for installation of flooring.
  - b. Review Testing Agency testing report of Concrete Moisture of concrete:
    - 1) Installer may verify Concrete Moisture of concrete.
6. Review condition of floor with regard to compliance with concrete installation tolerances and other work necessary to prepare floors for installation of flooring.
7. Review additional agenda items all related flooring sections.

#### B. Scheduling:

1. Concrete Moisture Testing:
  - a. General Contractor Responsibility to provide:
    - 1) Maintain ambient temperatures and relative humidity conditions as specified in Field Conditions in Part 1 of this specification before Moisture Testing Agency will test for concrete moisture.
    - 2) Notify Owner to contact Moisture Testing Agency when building is enclosed and temperature and relative humidity meet requirements for testing.
    - 3) Provide access for and cooperate with Moisture Testing Agency.
  - b. Owner's Representative Responsibility to provide:
    - 1) Provide following information to Moisture Testing Agency at time of notification:
      - a) Digital copy of floor plan(s).
      - b) Indicate different flooring material areas and which rooms on floor plan(s) and finish schedule requiring additional tests if required.
      - c) Digital copy of Specification Section 09 0503 (this specification) from Contract Documents for this Project.
    - 2) Notify Moisture Testing Agency with 'Concrete Moisture Testing Request and Proposal' when building is enclosed and temperature and relative humidity meet requirements for testing:
      - a) Moisture Testing dates are establish based on installation of carpet. To avoid testing 'green concrete' as much as possible, following schedule has been established for moisture testing:
        - (1) Notification by Owner' Representative to Testing Agency to be at least SIXTY FIVE (65) days minimum before installation of Sheet Carpeting. Proposed moisture testing date will be between THIRTY (30) and THIRTY FIVE (35) of installation of carpet and identified on 'Concrete Moisture Testing Request and Proposal'.
        - (2) Testing Agency has THIRTY (30) days to schedule moisture testing with Owner.
        - (3) Testing Agency has no more than FIVE (5) calendar days to complete Moisture Testing and issue 'Certified Moisture Testing Report'.

- (4) 'Certified Moisture Testing Report' to be given to Owner's Representative no less than THIRTY (30) days minimum before installation of Sheet Carpeting.
- (5) Owner's Representative to give Carpet Manufacture(s) 'Certified Moisture Testing Report' THIRTY (30) days before installation of carpet.
- 3) Sheet Carpeting:
  - a) Moisture Testing for Sheet Carpeting required.
  - b) Moisture Testing and Testing Report requirements specified in Informational Submittals.
  - c) See individual flooring section for additional scheduling requirements if required.
- 4) Tile Carpeting:
  - a) Moisture Testing for Tile Carpeting required.
  - b) Moisture Testing and Testing Report requirements specified in Informational Submittals.
  - c) See individual flooring section for additional scheduling requirements if required.

## 1.4 SUBMITTALS

### A. Informational Submittals:

#### 1. Certificates:

- a. Concrete Slab Moisture Technician:
  - 1) Provide current IFTI trained documentation and certified Field Technician certification. and/or
  - 2) Provide current ICRI 'Concrete Slab Moisture Testing Technician, Tier 2, Grade 1' Certification.
- b. Certified Standard Moisture Testing Report:
  - 1) Report to include following:
    - a) Available to Testing Agency from Owner's Representative:
      - (1) Project Name.
      - (2) Property Number.
    - b) Test date.
    - c) Executive summary.
    - d) Certified Moisture and Alkalinity (pH) Test Report.
    - e) Project floor plan.
    - f) Project photographs including following information on each photograph:
      - (1) Site location.
      - (2) Test hole number.
      - (3) Serial number probe.
      - (4) Relative Humidity (RH), Alkalinity (pH) and temperature reading.
      - (5) Property number.
    - g) Outlier Test (As specified in Field Quality Control Testing in Part 3 of this specification:
      - (1) Note test as Outlier Test for which hole number was conducted.
      - (2) Site location.
      - (3) Test hole number.
      - (4) Serial number probe.
      - (5) Relative Humidity (RH), Alkalinity (pH) and temperature reading.
      - (6) Property number.
  - 2) At completion of testing, Testing Agency shall submit Concrete Moisture Test Report for each flooring system included for project to following:
    - a) One (1) copy to Owner's Representative.

#### 2. Special Procedure Submittals:

- a. 'Concrete Moisture Testing Request and Proposal':
  - 1) Provided by Owner's Representative for each project to Testing Agency:
    - a) Testing Agency to fill out form with following information and return as instructed:
      - (1) Review request information.
      - (2) Add information as requested.
      - (3) Sign form.
      - (4) E-mail form back to Owner's Representative.
- b. Certified Moisture Testing Report Distribution:

- 1) Owner's Representative responsibilities after receiving Concrete Moisture Test Report:
    - a) Provide copies to following:
      - (1) One (1) copy to Architect.
      - (2) One (1) copy to Contractor.
      - (3) One (1) copy to Owner Furnished Carpet Manufacturer.
  - 2) General Contractor responsibilities after receiving Concrete Moisture Test Report from Owner's Representative:
    - a) Provide copies to following:
  - c. Moisture Testing Report Instructions:
    - 1) Carpet floor area testing for Alkalinity and Concrete Slab Moisture by Testing Agency Testing:
      - a) If 'all' Testing Agency's Special Procedure Submittal for RH concrete slab moisture testing results are less than ninety one (91) percent:
        - (1) Include Option A as specified in Section 09 6813 and Section 09 6816.
        - (1) Include Option B as specified in Section 09 6813 and Section 09 6816.
      - b) If 'any' Testing Agency's Special Procedure Submittal for RH concrete slab moisture testing results are ninety six (96) percent or more:
        - (1) Include Option C as specified in Section 09 6813 and Section 09 6816.
      - c) Testing pH at surface of concrete slab must be conducted in accordance with ASTM F 710 not to exceed 9 pH.
        - (1) If pH is equal to or less than 9, proceed with installation according to manufacturing installation guidelines and in accordance of Contract Documents.
        - (2) If pH exceeds 9 and manufacture recommended cure exceeds \$500, contact Church Headquarters at [carpet@ldschurch.org](mailto:carpet@ldschurch.org) or call Carpet Contract Manager in Purchasing before proceeding with installation.
- B. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Record Documentation:
      - 1) Testing and Inspection Reports:
        - a) Testing Agency Testing Reports of Alkalinity and Concrete Moisture testing.

## 1.5 QUALITY ASSURANCE

- A. Testing and Inspection.
1. Owner will provide Field Testing for Alkalinity and Concrete Moisture of concrete slab before installation as specified in Field Quality Control in Part 3 of this specifications for flooring:
    - a. See Section 01 1200: 'Multiple Contract Summary'.
    - b. See Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
  2. Category One VMR Testing Agency. See Section 01 6200 for definitions of Categories:
    - a. IFTI - Independent floor Testing & Inspection, Inc.:
      - 1) Contact Information: James Pouliot:
        - a) 1850 Gateway Blvd. Suite 230 Concord, CA 94520.
        - b) Phone: Office (800) 490-3657 x 207 or Cell (925) 819-1780.
        - c) Fax (877) 814-0338.
        - d) E-mail [james.pouliot@ifti.com](mailto:james.pouliot@ifti.com).
- B. Qualifications.
1. Concrete Slab Moisture Technician:
    - a. IFTI trained and certified Field Technician.  
and/or
    - b. ICRI 'Concrete Slab Moisture Testing Technician, Tier 2, Grade 1' Certification:
      - 1) Certification includes three (3) hour education session, written exam, and field testing performance exam based on ASTM standards.
      - 2) Certification valid for period of five (5) years from date of testing completion.
    - c. Provide documentation.

## 1.6 DELIVERY, STORAGE, AND HANDLING

### A. Storage And Handling Requirements:

1. Provide storage space and protection for flooring and installation accessories if materials are delivered before start of flooring installation.

## 1.7 FIELD CONDITIONS

### A. Ambient Conditions:

1. Testing conditions inside building shall be brought to same ambient temperature and relative humidity levels to be normal at occupancy of building (service conditions). Service conditions include normal levels of humidity, lighting, heating, and air conditioning:
  - a. If service conditions are not possible, test conditions shall be **75 deg F ± 10 deg F** maintain relative humidity between forty (40) and sixty (60) percent in spaces to receive testing.
2. Maintain these conditions forty eight (48) hours prior to, and during testing. Otherwise, results may not accurately reflect amount of moisture which is present in concrete slab or would normally be emitted from or through concrete slab during normal operating conditions.

## PART 2 - PRODUCTS Not Used

## PART 3 - EXECUTION

### 3.1 PREPARATION

#### A. Flooring Preparation:

1. General:
  - a. Prepare floor substrate in accordance with ASTM F710, 'Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring' (This standard is used for preparing concrete floors for all flooring).
    - 1) Required RH test and alkalinity test of concrete slab has been performed.
  - b. Concrete floor slab patching:
    - 1) Cracks, chips and joints must be properly patched or repaired.
  - c. Concrete surface cured, clean, dry, and free of foreign substances that will compromise carpet and/or other flooring installations.
    - 1) Removal of curing compounds.
    - 2) Remove paint, sealer, grease, oil, silicone sealants, and other materials incompatible with flooring adhesives.
    - 3) Removal of overspray from painted walls (essential so glue will stick).
  - d. Vacuum and damp mop floor areas to receive flooring before flooring installation.
2. Carpeted floor areas:
  - a. Prepare floor substrate in accordance with Carpet And Rug Institute (CRI) best practices to receive carpet installation and to provide installation that meets Carpet Manufacturer's warranty requirements.

#### B. Carpet Accessories:

1. Sundry items, such as adhesives, shall be conditioned to building ambient conditions before use.

### 3.2 FIELD QUALITY CONTROL

#### A. Field Tests:

1. General:
  - a. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
  - b. Quality Control is sole responsibility of Contractor as specified in Section 01 4523 'Testing And Inspection Services'.



2. Concrete Moisture and Alkalinity:
  - a. Testing Agency will test interior concrete slabs before installation of floor coverings as directed by Architect and will include following:
    - 1) Interior concrete slab areas to be tested:
      - a) Section 09 6813 'Tile Carpeting'.
      - b) Section 09 6816 'Sheet Carpeting'.
    - 2) Standard Moisture Testing required of interior concrete slabs on grade:
      - a) General:
        - (1) Testing for concrete moisture shall be taken at concrete slab substrates scheduled to receive flooring as specified in Contract Drawings for complete flooring installation.
        - (2) Outlier Test: If one (1) test is abnormally different from other moisture tests, then additional test should be done. Outlier will be defined in this specification as moisture test that is at least fifteen (15) percent higher or lower than other tests at project building completed same day:
          - (a) Retesting should be done within **5 feet** feet of original test hole.
          - (b) Contact Owner's Representative for the need to outlier test and additional testing fees will apply.
        - (3) Include required tests for carpeting and additional tests at each different type of flooring system included for project.
        - (4) Carpet area moisture testing may be performed sooner than other flooring areas such as athletic flooring if included for Project, but should be tested at same time.
    - b. Approved Concrete Moisture Tests:
      - 1) Concrete Moisture Test (test used with Standard Moisture and Comprehensive Moisture Testing if included for project). See Section 01 6200:
        - a) Relative Humidity (RH) testing using in-situ probes in accordance with ASTM F2170 testing requirements:
          - (1) Check calibration of measuring instrument.
          - (2) Building ambient conditions are met before testing.
          - (3) Drill Hole:
            - (a) Drill and prepare test holes as per ASTM F2170 (correct hole-depth and hole diameter are required).
            - (b) Drill holes equal to forty (40) percent of slab's thickness for concrete slabs on grade and twenty (20) percent of slab's thickness for suspended concrete slabs (hole must be perpendicular (90 deg) to surface).
          - (4) Clean Hole:
            - (a) Follow Manufacturer's installation instructions for cleaning holes and inserting sensor.
          - (5) Insert Sensor:
            - (a) Follow Manufacturer's installation instructions for inserting sensor.
          - (6) Readings:
            - (a) Follow Manufacturer's installation instructions for taking readings.
            - (b) Two (2) hours after installation of sensor, RH reading will be recorded. (Two (2) hour read is in lieu of the seventy two (72) hour ASTM standard)
          - (7) Future Testing:
            - (a) For future readings, replace protective cap by snapping it back into sensor.
          - (8) Test Report shall be submitted as specified in Informational Submittals in Part 1 of this specification.
            - (a) For future readings, replace protective cap by snapping it back into sensor.
        - b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
          - (1) Concrete moisture testing meter:
            - (a) Rapid RH 4.0 EX with Touch-n-Sense Technology and Rapid RH EX Smart Sensors by Wagner Meters, Rogue River, OR  
[www.wagnermeters.com](http://www.wagnermeters.com).
        - c) as specified in Informational Submittals in Part 1 of this specification.

- 2) Alkalinity Testing (pH) Test:
- a) Testing shall be performed in accordance with ASTM F710.
  - b) Test with pH meter or pH paper.
  - c) Testing shall be taken at every location and at each time concrete moisture test is performed at those locations.
  - d) Clean floor to remove all oil, dirt, dust and any floor coating or sealer.
    - (1) Lightly grind, sand, or bead blasting. Do not remove more than **1/8 inch** of concrete.
    - (2) Removal of more than **1/8 inch** may give high pH reading.
    - (3) Failure to remove laitance will produce low, inaccurate pH reading.
  - e) Place several drop of water on clean surface, forming puddle approximately **1 inch** :
    - (1) Allow puddle to set for sixty (60) ± five (5) seconds, then dip pH paper or meter into water.
    - (2) Remove immediately and record test result.
  - f) Testing to be performed concurrently with concrete moisture testing.
  - g) Test Report shall be submitted as specified in Informational Submittals in Part 1 of this specification.

**END OF SECTION**

**ATTACHMENTS**

## Concrete Moisture Testing Request and Proposal

Owner's Representative to complete Concrete Moisture Testing Request section below.  
Send completed form to the Testing Agency. Testing Agency will complete Concrete  
Moisture Testing Proposal section and submit to Owner's Representative.

### Concrete Moisture Testing Request

#### Project Information

Project Name		Date
Project address		Property number
City		Plan Type (new construction only)
State	Zip Code	Project Type New Construction      Existing
Facility type Meetinghouse    CES/S&I    Temple    Residential    Family History    Higher Education    Welfare Facility		
Type of new flooring to be installed (check all that apply): Carpet    Wood    Resilient    Seamless    Resinous		
Type of slab Below grade    On grade    Above grade/suspended		Age of slab? years    months

#### Billing and Owner Contact Information

Submit quote and report to:		Project Manager      Facilities Manager	
Project Manager		Phone	E-mail
Facilities Manager		Phone	E-mail
Billing address (Send Report to this address)		Street Address	
City		State	Zip code

#### Documents Provided to Testing Agency: (Owner Representative to provide the following to the Testing Agency)

- Digital copy of floor plans(s) indicating different flooring material areas.
- Indicate which areas on floor plans(s) and/or finish schedule requiring additional tests (if required).
- Digital copy of Specification Section 09 0503 from Contract Documents for this project.

#### New and R & I Meetinghouse Construction:

Allow thirty (30) days for testing agency to schedule the testing.  
Testing and report to be completed 35-30 days prior to flooring installation

Carpet installation date	Rush service requested Yes      No
--------------------------	---------------------------------------

#### New and R & I CES/S&I (stand-alone) and Welfare Facilities :

Allow thirty (30) days for testing agency to schedule the testing.  
Testing and report to be completed 15-10 days prior to flooring installation.

Proposed testing date	Number of tests As per Section 09 0503
-----------------------	---

#### Reference information:

Testing as per Section 09 0503 for floor preparation and ambient condition requirements to be performed prior to testing by Contractor or Owner.

### Concrete Moisture Testing Proposal

Proposal #:

#### Testing Agency Contact Information

IFTI Independent Floor Testing & Inspection 1850 Gateway Blvd., Suite 230, Concord, CA 94520	Contact: James Pouliot E-mail: james.pouliot@ifti.com	Phone: (800) 490-3657 ext. 207 Fax: (877) 814-0338
---	--	---

#### Directions: Use this document to provide a proposal for testing by doing the following:

Review the request Information above. Email proposal to Owner Representative.

Scope of Work	Comments	Cost
Standard Testing		\$
Outlier Test		\$
Comprehensive Moisture Testing		\$
Additional Testing (if requested by Owner or Architect)		\$
Total		\$

#### Signatures This form must be signed before testing can proceed.

Testing Agency:	Owner Representative:
-----------------	-----------------------

# Carpeting Pre-Installation Conference and Carpeting Checklist

Project Information		
Project	Scheduled Date of Carpet Installation	Conference Date
	Project Name:	
	Address:	Property Number
FM Group	FM Office Name:	
FM Address	Address:	
Project Description		
Conference Attendance		
Architect	Name:	
Contractor	Name:	
Project Manager	Name:	
Facility Manager	Name:	
Other	Name:	Title:
Other	Name:	Title:
Other	Name:	Title:
Manufacturer	Name:	
Carpet Installer	Company:	Name:

## Carpeting Checklist

### Schedule and Coordination

- ☐ Review carpet schedule for furnishing and installation carpet
- ☐ Review arrangements for building access and utilities
- ☐ Review meeting scheduled for inspection and sign-off
- ☐ Review coordination between other trades

### Existing Projects

- ☐ Asbestos removal issues (for removal and installation only)
- ☐ Review extent of furniture moving, if required
- ☐ Review requirement to check for broken pews, opera chairs, or other furnishings prior to their removal, if required

### Examination and Preparation

- ☐ Review Section 09 6816 'Sheet Carpeting' for floor preparation requirements
- ☐ Review building conditions and note areas of existing damage or other conditions not responsibility of carpet installer
- ☐ Review work necessary to prepare floors for installation of flooring
- ☐ Review if concrete flatness tolerance requirements meet specifications
- ☐ Review if additional leveling or patching may be required
- ☐ Review ambient condition requirements as specified in Specification Section 09 6816 'Sheet Carpeting'
- ☐ Review conditions not in compliance with installation requirements

### Scope of Work

- ☐ Review scope of work outlined on Carpet Request Information Sheet submitted to Carpet Manufacturer
- ☐ Review Concrete Moisture Report
- ☐ Review Carpet color, type, and locations
- ☐ Review quantity of rolls and dye lots
- ☐ Review if Tile Carpeting is included for installation as specified in Section 09 6813 'Tile Carpeting'
- ☐ Review if Base is included as specified in Section 09 6513 'Resilient Base and Accessories'. Note locations used
- ☐ Review cleaning and disposal requirements
- ☐ Review protection requirements of carpet after installation of carpeting

I hereby certify that the Carpeting Checklist has been discussed at pre-installation conference and all items have been reviewed and addressed. I acknowledge that the Carpeting Checklist does not cover all requirements as specified for Project Specifications. Before installation, resolve any conflicts or concerns regarding changes in original scope of work and unforeseen conditions. Signed Checklist to be given to Owner's Representative and included in Closing Submittals.

Installer Signature: \_\_\_\_\_ Date: \_\_\_\_\_

**SECTION 09 2226****METAL SUSPENSION SYSTEM: Gypsum Board****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install metal suspension system for supporting gypsum drywall in typical ceiling and soffit areas and to support items penetrating ceiling as described in Contract Documents including:
    - a. Hanger wires, fasteners, main runners/tees, cross runners/tees, and wall molding/track.
- B. Related Requirements:
  - 1. Section 09 2900: 'Gypsum Board'.
  - 2. Section 09 5116: 'Acoustical Tile Ceilings'.
  - 3. Section 26 5100: 'Interior Lighting' for electrical fixtures installed in ceiling.
  - 4. Division 21: 'Fire Suppression' for sprinklers installed in ceiling.
  - 5. Division 23: 'Mechanical' for related sections for HVAC installed in ceiling.
  - 6. Division 26: 'Electrical' for related electrical work.
  - 7. Division 27: 'Communications' for related sound and video work.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. The Ceilings & Interior Systems Construction Association (CISCA), 405 Illinois Avenue, 2B, St Charles IL. [www.cisca.org](http://www.cisca.org).
    - a. *'Ceiling Systems Handbook'*: Recommendations for direct hung acoustical tile and lay-in panel ceiling installation.
    - b. CISCA 0-2, *'Guidelines for Seismic Restraint for Direct-hung Suspended Ceiling Assemblies (zones 0-2)'* Covers Seismic Design Category C.
    - c. CISCA 3-4, *'Guidelines for Seismic Restraint for Direct-hung Suspended Ceiling Assemblies (zones 3-4)'* Covers Seismic Design Category D, E, and F.
    - d. *'Production Guide'*: Practical reference for ceiling systems and estimating costs.
- B. Definitions:
  - 1. Ceiling Suspension System: System of metal members, designed to support a suspended ceiling. May accommodate lighting fixtures or air diffusers.
  - 2. Clips: Designs to suit applications such as fire resistance, wind uplift and impact.
  - 3. Compression Post (Vertical Strut, Seismic Struts): Rigid member used to provide lateral force bracing of suspension system.
  - 4. Cross Runner, Cross Tee: Cross runner is secondary or cross beams of mechanical ceiling suspension system, usually supporting only acoustical tile. Cross tee is inserted into main runner to form different module sizes. In some suspension systems, however, cross runners also provide support for lighting fixtures, air diffusers and other cross runners.
  - 5. Hanger Wires: Wire employed to suspend acoustical ceiling from existing structure. Standard material is **12 gauge(0.105 inch)** galvanized, soft annealed steel wire, conforming to ASTM A641/A641M. Heavier gauge wire is available for higher load carrying installations, or situations where hanger wire spacing exceeds **4 feet** on center. Seismic designs or exterior installations subject to wind uplift may require supplemental bracing or substantial hanger devices such as metal straps, rods or structural angles.

6. Heavy-Duty Systems: Primarily used for installations in which the quantities and weights of ceiling fixtures (lights, air diffusers, etc.) are greater than those for ordinary commercial structure.
7. Main Beam, Main Runner, Main Tee: Primary or main beams of type of ceiling suspension system in which structural members are mechanically locked together. Provide direct support for cross runners and may support lighting fixtures and air diffusers, as well as acoustical tile. Supported by hanger wires attached directly to existing structure; or installed perpendicular to carrying channels and supported by specially designed sheet metal or wire clips attached to carrying channels.
8. Splay Wires: Wires installed at angle rather than perpendicular to grid.
9. Stiffening Brace: Used to prevent uplift of grid caused by wind pressure in exterior applications.

C. Reference Standards:

1. American Society of Civil Engineers/Structural Engineering Institute:
  - a. ASCE/SEI 7-10, 'Minimum Design Loads for Buildings and Other Structures'.
2. ASTM International:
  - a. ASTM A641/A641M-09a, 'Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire'.
  - b. ASTM A653/A653M-13, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
  - c. ASTM A1008/A1008M-13, 'Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable'.
  - d. ASTM C635/C635M-13a, 'Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings'.
  - e. ASTM C636/C636M-13, 'Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels'.
  - f. ASTM C645-13, 'Standard Specification for Nonstructural Steel Framing Members'.
  - g. ASTM C754-11, 'Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products'.
  - h. ASTM C841-03(2013), 'Standard Specification for Installation of Interior Lathing and Furring'.
  - i. ASTM D610-08(2012), 'Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces'.
  - j. ASTM E119-12a, 'Standard Test Methods for Fire Tests of Building Construction and Materials'.
  - k. ASTM E580/E580M-11b, 'Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions'.
3. International Code Council (IBC) (2006 edition):
  - a. IBC 803.9.1.1, 'Suspended Acoustical Ceiling'.
4. International Code Council Evaluation Services (ICC-ES):
  - a. AC156, 'Acceptance Criteria for Seismic Certification by Shake-table Testing of Nonstructural Components' (October 2010).
  - b. AC368, 'Acceptance Criteria For Suspended Ceiling Framing Systems' (February 2012).
  - c. ICC/ESR-1222, 'Suspended Ceiling System' (Reissued December 1, 2013).
  - d. ICC/ESR-1289, 'Fire-Resistance-Rated And Nonfire-Resistance-Rated Suspended Ceiling System' (Reissued July 1, 2013).
  - e. ICC/ESR-2631, 'Suspended Ceiling Framing Systems' (Reissued April 1, 2013).
5. Underwriters Laboratories (UL):
  - a. UL 263: 'Standard for Fire Test of Building Construction and Materials' (14th Edition).
  - b. UL 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials' (10th Edition).

### 1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate layout of suspension system with other construction that penetrates ceilings or is supported by them, including drywall furring, light fixtures, HVAC equipment, and fire-suppression systems.
2. All work above ceiling should be completed prior to installing suspended system. There should be no materials resting against or wrapped around suspension system, hanger wires or ties.

## 1.4 SUBMITTALS

- A. Action Submittals:
  - 1. Product Data:
    - a. Provide Manufacturer's technical literature on suspension system including listing dimensions, load carrying capacity and standard compliance.
  - 2. Samples:
    - a. Minimum **8 inch long** samples of suspension system components, including main runner/tee and cross runner/tee with couplings.
- B. Informational Submittals:
  - 1. Certificates:
    - a. Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.
    - b. Installer's certificates of training.

## 1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
  - 1. All system components conform to ASTM standards.
  - 2. Fire-Resistance Rating: UL approved metal suspension system.
- B. Qualifications. Requirements of Section 01 4301 applies, but not limited to following:
  - 1. Installer:
    - a. Installer training ('Ceiling Masters' training course or equivalent).
  - 2. Manufacturer:
    - a. Manufacturer in good standing of Cisca (Ceiling and Interior Systems Construction Association).

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
  - 1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
  - 1. Materials shall be delivered in original, unopened packages with labels intact.
  - 2. Store material in fully enclosed space protected against damage from moisture, direct sunlight, surface contamination, and general damage.

## 1.7 WARRANTY

- A. Manufacturer Warranty:
  - 1. Manufacturer standard ten (10) years warranty on suspension system including repair or replacement of rusting as defined by ASTM D610.

## PART 2 - PRODUCTS

### 2.1 SYSTEMS

- A. Manufacturers:
  - 1. Type One Acceptable Systems:
    - a. Drywall Grid by Armstrong World Industries, Lancaster, PA [www.armstrong.com](http://www.armstrong.com).
    - b. Drywall Grid System by Chicago Metallic Corporation, Chicago, IL [www.chicagometallic.com](http://www.chicagometallic.com).

- c. Drywall Suspension System - Flat Ceilings by USG, Chicago, IL [www.usg.com](http://www.usg.com).
  - d. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Components:
- 1. Main Runners/Tee and Cross Runners/Tee:
    - a. Heavy-duty in accordance with ASTM C635/C635M.
    - b. Cold-formed from ASTM A653/A653M, CS Type B steel and hot dipped galvanized G-40 coating for interior ceilings.
    - c. Double-Web construction.
  - 2. Wall Track/Molding.
  - 3. Fasteners:
    - a. Nails are not permitted when subjected to direct tension such as installed vertically into bottom of structural member.
    - b. Metal attachment:
      - 1) Acoustical Eye Lag Screws:
        - a) **1/4 inch** screws zinc coated with self-drilling or self-piercing sharp point.
    - c. Wood attachment:
      - 1) Acoustical Eye Lag Screws:
        - a) **3 inch x 1/4 inch** screws zinc coated for wood joists with Type 17 self-drilling point.
    - d. Wire Tie to Metal Structural Member attachment:
      - 1) Wire wrapped to structural member with pigtail knot with three (3) tight wraps within **3 inch** length at top connection.
  - 4. Hanger Wires, Braces, and Ties:
    - a. Zinc-Coated, carbon-steel wire meeting requirements of ASTM A641/A641M, Class 1 zinc coating, soft temper.
    - b. Size:
      - 1) Standard size: **12 gauge (0.105 inch)** galvanized, soft annealed steel wire.
      - 2) Select wire diameter so its stress is less than yield when loaded at three (3) times hanger design load (ASTM C635/C635M), Table 1, 'Direct Hung') will be less than yield stress of wire, but provide not less than **12 gauge (0.105 inch)**.
    - c. Protect with rust inhibitive paint.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification Of Conditions:
- 1. Inspect area receiving suspension system to identify conditions which will adversely affect installation.
    - a. Work trades work to be thoroughly dry and complete prior to installation.
    - b. Verify weather tightness of area to receive suspension system prior to installation.
  - 2. Notify Architect of unsuitable conditions in writing.
    - a. Do not install suspension system until adverse conditions have been remedied.

### 3.2 INSTALLATION

- A. Interface With Other Work:
- 1. All work above ceiling should be completed prior to installing suspended ceiling system including related work including: drywall furring work, acoustical tile, light fixtures, mechanical systems, electrical systems, and sprinklers.
- B. General:
- 1. Install suspension system in accordance with Manufacturer's written instructions, and in compliance with ASTM installation standard, and applicable codes as required by AHJ with modifications listed below except where Manufacturer's instructions are more stringent:
    - a. Main runners/tees hanger wires **48 inches** on center maximum.



- b. Cross runners/tees hanger wires **24 inches** on center maximum.
- c. Do not kink, twist, or bend hanger wires as a means of leveling assembly.
- 2. Hanger Wires:
  - a. Install hanger wire to structure as required with necessary on center spacing to support expected ceiling load requirements, following local practices, codes and regulations. Attach with pigtail knot with three (3) tight wraps within **3 inch** length at each end.
  - b. Provide additional wires at light fixtures, grilles, and access doors where necessary by appropriate method in accordance with industry accepted practice.
  - c. Additional Hanger Wires: Wrapped tightly three (3) full turns within **3 inch** length to structure and component at locations where imposed loads could cause deflection exceeding 1/360 span.
- C. Tolerances:
  - 1. Main Runners/Tees:
    - a. Installed and leveled to meet IBC requirements to within **1/4 inch** in **10 foot** with supporting wire taut to prevent any subsequent downward movement of main runners when ceiling loads are imposed.
  - 2. Cross Runners/Tees:
    - a. Main runners, or other cross runners, must support cross runners to within **1/32 inch** of required center-to-center spacing. This tolerance must be noncumulative beyond **12 feet**
    - b. Intersecting runners must be installed to form right angle to supporting members.

### 3.3 FIELD QUALITY CONTROL

- A. Field Inspections:
  - 1. Inspect:
    - a. Suspended ceiling system.
    - b. Hanger wires, braces, ties, anchors and fasteners.
- B. Non-Conforming Work:
  - 1. Remove and replace defective materials at no additional cost to Owner.

**END OF SECTION**

**BLANK PAGE**

**SECTION 09 2900****GYPSUM BOARD****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install gypsum board as described in Contract Documents, except behind ceramic tile.
  - 2. Furnish and install acoustical sealants as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 07 9219: 'Acoustical Joint Sealants' for quality of acoustical sealants.
  - 2. Section 09 3013: 'Ceramic Tile' for installation of backerboard joint reinforcing.
  - 3. Section 09 9413: 'Interior Textured Finishing'.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Accessories: Metal or plastic beads, trim, or moulding used to protect or conceal corners, edges, or abutments of the gypsum board construction.
  - 2. Drywall Primer: Paint material specifically formulated to fill the pores and equalize the suction difference between gypsum board surface paper and the compound used on finished joints, angles, fastener heads, and accessories and over skim coatings.
  - 3. Skim Coat: Either a thin coat of joint compound trowel applied, or a material manufactured especially for this purpose and applied in accordance with manufacturer's recommendations, over the entire surface.
  - 4. Texturing: Regular or irregular patterns typically produced by applying a mixture of joint compound and water, or proprietary texture materials including latex base texture paint, to a gypsum board surface previously coated with drywall primer.
- B. Reference Standards:
  - 1. ASTM International:
    - a. ASTM C11-15, 'Standard Terminology Relating to Gypsum and Related Building Materials and Systems'.
    - b. ASTM C475/C475M-15, 'Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board'.
    - c. ASTM C840-13, 'Standard Specification for Application and Finishing of Gypsum Board'.
    - d. ASTM C1002-14, 'Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs'.
    - e. ASTM C1047-14a, 'Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base'.
    - f. ASTM C1178/C1178M-13, 'Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel'.
    - g. ASTM C1396/C1396M-14, 'Standard Specification for Gypsum Board'.
    - h. ASTM E84-15, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
    - i. ASTM E90-09, 'Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements'.
    - j. ASTM E119-15, 'Standard Test Method for Fire Tests of Building Construction and Materials'.
    - k. ASTM E413-10, 'Classification for Rating Sound Insulation'.

2. Gypsum Association:
  - a. GA-214-15, 'Recommended Levels of Gypsum Board Finish'.
  - b. GA-216-10: 'Application and Finishing of Gypsum Panel Products'.
  - c. GA-600-15, 'Fire Reference Design Manual'.
  - d. GA-801-07, 'Handling and Storage of Gypsum Panel Products: A Guide for Distributors, Retailers, and Contractors'.
3. International Building Code (IBC) (2015 or latest approved version):
  - a. Chapter 25, 'Gypsum Board And Plaster'.
4. Underwriters Laboratories, Inc.
  - a. UL 263: 'Test Method for Fire Tests of Building Construction and Materials' (14th Edition).
  - b. UL 723: 'Test for Surface Burning Characteristics of Building Materials; (10th Edition).

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
  1. Schedule pre-installation conference immediately before installation of gypsum wallboard.
  2. In addition to agenda items specified in Section 01 3100, review following:
    - a. Finish requirements necessary for installation of finish materials over gypsum wallboard, and location and installation of ceramic tile backerboard.

### 1.4 SUBMITTALS

- A. Informational Submittals:
  1. Test And Evaluation Reports:
    - a. Fire test results or assembly diagrams and numbers confirming products used will provide required fire ratings with installation configurations used.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. General:
  1. Following recommendations of GA-801 Guide for Handling and Storage of Gypsum Panel Products unless local, state or federal laws or agency rules differing from the recommendations shall take precedence.
- B. Delivery And Acceptance Requirements:
  1. Deliver materials in original packages, containers, or bundles bearing brand name, applicable standard designation, and Manufacturer's name.
- C. Storage And Handling Requirements:
  1. Store material under roof and keep dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack gypsum board flat to prevent sagging.

### 1.6 FIELD CONDITIONS

- A. Ambient Conditions:
  1. Comply with ASTM C840 or GA-216 requirements, whichever are more stringent:
    - a. Do not install interior products until installation areas are enclosed and conditioned.
      - 1) Temperature shall be 50 deg F and 95 deg F maximum day and night during entire joint operation and until execution of Certificate of Substantial Completion.
      - 2) Provide ventilation to eliminate excessive moisture.
      - 3) Avoid hot air drafts that will cause too rapid drying.
    - b. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

**PART 2 - PRODUCTS****2.1 MATERIALS****A. Manufacturers:****1. Manufacturer Contact List:**

- a. American Gypsum, Dallas, TX [www.americangypsum.com](http://www.americangypsum.com).
- b. CertainTeed Gypsum, Inc; Tampa, FL [www.certainteed.com](http://www.certainteed.com).
- c. Georgia Pacific, Atlanta, GA [www.gp.com](http://www.gp.com).
- d. National Gypsum, Charlotte, NC [www.nationalgypsum.com](http://www.nationalgypsum.com).
- e. Pabco Gypsum, Newark, CA [www.pabco gypsum.com](http://www.pabco gypsum.com).
- f. United States Gypsum Co, Chicago, IL [www.usg.com](http://www.usg.com).

**B. Materials:****1. Interior Gypsum Board:****a. General:****1) Size:**

- a) Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

**2) Class Two Quality Standard:**

- a) Core: Fire-resistant rated gypsum core.
- b) Complies with Type X requirements of ASTM C1396/C1396M (Section 5).
- c) Surface paper: Face paper suitable for painting.
- d) Long edges: Tapered edge.
- e) Overall thickness: **5/8 inch**.

**2. Glass Mat Gypsum Tile Backer:**

- a. Product meeting requirements of ASTM C1178/C1178M.
- b. Type X, **5/8 inch**.
- c. Square edges.
- d. Category Four Approved Manufacturer. See Section 01 6200 for definitions of Categories:
  - 1) DensShield Fireguard Type X by Georgia Pacific.
  - 2) GlasRoc Tilebacker Type X by CertainTeed.

**2.2 ACCESSORIES****A. Manufacturers:****1. Manufacturer Contact List:**

- a. Kinetics Noise Control, Dublin, OH [www.kineticsnoise.com](http://www.kineticsnoise.com).
- b. Magnum Products, Lenaxa, KS [www.levelcoat.com](http://www.levelcoat.com).
- c. National Gypsum, Charlotte, NC [www.nationalgypsum.com](http://www.nationalgypsum.com).
- d. Soundproofing Co, San Marcos, CA [www.soundproofing.org](http://www.soundproofing.org).
- e. United States Gypsum Co, Chicago, IL [www.usg.com](http://www.usg.com).
- f. Westpac Materials Inc, Orange, CA [www.westpacmaterials.com](http://www.westpacmaterials.com).
- g. Wm. Zinsser & Co, Somerset, NJ [www.zinsser.com](http://www.zinsser.com).

**2. Gypsum Board Mounting Accessories:****a. Resilient Sound Isolation Clips:****1) Design Criteria:**

- a) Sound Transmission: As per ASTM E90 and E413:

**2) Type Two Acceptable Products:**

- (1) IsoMax by Kinetics Noise Control.
- (2) SSP Clips by Soundproofing Co.
- (3) Equal as approved by Architect before installation. See Section 01 6200.

**b. Furring Channels:**

- 1) Class Two Quality Standards. See Section 01 6200 for definitions:

- a) Walls: Galvanized DWFC-25.
  - b) Ceilings: Galvanized DWFC-20.
  - 2) Accessories as required by Manufacturer's fire tests to provide necessary fire ratings.
  - c. Corner And Edge Trim:
    - 1) Metal, paper-faced metal, paper-faced plastic, or solid vinyl meeting requirements of ASTM C1047. Surfaces to receive bedding cement treated for maximum bonding.
  - d. Control Joint:
    - 1) Bent zinc sheet with V-shaped slot, perforated flanges, covered with plastic tape meeting requirements of ASTM C1047.
  - 3. Joint Compound:
    - a. Best grade or type recommended by Board Manufacturer and meeting requirements of ASTM C475/C475M.
      - 1) Use Taping Compound for first coat to embed tape and accessories.
      - 2) Use Taping Compound or All-Purpose Compound for subsequent coats except final coat.
      - 3) Use Finishing Compound for final coat and for skim coat.
  - 4. Joint Reinforcing:
    - a. Paper reinforcing tape acceptable to Gypsum Board Manufacturer.
  - 5. Fasteners:
    - a. Bugle head screws meeting requirements of ASTM C1002:
      - 1) Gypsum Board:
        - a) Type W: For fastening gypsum board to wood members, of length to penetrate wood framing **5/8 inch** minimum.
        - b) Type S: For fastening gypsum board to steel framing and ceiling suspension members, of length to penetrate steel framing **3/8 inch** minimum.
      - 2) Glass Mat Gypsum Tile Backer:
        - a) Wood Framing: **11 ga (0.1233 in)** galvanized with **7/16 inch** head, hot dipped. Screws: Type W or Type S Hi-Lo, bugle head, rust resistant.
- B. Primer / Surfer On Surfaces To Receive Texturing:
- 1. Type Two Acceptable Products:
    - a. Sheetrock First Coat by USG.
    - b. Prep Coat by Westpac Materials.
    - c. Level Coat by Magnum Products.
    - d. Equal as approved by Architect before bidding. See Section 01 6200.
- C. Primer On Surfaces To Receive Wallcovering:
- 1. White, self-sizing, water based, all purpose wallcovering primer.
  - 2. Type Two Acceptable Products:
    - a. Shieldz Universal Pre-Wallcovering Primer by Wm. Zinsser and Company.
    - b. Equal as approved by Architect before application. See Section 01 6200.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification Of Conditions:
- 1. Examine substrate and verify framing is suitable for installation of gypsum board.
  - 2. Examine gypsum board before installation. Reject panels that are wet, moisture damaged, and mold damaged.
  - 3. Notify Architect of unsuitable conditions in writing.
    - a. Do not install board over unsuitable conditions.
  - 4. Commencement of Work by installer is considered acceptance of substrate.

### 3.2 INSTALLATION

- A. Interface With Other Work:
  - 1. Coordinate with Division 06 for location of backblocking for edges and ends of gypsum board and for blocking required for installation of equipment and building specialties.
  - 2. Do not install gypsum board until required blocking is in place.
- B. General: Install and finish as recommended in ASTM C840 or GA-216 unless specified otherwise in this Section.
- C. Mounting Accessories:
  - 1. Furring Channels: Apply with screws through flanges into each framing member.
- D. Interior Gypsum Board:
  - 1. General:
    - a. Install so trim and reinforcing tape are fully backed by gypsum board. No hollow spaces between pieces of gypsum board over **1/8 inch** wide before taping are acceptable.
    - b. Rout out backside of gypsum board to accommodate items that extend beyond face of framing, but do not penetrate face of gypsum board, such as metal door frame mounting brackets, etc.
    - c. On walls over **108 inches** high, apply board perpendicular to support
    - d. Butt edges in moderate contact. Do not force in place. Shim to level.
    - e. Leave facings true with joint, finishing flush. Vertical work shall be plumb and ceiling surfaces level.
    - f. Scribe work closely:
      - 1) Keep joints as far from openings as possible.
      - 2) If joints occur near an opening, apply board so vertical joints are centered over openings.
      - 3) No vertical joints shall occur within **8 inches** of external corners or openings.
    - g. Install board tight against support with joints even and true. Tighten loose screws.
    - h. Caulk perimeter joints in sound insulated rooms with specified acoustical sealant.
  - 2. Ceilings:
    - a. Apply ceilings first using minimum of two (2) men.
    - b. Use board of length to give minimum number of joints.
    - c. Apply board perpendicular to support.
      - 1) Single Layer Application:
        - a) Stagger end joints:
          - (1) End and edge joints of board applied on ceilings shall occur over framing members or be back blocked with **2x4** blocking.
          - (2) Edge joints of board vertically applied on walls shall occur over framing members.
          - (3) **2x4** blocking is required at wall to ceiling transitions and at top of ceiling vault transitions.
  - 3. Fastening:
    - a. Apply from center of board towards ends and edges.
    - b. Apply screws **3/8 inch** minimum from ends and edges, **one inch** maximum from edges, and **1/2 inch** maximum from ends.
    - c. Spacing:
      - 1) Ends: Screws not over **7 inches** on center at edges where blocking or framing occurs.
      - 2) Wood Framed Walls And Ceilings: Screws **7 inches** on center in panel field.
      - 3) Metal Framed Walls: Screws **12 inches** on center in panel field.
    - d. Set screw heads **1/32 inch** below plane of board, but do not break face paper. If face is accidentally broken, apply additional screw **2 inches** away.
    - e. Screws on adjacent ends or edges shall be opposite each other.
    - f. Drive screws with shank perpendicular to face of board.
  - 4. Trim:
    - a. Corner Beads:
      - 1) Attach corner beads to outside corners.

- a) Attach metal corner bead with staples spaced **4 inches** on center maximum and flat taped over edges of corner bead. Also, apply screw through edge of corner bead where wood trim will overlay corner bead.
    - b) Set paper-faced trim in solid bed of taping compound.
  - b. Edge Trim: Apply where gypsum board abuts dissimilar material. Hold channel and 'L' trim back from exterior window and door frames **1/8 inch** to allow for caulking.
- 5. Finishing:
  - a. General:
    - 1) Tape and finish joints and corners throughout building as specified below to correspond with final finish material to be applied to gypsum board. When sanding, do not raise nap of gypsum board face paper or paper-faced trim.
    - 2) First Coat:
      - a) Apply tape over center of joint in complete, uniform bed of specified taping compound and wipe with a joint knife leaving a thin coating of joint compound. If metal corner bead is used, apply reinforcing tape over flange of metal corner bead and trim so half of tape width is on flange and half is on gypsum board.
      - b) Completely fill gouges, dents, and fastener dimples.
      - c) Allow to dry and sand lightly if necessary to eliminate high spots or excessive compound.
    - 3) Second Coat:
      - a) Apply coat of specified joint compound over embedded tape extending **3-1/2 inches** on both sides of joint center. Use finishing compound only if applied coat is intended as final coat.
      - b) Re-coat gouges, dents, and fastener dimples.
      - c) Allow to dry and sand lightly to eliminate high spots or excessive compound.
    - 4) Third Coat: Apply same as second coat except extend application **6 inches** on both sides of joint center. Allow to dry and sand with fine sandpaper or wipe with damp sponge.
    - 5) Fourth Coat: Apply same as second coat except extend application **9 inches** on both sides of joint center. Allow to dry and sand with fine sandpaper or wipe with damp sponge.
  - a. Finishing Levels: Finish panels to levels indicated below and according to ASTM C840, GA-214 and GA-216:
    - 1) Gypsum Board Surfaces not painted or finished:
      - a) GA-214 Level 1: 'All joints and interior angles shall have tape set in joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable'.
    - 2) Gypsum Board Surfaces Under Acoustical Tile:
      - a) GA-214 Level 2: 'All joints and interior angles shall have tape embedded in joint compound and wiped with a joint knife leaving a thin coating of joint compound over all joints and interior angles. Fastener heads and accessories shall be covered with a coat of joint compound. Surface shall be free of excess joint compound. Tool marks and ridges are acceptable. Joint compound applied over the body of the tape at the time of tape embedment shall be considered a separate coat of joint compound and shall satisfy the conditions of this level.
      - b) Note: It is critical that gypsum board ceiling be smooth before installing ceiling tile. Drywall joints must be as specified in paragraph above.
    - 3) Gypsum Board Surfaces to Receive: Wall Covering Type A - Section 09 7226: 'Sisal Wall Covering':
      - a) GA-214 Level 3: 'All joints and interior angles shall have tape embedded in joint compound and one additional coat of joint compound applied over all joints and interior angles. Fastener heads and accessories shall be covered with two separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Coat prepared surface with specified wall covering primer'.
    - 4) Gypsum Board Surfaces to Receive: Smooth Gypsum Board Surfaces:
      - a) GA-214 Level 4: 'All and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over all flat joints and one separate coat of joint compound applied over interior angles. Fastener heads



and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Coat prepared surface with specified primer'.

5) Painted, Untextured Gypsum Board Surfaces, Except in Mechanical, Storage, And Utility Areas:

- a) GA-214 Level 5: 'All joints and interior angles shall have tape embedded in joint compound and two separate coats of joint compound applied over flat joints and one separate coat of joint compound applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. A thin skim coat of joint compound trowel applied, or a material manufactured especially for this purpose and applied in accordance with manufacturer's recommendations, shall be applied to the entire surface. The surface shall be smooth and free of tool marks and ridges. Coat prepared surface with specified primer'.

E. Glass Mat Gypsum Tile Backer:

1. Apply glass mat gypsum tile backer to framing. Attach using specified fasteners spaced **6 inches** on center on edges and into all framing members. Drive screws flush with surface of board.
2. Shim board to be plumb and flat or level and flat, depending on location.
3. Apply reinforcing only at joints where abutting different materials.

### 3.3 FIELD QUALITY CONTROL

A. Non-Conforming Work:

1. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  - a. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - b. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

### 3.4 CLEANING

- A. Remove from site debris resulting from work of this Section including taping compound spills.

**END OF SECTION**

**BLANK PAGE**

**SECTION 09 3013****CERAMIC TILING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install ceramic tile and tile setting materials and accessories as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 09 2900: Installation of backerboard behind ceramic tile, except for joint reinforcing.
  - 2. Division 23: Floor drains.
- C. Products Installed But not Furnished Under This Section:
  - 1. Interior Ceramic Tile Joint Sealants:
- D. Related Requirements:
  - 1. Section 07 9213: 'Elastomeric Joint Sealants'.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. American National Standard Specification (ANSI) for the Installation of Ceramic Tile.
  - 2. International Standards Organization (ISO) 13007, 'Classification for Adhesives and Grout'.
  - 3. Tile Council of North America:
    - a. TCNA Handbook, 'Handbook for Ceramic, Glass, and Stone Tile Installation, 2015'.
- B. Definitions:
  - 1. Crack Isolation: Prevention of transfer of cracks from substrate through tile or stone when substrate is subjected to horizontal movement of cracks.
  - 2. Dry-Set Mortar: Water-retentive hydraulic cement mortar usable with or without sand. When this mortar is used, neither tile nor walls have to be soaked during installation.
  - 3. Dynamic Coefficient of Friction (DCOF): Measures ratio of forces necessary to keep two surfaces sliding.
  - 4. Epoxy Grout: Mortar system employing epoxy resin and epoxy hardener portions.
  - 5. Grout: Rich or strong cementitious or chemically setting mix used for filling tile joints.
  - 6. ISO 13007 Standards Product Classifications:
    - a. Adhesives:

Types	Classes	Special Characteristics
C = Cementitious (Thin-Set Mortars)	1 = Normal 2 = Improved	F = Fast-Setting T = Slip-Resistant E = Extended Open Time S1 = Deformable S2 = Highly Deformable P1 = Plywood Adhesion P2 = Improved Plywood Adhesion
D = Dispersion (Mastics)	1 = Normal 2 = Improved	F = Fast-Setting T = Slip-Resistant

		E = Extended Open Time
R = Reaction Resin (Epoxies)	1 = Normal 2 = Improved	T = Slip-Resistant

- 1) Cementitious Adhesive (C): Mixture of hydraulic binding agents (e.g. portland cement), aggregates, and organic additives (e.g. latex polymers, moisture retention additive, etc...) to be mixed with water or latex admix before mixing.
- 2) Dispersion Adhesive (D): Ready-to-use mixture of organic binding agents in the form of an aqueous polymer dispersion, organic additives and mineral fillers - mastic type products.
- 3) Reaction Resin Adhesive (R): Single or multi-component mixture of synthetic resin, mineral fillers and organic additives in which curing occurs by chemical reaction – epoxy or urethane based products.
- 4) Class 1 (1): Adhesive has passed minimum pass level tests that are mandatory for that adhesive type.
- 5) Class 2 (2): Adhesive has passed same tests as Class 1 and/or other applicable tests, but at higher pass levels.
- 6) Fast-Setting (F): Adhesive with accelerated cure time that must achieve minimum strength requirements of fast setting adhesive. This designation does not apply to reaction resin adhesives (R).
- 7) Slip-Resistance (T): Downward movement of a tile applied to combed adhesive layer on vertical surface must be  $\leq 0.5\text{mm}$  for a C or D adhesive, and  $\leq 5\text{mm}$  for a type R adhesive.
- 8) Extended Open Time (E): Maximum time interval after application at which tiles can be embedded in applied adhesive and meet tensile adhesion strength requirement must be  $\geq 30$  minutes. This designation does not apply to reaction resin adhesives (R).
- 9) Deformability (S): Capacity of hardened adhesive to be deformed by stresses between tile and substrate without damage to installed surface – to pass S1 requirements an adhesive must be able to deform  $\geq 2.5\text{mm}$  but  $< 5\text{mm}$ ; to pass S2 requirements an adhesive must be able to deform  $\geq 5\text{mm}$ . This designation does not apply to reaction resin adhesives (R).
- 10) Exterior Glue Plywood (P): Adhesive with ability to bond tile or stone to exterior glue plywood substrates (interior only). This designation does not apply to reaction resin adhesives (R) or dispersion adhesives (D).

b. Grouts:

Types	Classes	Special Characteristics
CG = Cementitious Grout	1 = Normal 2 = Improved	F = Fast-Setting A = High Abrasion Resistance W = Reduced Water Absorption
RG = Reaction Resin Grouts	1 = Normal 2 = Improved	Higher performance characteristics than improved cementitious grouts

- 1) Cementitious Grout (CG): Mixture of hydraulic binding agents (e.g. portland cement), aggregates, inorganic and organic additives (e.g. latex polymers, moisture retention additive, etc...).
- 2) Reaction Resin Grout (RG): Single or multi-component mixture of synthetic resin, mineral fillers and organic additives in which curing occurs by chemical reaction – epoxy or urethane based products.
- 3) Class 1 (1): Grout has passed minimum pass level tests that are mandatory for cementitious grouts.
- 4) Class 2 (2): Cementitious grout has passed same tests as Class 1 and/or other applicable tests, but at higher pass levels.
- 5) Fast-Setting (F): Grout with accelerated cure time that must achieve minimum compressive strength requirements under normal conditions within twenty four (24) hours. This designation applies only to cementitious grouts (CG).

- 6) High Abrasion Resistance (A): Capability of grout to resist wear. This designation applies only to cementitious grouts (CG).
- 7) Reduced Water Absorption (W): Grout has lower water absorption rate than standard cementitious grout. This designation applies only to cementitious grouts (CG).
7. Latex/Polymer Modified Portland Cement Mortar: Latex/Polymer modified portland cement mortar is a mixture of portland cement, sand, and special latex/polymer additive that is used as a bond coat for setting tile.
8. Mastic: Tile adhesive.
9. Mortar Bed: Layer of mortar on which tile is set. Final coat of mortar on wall, floor or ceiling is called a mortar bed.
10. Movement Joints:
  - a. Construction Joint: Surface where two successive placements of concrete meet, across which it may be desirable to achieve bond, and through which reinforcement may be continuous.
  - b. Contraction Joint: Formed, sawed or tooled groove in concrete structure to create weakened plane and regulate location of cracking resulting from dimensional change of different parts of structure. See also Isolation Joint.
  - c. Control joint: See contraction joint.
  - d. Expansion Joint: (1) Separation provided between adjoining parts of structure to allow movement where expansion is likely to exceed contraction; (2) Isolation joint intended to allow independent movement between adjoining parts
  - e. Isolation Joint: Separation between adjoining parts of concrete structure, usually vertical plane, at designated location such as to interfere least with performance of structure, yet such as to allow relative movement in three directions and avoid formation of cracks elsewhere in concrete and through which all or part of bonded reinforcement is interrupted.
11. Mud: Slang term for mortar.
12. Non-vitreous tile: Tile with water absorption of more than 7.0 percent.
13. Pavers: Unglazed porcelain or natural clay tile formed by dust-pressed method and similar to ceramic mosaics in composition and physical properties but relatively thicker with 6 inch - or more of facial area. (ASTM C242).
14. Sanded Cement Grout: Factory prepared mixture of cement, graded sand, and other ingredients to produce water-resistant, dense, uniformly colored material. Used for joints of **1/8 inch** width or greater.
15. Static Coefficient of Friction (SCOF): Measures ratio of forces necessary to start two surfaces sliding (older measurement of friction replaced by dynamic coefficient of friction (DCOF)).
16. Setting Bed: See Mortar Bed.
17. Tile:
  - a. Ceramic Tile: Ceramic surfacing unit, usually relatively thin in relation to facial area, made from clay or mixture of clay; and other ceramic material, called body of the tile, having either 'glazed' or 'unglazed' face, and fired above red heat to temperature sufficiently high to produce specific physical properties and characteristics.
  - b. Paver Tile: Unglazed porcelain or natural clay tile formed by dust-pressed method and similar to ceramic mosaics in composition and physical properties but relatively thicker (usually **3/8 inch** thick) with **6 inch** or more of facial area. (ASTM C242).
  - c. Porcelain Tile: Ceramic mosaic tile or paver that is generally made by dust-pressed method, of composition resulting in tile that is dense, fine-grained, and smooth with sharply formed face, usually impervious. (ASTM C242).
  - d. Wall Tile: Glazed tile with body that is suitable for interior use and which is usually nonvitreous and is not required nor expected to withstand excessive impact.
18. Thin-set: Term used to describe bonding of tile with suitable materials applied approximately 1/8 inch thick.
19. Urethane: Elastomeric polymer with excellent chemical and water resistance.
20. Unsanded Cement Grout: Factory prepared mixture of cement and additives that provide water retentivity. Used for joints of **1/8 inch** or less.
21. Vapor Retarder: Waterproof membrane placed under concrete floor slabs that are placed on grade.
22. Vitreous Tile: Ceramic tile with low porosity, used indoors or outdoors, in wet or dry locations.
23. Waterproof Membrane: Membrane to provide positive waterproof floor over substrate, which is to receive tile installation using a wire reinforced mortar bed.

## C. Reference Standard:

1. American National Standards Institute:
  - a. ANSI A108/A118/A136.1, 'American National Standards Specifications for the Installation of Ceramic Tile', Version 2013.1 (compilation of standards):
    - 1) Installation Standards:
      - a) A108.01, 'General Requirements: Subsurfaces and Preparation by Other Trades'.
      - b) A108.02, 'General Requirements: Materials, Environmental, and Workmanship'.
      - c) A108.05, 'Installation of Ceramic Tile with Dry-Set Portland Cement Mortar of Latex-Portland Cement Mortar'.
      - d) A108.6, 'Installation of Tile with Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy'.
      - e) A108.10, 'Installation of Grout in Tilework'.
      - f) A108.17, 'Installation of Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone'.
    - 2) Material Specifications:
      - a) A118.1, 'Dry-Set Portland Cement Mortar'.
      - b) A118.3, 'Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive'.
      - c) A118.4, 'Latex Portland Cement Mortar'.
      - d) A118.6, 'Cement Grouts for Tile Installation'.
      - e) A118.7, 'High-Performance Polymer Modified Latex/Portland Cement Grouts for Tile Installation'.
      - f) A118.10, 'Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone Installations'.
      - g) A118.12, 'Crack Isolation Membranes for Thin-set Ceramic Tile and Dimension Stone Installations'.
  - b. ANSI A137.1-2012, 'National Standard Specifications for Ceramic Tile'.
2. ASTM International:
  - a. ASTM A1064/A1064M-14, 'Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete'.
  - b. ASTM C144-11, 'Standard Specification for Aggregate for Masonry Mortar'.
  - c. ASTM C150/C150M-15, 'Standard Specification for Portland Cement'.
  - d. ASTM C206-14, 'Standard Specification for Finishing Hydrated Lime'.
  - e. ASTM C207-06(2011), 'Standard Specification for Hydrated Lime for Masonry Purposes'.
  - f. ASTM C242-15, 'Standard Terminology of Ceramic Whitewares and Related Products'.
  - g. ASTM C373-14a, 'Standard Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products'.
  - h. ASTM C482-02(2014), 'Standard Test Method for Bond Strength of Ceramic Tile to Portland Cement Paste'.
  - i. ASTM C501-84(2009), 'Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser'.
  - j. ASTM C648-04(2014), 'Standard Test Method for Breaking Strength of Ceramic Tile'.
  - k. ASTM C847-14a, 'Standard Specification for Metal Lath'.
3. International Organization for Standardization:
  - a. ISO 13007-1:2013, 'Ceramic tiles - Grouts and adhesives - Part 1: Terms, definitions and specifications for adhesives'.
  - b. ISO 13007-2: 2013, 'Ceramic tiles - Grouts and adhesives - Part 2: Test methods for adhesives'.
  - c. ISO 13007-3: 2013, 'Ceramic tiles - Grouts and adhesives - Part 3: Terms, definitions and specifications for grouts'.
  - d. ISO 13007-4:2010, 'Ceramic tiles - Grouts and adhesives - Part 4: Test methods for grouts'.
4. Tile Council of North America:
  - a. TCNA F111-15, 'On-Ground or Above-Ground Concrete, Unbonded Mortar Bed, Ceramic Tile'.
  - b. TCNA W211-15, 'Masonry or Concrete, Bonded Mortar Bed, Ceramic Tile'.
  - c. TCNA W221-15, 'Solid Backing, Mortar Bed, Ceramic Tile'.
  - d. TCNA W244c-15, 'Wood or Metal Studs, Cement Backer Board, Ceramic Tile'.
  - e. TCNA W245-15, 'Wood or Metal Studs, Coated Glass Mat Water-Resistant Gypsum Backer Board, Ceramic Tile'.

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
  - 1. In addition to agenda items specified in Section 01 3100, review following:
    - a. Review installation scheduling, coordination with related work, and placement of tile.
    - b. Review Manufacturer's installation requirements, submittals, and Installers requirements to assure issuance of Manufacturer's system warranty.
    - c. Review surface preparation.
    - d. Review water-proofing and crack isolation membrane requirements.
    - e. Review tile base installation requirements.
    - f. Review floor tile grout thickness requirements.

### 1.4 SUBMITTALS

- A. Action Submittals:
  - 1. Samples:
    - a. **24 inch** square sample on specified tile backer showing all types of tile, grout, and colors specified in this Section. 1/2 of sample board shall show floor tile and 1/2 shall show wall tile.
    - b. One sample of each type of base tile and trim piece to be used on Project.
- B. Informational Submittals:
  - 1. Certificates:
    - a. Master grade certificate.
      - 1) Conform to ANSI A137.1.
  - 2. Manufacturer's Instructions:
    - a. Provide instructions for installation of tile-setting materials.
  - 3. Source Quality Control Submittals:
    - a. Provide Manufacturer documentation indicating proposed materials will satisfy requirements for Manufacturer's Warranty.
  - 4. Qualification Statement. See Section 01 4301 for qualifications:
    - a. Installer:
      - 1) Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Operations and Maintenance Data:
      - 1) Cleaning and maintenance instructions.
    - b. Warranty Documentation:
      - 1) Include copy of final, executed warranty.
    - c. Record Documentation:
      - 1) Manufacturers Documentation:
        - a) Manufacturer's cut sheets of materials used in installed system.
        - b) Tile color and pattern selections.

### 1.5 QUALITY ASSURANCE

- A. Source Of Materials:
  - 1. Provide materials obtained from one (1) source for each type and color of tile, grout, and setting materials for Manufacturer's system warranty.
- B. Qualifications:
  - 1. Installer: Requirements of Section 01 4301 applies, but not limited to following:
    - a. Minimum three (3) years experience installing specified tile installations.
    - b. Minimum five (5) satisfactorily completed installations of comparable quality, scope, similar size, and complexity in past two (2) years before bidding.
    - c. Upon request, submit documentation.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
  - 1. Deliver and store packaged materials in their original unopened containers with labels intact until time of use.
- B. Storage and Handling Requirements:
  - 1. Store and handle materials in a manner to prevent damage or contamination by water, freezing, or foreign matter.
  - 2. Keep grade seals intact and cartons dry until tile are used.

## 1.7 FIELD CONDITIONS

- A. Ambient Conditions:
  - 1. Do not apply tile setting materials to surfaces that contain frost.
  - 2. Keep ambient temperatures of area to receive tile work and surface temperatures of substrates at **50 deg F** minimum during preparation of mortar bed, laying of tile, and for seventy two (72) hours after completion of tile work. Use electric heat to prevent discoloration of grout.
  - 3. Temperature of substrate shall be **60 deg F** and rising for application of epoxy and furan unless otherwise specifically authorized by Manufacturer.
  - 4. Maintain epoxy at stable temperature between **60 deg F** and **90 deg F** during curing period.

## 1.8 WARRANTY

- A. Manufacturer Warranty:
  - 1. Mortar Manufacturer's twenty five (25) year minimum system warranty on tile-setting materials for surface preparation, setting materials and grouting materials; includes replacement of defective materials and deterioration, including replacement of tile and labor and materials when products purchased are used within their shelf life and installed in accordance to Manufacturers written instructions and industry standard guidelines.

## PART 2 - PRODUCTS

### 2.1 SYSTEMS

- A. Manufacturers:
  - 1. Manufacturer's Contact List:
    - a. Custom Building Products, Seal Beach, CA [www.custombuildingproducts.com](http://www.custombuildingproducts.com).
      - 1) Contact Information: John Gallup (206) 718.6024 [johng@cbpmail.net](mailto:johng@cbpmail.net).
    - b. Dal-Tile Corp., Div. of Mohawk Industries, Dallas, TX [www.daltile.com](http://www.daltile.com).
    - c. Interceramic Inc., Garland, TX [www.interceramic.com](http://www.interceramic.com).
    - d. Laticrete International Inc., Bethany, CT [www.laticrete.com](http://www.laticrete.com).
    - e. Mapei Americas Headquarters, Deerfield Beach, FL [www.mapei.com](http://www.mapei.com).
      - 1) Contact Information: Bart A. Wilde (801) 467-2060 [bawilde@mapei.com](mailto:bawilde@mapei.com).
    - f. Merkrete, by Parex USA, Inc., Anaheim, CA [www.merkrete.com](http://www.merkrete.com).
      - 1) Contact Information: Andy Townes (505) 873-1181 [andy.townes@parexusa.com](mailto:andy.townes@parexusa.com).
    - g. Schluter Systems L.P., Plattsburgh, NY [www.schluter.com](http://www.schluter.com).
- B. Category Two National Contract Suppliers. See Section 01 6200 for definitions of Categories:
  - 1. Contact following suppliers to procure components of tile assembly:
    - a. Daltile And Stone, Salt Lake City, UT:
      - 1) LDS Project Coordinators:
        - a) Russ Green and Larry McCleary, (801) 487-9901, cell (801) 301 1461, fax (801) 487-0345 [larry.mccleary@daltile.com](mailto:larry.mccleary@daltile.com) - [www.daltileproducts.com](http://www.daltileproducts.com) or [www.daltilegreenworks.com](http://www.daltilegreenworks.com).



- b. Interceramic:
    - 1) LDS Project Coordinators:
      - a) First Contact: Diego Chavez, phone (214) 503-5433, fax (877) 551-1979  
[dichavez@interceramic.com](mailto:dichavez@interceramic.com).
      - b) Second Contact: Jose Valdez, phone (214) 503-5507, fax (877) 551-1979  
[jvaldez@interceramic.com](mailto:jvaldez@interceramic.com).
- C. Design Criteria:
- 1. General:
    - a. Paver Tile: Standard grade porcelain tile, solid color throughout, graded in accordance with ANSI A137.1:
      - 1) Cove Base with external and internal corner pieces shall be standard grade.
    - b. Ceramic Tile:
      - 1) Tile shall be standard quality, white or off-white body, square or cushion edge, graded in accordance with ANSI A137.1.
      - 2) Square edge, white body, lug type wall tile. Field wall tile shall have two lugs on each edge to assure uniform joint, approximately **0.040 inch**.
      - 3) External and internal corner pieces shall be standard grade.
  - 2. Capabilities:
    - a. Paver Tile:
      - 1) Water Absorption when tested in accordance with ASTM C373: 0.1 to 0.5 percent.
      - 2) Abrasive Wear Resistance when tested in accordance with ASTM C501: 275 minimum.
      - 3) Breaking Strength when tested in accordance with ASTM C648: 300 lbs minimum.
      - 4) Bond Strength when tested in accordance with ASTM C482: 200 psi minimum.
      - 5) Coefficient of Friction: 0.42 minimum as measured by DCOF (Dynamic Coefficient of Friction) AcuTest method and requirements as per ANSI A137.1.
- D. Description:
- 1. Paver Tile:
    - a. Tile Sizes:
      - 1) Finished floor with no slope shown on Contract Documents: **12 inches** square minimum:
        - a) Cove Base: External and internal corner pieces to match with bull-nosed top:
          - (1) **6 inches by 12 inches**.
          - (2) **6 inches by 8 inches**.
        - b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
          - (1) Daltile.
          - (2) Interceramic.
    - b. Category Four Approved Colors. See Section 01 6200 for definitions of Categories:
      - 1) CD05 Bianco Alpi by Daltile.
      - 2) Dotti Ivory by Interceramic.
  - 2. Ceramic Tile:
    - 1) Walls: **4-1/4 inches by 4-1/4 inches**.
    - 2) Ceramic Tile Base:
      - a) **4-1/4 inch** (high, A4402 bullnose base.
    - 3) Category Four Approved Colors. See Section 01 6200 for definitions of Categories:
      - a) Room Walls:
        - (1) Selected by Architect to match existing tile
        - (2) Canvas by Interceramic.
  - 3. Joint Sealants:
    - a. Interior Ceramic Tile Joints are furnished in Section 07 9213 and installed in Section 09 3013 'Ceramic Tiling' including the following:
      - 1) Ceramic and paver cove base inside corners.
      - 2) Ceramic and paver tile joints.
  - 4. Backer Board Joint Reinforcing: **2 inch** wide glass fiber mesh tape.
  - 5. Tile Setting Products:
    - a. Use only products of same Manufacturer to validate warranty, unless otherwise acceptable to Ceramic Tile Supplier.
    - b. Latex-Portland Cement Mortar For Floors:

- 1) Design Criteria:
  - a) Meet Requirements of ANSI A118.4, ANSI A118.6, ANSI 118.11, or ANSI A118.15 and ISO 13007 C2ES1P2 for manufactured mortar.
- 2) Category Four Approved Products. See Section 01 62 00 for definitions of Categories:
  - a) CUSTOM: Megalite Thinset or FlexBond Fortified Thin-Set Mortar.
  - b) LATICRETE: 254 Platinum Thinset.
  - c) MAPEI: Ultraflex 3.
  - d) MERKRETE: 735 Premium Flex.
- c. Latex/Polymer Modified Portland Cement Mortar For Walls:
  - 1) Meet Requirements of ANSI A118.4, ANSI A118.6, or ANSI A118.15 and ISO 13007; C2ES1P2 for manufactured mortar.
  - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a) CUSTOM: Megalite Thin-Set Mortar or FlexBond Fortified Thin-Set Mortar.
    - b) LATICRETE: 254 Platinum Thinset.
    - c) MAPEI: Ultraflex 3.
    - d) MERKRETE: 735 Premium Flex.
- d. Floor Grout (Epoxy):
  - 1) Meet Requirements of ANSI A118.3 or ANSI A118.6 and ISO 13007 RG.
  - 2) Color:
    - a) CUSTOM: No. 145 Light Smoke.
    - b) LATICRETE: No. 24 Natural Grey.
    - c) MAPEI: No. 11 Sahara Beige.
    - d) MERKRETE: Pro Epoxy D-153 Buckskin.
  - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a) CUSTOM: CEG-Lite 100% Solids Commercial Epoxy Grout.
    - b) LATICRETE: SpectraLOCK PRO.
    - c) MAPEI: Kerapoxy or Opticolor.
    - d) MERKRETE: Pro Epoxy.
- e. Wall Grout (Modified Polymer):
  - 1) Meet Requirements of ANSI A118.6 or ANSI A118.6 and ISO 13007.
  - 2) Color:
    - a) As selected by Architect to match existing.
  - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a) CUSTOM: PolyBlend Non-Sanded Grout or Prism SureColor Grout.
    - b) LATICRETE: 1600 Series Unsanded Dry Set Wall Grout with 1776 Grout Admix Plus additive.
    - c) MAPEI: Keracolor-U Unsanded Polymer-Modified Grout.
    - d) MERKRETE: Non-Sanded ColorGrout, latex modified.
- f. Crack Isolation Membrane:
  - 1) Meet Requirements of ANSI A118.12.
  - 2) Use only products with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 3) Category Four Approved Products. See Section 01 6200 for definitions for Categories:
    - a) Flexible, thin, load-bearing, fabric-reinforced:
      - (1) CUSTOM: Crack Buster Pro Crack Prevention Mat Underlayment, with Peel & Stick Primer.
      - (2) LATICRETE: Blue 92 Anti-Fracture Membrane.
      - (3) MAPEI: Mapeguard 2, and Primer SM.
      - (4) MERKRETE: Hydro-Guard SP-1.
    - b) Liquid applied, latex based:
      - (1) CUSTOM: RedGard Waterproofing and Crack Prevention Membrane or FractureFree Crack Prevention Membrane.
      - (2) LATICRETE: Hydro Ban.
      - (3) MAPEI: Mapelastic AquaDefense.
      - (4) MERKRETE: Fracture Guard 5000.
- g. Stone Thresholds:
  - 1) Texture and color variation shall be within limits established by Architect's approved sample.
  - 2) Free of defects that would materially impair strength, durability, and appearance.
  - 3) Finish: 80 grit exterior hone.

- 4) White marble, one (1) piece, **7/8 inch** thick by **2 1/2 inches** by door opening width.  
Cross-section to meet handicap accessibility requirements.

### **PART 3 - EXECUTION:**

#### **3.1 INSTALLERS**

- A. Acceptable Installers:
  1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

#### **3.2 EXAMINATION**

- A. Verification Of Conditions:
  1. Examine substrates where tile will be installed for compliance with requirements for installation tolerances and other conditions effecting performance of installed tile.
  2. Verify tile substrate is well cured, dry, clean, and free from oil or waxy films, and curing compounds.
  3. Notify Architect in writing if surfaces are not acceptable to install tile:
    - a. Do not lay tile over unsuitable surface.
    - b. Commencing installation constitutes acceptance of surfaces and approval of existing conditions.

#### **3.3 PREPARATION**

- A. Surface Preparation:
  1. Allow concrete to cure for twenty eight (28) days minimum before application of mortar bed.
  2. Repair and clean substrate in accordance with installation standards and manufacturer's instructions.

#### **3.4 INSTALLATION**

- A. Interface With Other Work:
  1. Grounds, anchors, plugs, hangers, door frames, electrical, mechanical, and other work in or behind tile shall be installed before tile work is started.
- B. Special Techniques:
  1. Install in accordance with following latest TCNA installation methods:
    - a. Flush Concrete Slabs with crack isolation membrane: TCNA F115.
    - b. Framed Walls: TCNA W245 with waterproof membrane.
    - c. Masonry Walls: TCNA W211 or W221.
    - d. Tile Cove Base: TCNA Flush style.
- C. Tolerances:
  1. Plane of Vertical Surfaces:
    - a. **1/8 inch in 8 feet** from required plane shall be plumb and true with square corners.
  2. Variation In Slab Grade:
    - a. Plus or minus **1/8 inch** in any **10 feet** of floor slab and distance between high point and low point of slab of **1/2 inch** .
    - b. Slab Testing Procedure:
      - 1) Place ends of straightedge on **3/8 inch** high shims.

- 2) Floor is satisfactory if **1/4 inch** diameter steel rod rolled under straightedge will not touch anywhere along **10 foot** length and **1/2 inch** diameter steel rod will not fit under straightedge anywhere along **10 foot** length.

D. General:

1. Install tile in pattern indicated:
  - a. Align joints when adjoining tiles on floor, base, walls, and trim are same size.
  - b. Adjust to minimize tile cutting and to avoid tile less than half size.
  - c. Center and balance areas of tile if possible.
2. Extend tile into recesses and under equipment and fixtures to form a complete covering without interruption:
3. Maintain heights of tilework in full courses to nearest obtainable dimension where heights are given in **feet and inches** and are not required to fill vertical spaces exactly.
4. Install cut tile with cuts on outer edges of field:
  - a. Provide straight cuts that align with adjacent materials.
  - b. When possible, smooth cut edges of tile or use appropriate cutter or wet saw to produce smooth cuts.
  - c. Do not install tile with jagged or flaked edges.
5. Terminate tile neatly at obstructions, edges, and corners, without disruption of pattern or joint alignment:
  - a. Fit tile closely where edges are to be covered by trim, escutcheons, or similar devices.
6. Provide straight tile joints of uniform width, subject to variance in tolerance allowed in tile size:
  - a. Make joints smooth and even, without voids, cracks, or excess mortar or grout.
7. Use a beating block and hammer or rubber mallet so faces and edges of individual tiles are flush and level with faces and edges of adjacent tiles, and to reduce lippage.
8. Accessories in tilework shall be evenly spaced, properly centered with tile joints, and level, plumb, and true to correct projection.
9. Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

E. Application On Concrete Floor:

1. Clean substrate surface thoroughly.
  - a. Dampen if very dry, but do not saturate.
2. Install tile with 100 percent contact with mortar bed.
  - a. Obtaining 100 percent contact may require troweling mortar layer on back of each tile before placing on mortar bed.
3. Install base by flush method (square or thin-lip method is not acceptable):
  - a. Allow for expansion joint directly above any expansion or control joints in slab.
4. Insert temporary filler in expansion joints.

F. Application On Walls:

1. On Mortar Bed Over CMU:
  - a. Apply mortar bed to required thickness of **3/8 inch** minimum to **3/4 inch**.
  - b. Properly cure before installing tile.
2. On Glass Mat Gypsum Tile Backer Over Framing:
  - a. Embed fiberglass reinforcing tape at joints with mortar used to adhere tile.
3. Dampen dry backings as determined by environmental conditions and Manufacturer's recommendations to achieve cure.
4. Allow for sealant joints full height at room corners in wall tile. Insert temporary filler in expansion joints.
5. Install wall tile directly atop bull-nosed paver tile base.

G. Application Of Mortar:

1. Do not spread more mortar than can be covered within ten (10) to fifteen (15) minutes:
  - a. If 'skinning' occurs, remove mortar and spread fresh material.
  - b. Spread mortar with notches running in one (1) direction, perpendicular to pressing, pushing and pulling of tile during placement.
2. Install tile before mortar has started initial cure:
  - a. For thin set mortar application, use notch trowel that will achieve the recommended coverage of mortar after tiles have been installed.

3. Place tile in fresh mortar, press, push and pull tile slightly to achieve as near 100 percent coverage and contact of tile with setting material and substrate as possible:
    - a. Average contact area shall be not less than eighty (80) percent except on exterior or shower installations where contact area shall be ninety five (95) percent when not less than three (3) tiles or tile assemblies are removed for inspection. The eighty (80) percent or ninety five (95) percent coverage shall be sufficiently distributed to give full support of the tile.
    - b. Support corners and edges with mortar leaving no hollow corners or edges.
  4. Install so there is **1/8 inch** of mortar between tile and substrate after proper bedding:
    - a. Periodically remove sheets or individual tiles to assure proper bond coverage consistent with industry specifications.
    - b. If coverage is found to be insufficient, use a larger size notch trowel.
- H. Application Of Grout:
1. Firmly set tile before applying grout:
    - a. This requires forty eight (48) hours minimum.
  2. Before grouting:
    - a. Remove all paper and glue from face of mounted tile.
    - b. Remove spacers or ropes before applying grouting:
  3. Mixing Grout:
    - a. Use clean buckets and mixing tools:
      - 1) Use sufficient pressure and flow grout in progressively to avoid air pockets and voids.
    - b. Machine mixing of grout is preferred to assure uniform blend. To prevent trapping air bubbles into prepared grout, use slow speed mixer.
    - c. Slake for fifteen (15) minutes.
    - d. Water or latex additives used for mixing with dry grout shall be measured accurately.
  4. Before grouting entire area, do a test area to assure there will be no permanent staining or discoloration of tile and to verify that excess grout can be easily removed from tile surface:
    - a. If necessary, pre-coat exposed surfaces of tile with a grout release recommended by Grout Manufacturer to facilitate removal of excess grout.
  5. Installing Grout:
    - a. Use caution, when grouting glazed ceramic tiles to prevent scratching or damaging surface of tile.
    - b. Dampen dry joints prior to grouting with sand-portland cement grout, standard sanded cement grout, standard unsanded cement grout, polymer modified sanded tile grout, and polymer modified unsanded tile grout. Do not leave puddles of water in joints before grouting.
    - c. Keep an adequate joint depth open for grouting. Force maximum amount of grout into joints.
    - d. Apply grout to produce full, smooth grout joints of uniform width, and free of voids and gaps
      - 1) Fill joints of cushion edge tile to depth of cushion.
      - 2) Fill joints of square edge tile flush with surface.
      - 3) Fill joint between wall tile and bull-nosed paver tile base with floor grout.
    - e. Install floor tile with grout thickness of **3/16 inch** maximum.
    - f. Remove excess grout from surface of tile before it loses its plasticity or begins to set.
    - g. Finished grout shall be uniform in color, smooth, and without voids, pin holes, or low spots.
- I. Curing:
1. Keep installation at **65 to 85 deg F** during first eight (8) hours of cure. Shade area completely from sun during this period.
- J. Application of Joint Sealants:
1. Apply joint sealants after grout has cured:
    - a. This requires forty eight (48) hours minimum.
  2. Before applying sealant:
    - a. Remove spacers or ropes before applying joint sealants.
    - b. Apply backer rod and joint sealants at expansion joints.

### 3.5 FIELD QUALITY CONTROL

#### A. Non-Conforming Work:

1. Correct any work found cracked, chipped, broken, unbounded and otherwise defective or not complying with contract document requirements at no additional cost to the Owner.

### **3.6 CLEANING**

- A. If one has been used, remove grout release and clean tile surfaces so they are free of grout residue and foreign matter:
  1. If a grout haze or residue remains, use a suitable grout haze remover or cleaner.
  2. Flush surface with clean water before and after cleaning.

### **3.7 PROTECTION**

- A. Close to traffic areas where tile is being set and other tile work being done:
  1. Keep closed until tile is firmly set.
  2. Before, during, and after grouting, keep area clean, dry, and free from foreign materials and airflow that will interfere with setting and curing of grout.
- B. Newly tiled floors shall not be walked on nor worked on without using kneeling boards or equivalent protection of tiled surface.
- C. After cleaning, provide protective covering and maintain conditions protecting tile work from damage and deterioration:
  1. Where tiled surfaces will be subject to equipment or wheel traffic or heavy construction traffic, cover protective covering with **1/4 inch** hardboard, plywood, or similar material.

**END OF SECTION**

**SECTION 09 5116****ACOUSTICAL TILE CEILINGS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install acoustical tile on backerboard as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 09 2226: 'Metal Suspension System' for Gypsum Board.
  - 2. Section 09 2900: 'Gypsum Board'.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. The Ceilings & Interior Systems Construction Association (CISCA), 405 Illinois Avenue, 2B, St Charles IL. [www.cisca.org](http://www.cisca.org).
    - a. *'Ceiling Systems Handbook'*: Recommendations for direct hung acoustical tile installation.
    - b. *'Production Guide'*: Practical reference for ceiling systems and estimating costs.
- B. Definitions:
  - 1. Acoustical Tile: Prefinished material with various surface finishes installed in concealed suspension system or adhered to ceiling surface to provide improved sound absorption qualities.
  - 2. Acoustical Cement/Adhesive: Special type of adhesive or mastic used to stick up or adhere **12 inch x 12 inch** acoustical tile to concrete or gypsum board.
  - 3. Absorption: Materials that have capacity to absorb sound. Absorption is the opposite of reflection.
  - 4. Bevel Edge: Acoustical tile is considered bevel edge when face of tile camfered at approximately 45 degree for **1/8 inch** to **1/4 inch** around the perimeter of tile.
  - 5. Ceiling Attenuation Class (CAC): Rates ceiling's efficiency as barrier to airborne sound transmission between adjacent closed offices. Shown as minimum value, previously expressed as CSTC (Ceiling Sound Transmission Class). Single-figure rating derived from normalized ceiling attenuation values in accordance with classification ASTM E413, except that resultant rating shall be designated ceiling attenuation class. (Defined in ASTM E1414.) Acoustical unit with high CAC may have low NRC.
  - 6. Center Line: Line indicating midpoint of surface in either direction. Used as guide in starting ceiling.
  - 7. Class A: Fire classification for product with flame spread rating of no more than 25 and smoke developed rating not exceeding 50, when tested in accordance with ASTM E84 or UL 723.
  - 8. Flame Spread: The propagation of flame over a surface.
  - 9. Flame Spread Index: Comparative measure, expressed as a dimensionless number, derived from visual measurements of the spread of flame versus time for a material tested in accordance with ASTM E84 or UL 723.
  - 10. Interior Finish: Interior finish includes interior wall and ceiling finish and interior floor finish.
  - 11. Kerf: Slit cut into midpoint of edge of tiles.
  - 12. Light Reflectance (LR): Percentage of light a surface reflected by ceiling surface expressed in decimal form.
  - 13. Mineral Base: Ceilings composed principally of mineral materials such as fibers manufactured from rock or slab, with or without binders.
  - 14. Noise Reduction Coefficient (NRC): Average sound absorption coefficient measured at four frequencies: 250, 500, 1,000 and 2,000 Hertz expressed to the nearest integral multiple of 0.05. Rates ability of ceiling or wall panel or other construction to absorb sound. NRC is fraction of



- sound energy, averaged over all angles of direction and from low to high sound frequencies that is absorbed and not reflected.
15. Smoke-Developed Index: Comparative measure, expressed as a dimensionless number, derived from visual measurements of smoke obscuration versus time for a material tested in accordance with ASTM E84 or UL 723.
  16. Sound Absorption: Property possessed by materials and objects, including air, of converting sound energy into heat energy. Sound wave reflected by surface always loses part of its energy. Fraction of energy that is not reflected is called sound absorption coefficient of reflecting surface. For instance, if material reflects 80 percent of sound energy, then sound absorption coefficient would be 20 percent (0.20).
  17. Surface Burning Characteristic: Rating of interior and surface finish material providing indexes for flame spread and smoke developed, based on testing conducted according to ASTM Standard E84 or UL 723.
  18. Textured Pattern: Granular or raised (fine, coarse, or a blend), felted or matted surface as an integral part of the basic product or superimposed on the product surface.
  19. Tile: Acoustical ceiling board, usually **12 inch x 12 inch**, which is stapled, cemented, or suspended by concealed grid system. Edges are often kerfed and cut back.
- C. Reference Standards:
1. American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE):
    - a. ASHRAE Standard 62.1-2013, 'Ventilation for Acceptable Indoor Air Quality'.
  2. ASTM International;
    - a. ASTM D1779-98(2011), 'Standard Specification for Adhesive for Acoustical Materials'.
    - b. ASTM E84-15, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
    - c. ASTM E795-05(2012), 'Standard Practices for Mounting Test Specimens During Sound Absorption Tests'.
    - d. ASTM E1264-14, 'Standard Classification for Acoustical Ceiling Products'.
    - e. ASTM E1414/E1414-11a, 'Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum'.
    - f. ASTM E1477 - 98a(2013), 'Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers'.
  3. International Building Code (IBC) (2009 and 2012 Edition):
    - a. Chapter 8, 'Interior Finishes':
      - 1) Section 803, 'Wall And Ceiling Finishes':
        - a) 803.1.1, 'Interior Wall and Ceiling Finish Materials'.
        - b) 803.1.2, 'Room Corner Test for Interior Wall or Ceiling Finish Materials'.
  4. National Fire Protection Association:
    - a. NFPA 101: 'Life Safety Code' (2015 Edition).
    - b. NFPA 265: 'Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile Coverings on Full Height Panels and Walls' (2015 Edition).
  5. Underwriters Laboratories Inc.:
    - a. UL 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials' (Tenth Edition).

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
1. Participate in pre-installation conference specified in Section 09 2900 to review finish requirements for gypsum wallboard ceilings.
  2. Schedule acoustical tile ceiling pre-installation conference after installation of gypsum wallboard but before beginning installation of tile.
  3. In addition to items specified in Section 01 3100, review following:
    - a. Verify that tile comes from same dye lot and has same dye lot code.
    - b. Review requirements of acceptable and non acceptable tile.



## 1.4 SUBMITTALS

- A. Action Submittals:
  - 1. Samples:
    - a. One (1) sample of each variant of specified tile series.
- B. Informational Submittals:
  - 1. Certificates:
    - a. Installer(s):
      - 1) Provide each Installer's 'Certificate of Completion - LDS Duratile' from Manufacture showing Name and completion date with bid to be included in closing documents for project.
        - a) Certificate is valid for two (2) years from date printed on Certificate before recertification is required.
  - 2. Test And Evaluation Reports:
    - a. If requested by Owner, provide copies of Quality Assurance requirements for 'Class A' flame spread rating and 'Room-Corner Test'.
  - 3. Manufacturer Installations:
    - a. Published installation recommendations.
  - 4. Qualification Statement:
    - a. Installer(s):
      - 1) Provide Qualification documentation unless waived by Owner.
- C. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Warranty Documentation:
      - 1) Include final, executed copy of warranty.
    - b. Record Documentation:
      - 1) Manufacturers Documentation:
        - a) Manufacturer's literature on tile and adhesive.
        - b) Color and pattern selection.
      - 2) Installer(s) 'Certificate of Completion - LDS Duratile' submitted at time of bid.
- D. Maintenance Material Submittals:
  - 1. Extra Stock Materials:
    - a. Provide Owner with six (6) cartons of each type of tile with same dye lot code.

## 1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
  - 1. Fire-Test-Response Characteristics: As determined by testing identical ceiling tile applied with identical adhesives to substrates according to test method indicated below by qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    - a. Surface-Burning Characteristics:
      - 1) Ceiling tile shall have Class A flame spread rating in accordance with ASTM E84 or UL 723 Type 1.
        - a) Class A (Flame spread index 0-25; Smoke-developed index 0-450).
        - b) Flash point: None.
  - 2. Passage of 'Room-Corner Test' as recognized by AHJ, is required for system. Adhesive cited in test literature is required for installation of ceiling tile on Project.
    - a. Room Corner Tests:
      - 1) ASTM E84, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
      - 2) IBC 803.2.1, 'Room Corner Test for Interior Wall or Ceiling Finish Materials'.
      - 3) NFPA 265: 'Room Corner Test for Interior Wall or Ceiling Finish Materials'.
      - 4) UL 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'.

**B. Qualifications:**

1. Installer: Requirements of Section 01 4301 applies, but not limited to following:
  - a. Minimum five (5) years satisfactorily completed projects of comparable quality, similar size, and complexity including a minimum of three (3) years of experience in glue-up ceiling tile installations, and shall have satisfactorily completed glue-up installation(s) within in past three (3) years before bidding.
  - b. Review, understand, and comply Installer Qualifications and submitted 'DuraTile' published installation recommendations provided by Manufacturer:
    - 1) Contact Armstrong CSA customer service center at (800) 442-4212 to obtain and review compliance package on DuraTile prior to bidding.
    - 2) This requirement may be waived by Owner, if Installer has previously complied with Installer Qualification requirements and can document at least two (2) satisfactorily completed projects of comparable size using Armstrong 12 inch x 12 inch (300 mm x 300 mm) ceiling tile for glue-up within past three (3) years prior to bidding.
    - 3) Installer shall note complete compliance with Qualification requirements on submitted bid form.
    - 4) Submit qualification documentation unless waived by Owner.
  - c. Agree to complete and pass 'LDS Duratile Personal Learning Module' (Certificate required for all Installer(s) for Church projects). Certification valid for two (2) years:
    - 1) Go to <http://www.armstrong.com/commceilingsna/#>.
    - 2) Click on My Armstrong Upper Right hand Corner.
    - 3) First time users: Click on 'Register' button and provide all appropriate information for username and password (you must register as a contractor to have access to 'ELearning System').
    - 4) Under My Armstrong Functions (left hand side), click on 'ELearning System'.
    - 5) Click on 'LDS Duratile Video'.
    - 6) Watch video and take Quiz (10 questions). Passing grade required for certificate.
    - 7) Print Certificate.
    - 8) Certificate must be submitted with Bid.
    - 9) Submit 'Certificate of Completion LDS - Duratile'. Required for all projects and may not be waived by Owner.

**1.6 DELIVERY, STORAGE, AND HANDLING****A. Delivery and Acceptance Requirements:**

1. Materials shall be delivered in original, unopened packages with labels intact.

**B. Storage And Handling Requirements:**

1. Store materials where protected from moisture, direct sunlight, surface contamination, and damage.
2. Store acoustic tile in cool, dry location, out of direct sunlight and weather, and at temperatures between **32 deg F** and **86 deg F**
3. Store adhesive on site at installation temperature, between **65 and 90 deg F**, for one week before installation.
4. Handle acoustical ceiling tiles carefully to avoid chipping edges or damage. Use no soiled, scratched, or broken material in the Work.

**1.7 FIELD CONDITIONS****A. Ambient Conditions:**

1. Building shall be enclosed, mechanical system operating with proper filters in place, and temperature and humidity conditions stabilized within limits under which Project will operate before, during, and after installation until Substantial Completion.
2. Temperature at time of setting tile shall be **50 deg F** minimum and **100 deg F** maximum.

## 1.8 WARRANTY

### A. Manufacturer Warranty:

1. Provide Manufacturer's ten (10) year limited system warranty for the following:
  - a. Manufacturer's warranty to be free from defects in materials and factory workmanship.
  - b. Manufacturer's warranty against sagging and warping.
  - c. Manufacturer's warranty against mold/mildew, and bacterial growth.

## PART 2 - PRODUCTS

### 2.1 SYSTEM

#### A. Manufacturers:

##### 1. Manufacturer Contact List:

- a. Armstrong World Industries, Strategic Accounts, Lancaster, PA [www.ceilings.com](http://www.ceilings.com).
  - 1) For pricing and ordering of tile, contact Sherry Brunt, Phyllis Miller, or Beth Rinehart at (800) 442-4212, or [Armstrongcsa@armstrong.com](mailto:Armstrongcsa@armstrong.com).
  - 2) For Strategic Account information, contact Deborah Pickens at (480) 695-9053 [dlpickens@armstrong.com](mailto:dlpickens@armstrong.com).
- b. Franklin International, Inc., Columbus, OH [www.titebond.com](http://www.titebond.com).

#### B. Materials:

##### 1. Description:

- a. Size: **3/4 inch** thick minimum by **12 inches** square.
- b. Color: White.
- c. Grid Face: Tile glue-up.
- d. Surface Finish: Factory-applied.
- e. Wet-formed high density mineral fiber.

##### 2. Design Criteria:

- a. Meet requirements of ASTM E1264, Type III (mineral base with painted finish), Form 2 (water felted), Pattern CE (perforated, small holes – lightly textured), Fire Class A.
- b. Acoustics:
  - 1) Noise Reduction Coefficient (Rating expressed according to ASTM E1284 requirements:
    - a) NRC rating: 60 minimum.
  - 2) CAC rating: 35 minimum.
- c. Anti Mold / Mildew:
  - 1) Resistance against growth of mold/mildew.
- d. Durable:
  - 1) Impact-resistant.
  - 2) Scratch-resistant.
- e. Tongue and Groove.
- f. Finish:
  - 1) Abuse-resistant/durable, factory applied vinyl latex paint.
- g. Fire Performance:
  - 1) Panels meet ASTM E84 or UL 723 Type 1 surface burning characteristics.
- h. High Recycled Content (HRC): Classified as containing greater than 50 percent total recycled content.
- i. Light Reflectance (LR): 0.86 Average (Range of 0.84 to 0.88).
- j. Sag Resistance:
  - 1) Resistance to sagging in high humidity conditions up to, but not including, standing water and outdoor applications.
- k. Texture: Embossed texture with fine fissuring and small perforations with natural variation in texture and color appearance between tile.
- l. VOC Emissions:
  - 1) Low formaldehyde: Contributing less than 13.5 ppb in typical conditions per ASHRAE Standard 62, 'Ventilation for Acceptable Indoor Air Quality'.

3. Acoustic Tile:
  - a. Category Three National Account Approved Product. See Section 01 6200 for definitions of Categories:
    - 1) DuraTile Item No. MN80377 by Armstrong.
- C. Accessories:
  1. Adhesive:
    - a. Description:
      - 1) For use on acoustical ceiling tiles.
    - b. Design Criteria:
      - 1) Meet requirements of ASTM D1779.
      - 2) Meet NFPA Class A fire rating when tested in accordance with ASTM E84.
      - 3) Fast grab and 'no sag' installation.
      - 4) Water cleanup.
      - 5) Not recommended for use on tiles larger than 12 inch x 12 inch.
    - c. Type Two Acceptable Products:
      - 1) Titebond No. 2704 Solvent Free Acoustical Ceiling Tile Adhesive by Franklin International.
      - 2) Highest quality of adhesive from manufacturer recommended by Tile Manufacturer as approved by Architect before use. See Section 01 6200.
  2. Edge Molding:
    - a. Steel 'U' molding with baked enamel finish.
    - b. Type Two Acceptable Products:
      - 1) 7843 Series by Armstrong.
      - 2) Equal as approved by Architect before installation. See Section 01 6200.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification Of Conditions:
  1. Inspect for defects in backing and support that are not acceptable.
    - a. Examine areas around HVAC diffusers and light fixtures for tile installation problems.
    - b. Examine ceiling for levelness. CISC A 'Code of Practice' requires ceiling to be free of irregularities and be level to within 1/4 inch (6 mm) in 12 foot (305 mm).
    - c. Examine substrate for any problems that will compromise adhesion of ceiling tile.
  2. Notify Architect in writing of unacceptable conditions.
  3. Do not apply ceiling tile until defects in backing and support are corrected.

### 3.2 PREPARATION

- A. Surface Preparation:
  1. Follow Manufacturer recommendations for surface preparation:
    - a. Substrate must be clean, free of grease and dirt, sound, smooth, even and level before applying tile to surface.
      - 1) Do not install new ceiling tile over old glue globs or bad substrate with any surface finish that is incompatible with tile adhesive.
    - b. Painted Surfaces: Avoid applying tile to newly painted ceiling.
    - c. Materials shall be dry and clean at time of application.

### 3.3 INSTALLATION

- A. Special Techniques:
  1. Installation shall be in accordance with Manufacturer's recommendations:
    - a. Do not install tile when room temperature exceeds or below recommended ambient conditions.
    - b. Tile is directional tile and must be installed in same direction of pattern running parallel to long dimension of each room.
    - c. Remove loose dust from back of tile and ceiling where adhesive is to be applied.

- d. Prime **3 inch** minimum circle near each corner by buttering very thin coat of adhesive.
  - e. Apply daub of adhesive to each corner. Daubs will be of sufficient size to form a circle **2-1/2 to 3 inches** in diameter and **1/8 to 1/4 inch** thick when tile is pressed firmly in place. Do not apply daubs so far in advance of installation that adhesive skins over.
  - f. Do not bend tile during installation.
2. Tile Layout:
    - a. Lay out tile symmetrically about center lines of room.
    - b. Lay out so tiles at room perimeters are at least 1/2 full tile size.
    - c. Leave tile in true plane with straight, even joints.
    - d. Tile joints shall be straight and in alignment, and exposed surface flush and level.
    - e. Furnish and install specified molding wherever tile has exposed edges or abuts walls, columns, and other vertical surfaces, except at curves of **3 inch** radius or smaller.
    - f. Cut around penetrations that are not to receive moldings cleanly with sharp knife and at a slight angle away from cutout.
  3. Ceiling mounted items:
    - a. Locate light fixtures, speakers, and mechanical diffusers and grilles symmetrically in room and centered on tile centers or tile joints insofar as possible, unless shown otherwise.
    - b. Keep method of locating ceiling mounted items as consistent as possible throughout building.
    - c. Ceiling mounted item location method within each room shall always be consistent.

### 3.4 FIELD QUALITY CONTROL

- A. Non-Conforming Work:
  1. Acoustical Tile. The following have been identified by the Manufacturer as tile defects, should not be installed, and will be replaced at no charge to Owner. Manufacturer will replace any material that does not meet product specifications. Installer to call 1 (800) 442-4212 immediately to report any tile discrepancies:
    - a. Obvious Tile Defects:
      - 1) Gross surface defects or damage.
      - 2) Gross damage to edges and corners.
      - 3) Bevels without paint.
    - b. Size Measurement:
      - 1) Tiles measure **12 inches**, plus or minus **1/32 inch**, measured across center of two (2) parallel sides.
    - c. Squareness Measurement:
      - 1) Measure two (2) diagonals of an individual ceiling tile.
      - 2) Diagonal measurements need to be within **1/16 inch** of each other. No more than **1/16 inch** difference.
    - d. Warp:
      - 1) Tiles specification is plus or minus **0.050 inch** as measured in the center of tile.
  2. Installer:
    - a. Substrate preparation and installation of ceiling tile not following CISCA Code of Practice will be unacceptable and considered defective and subject to replacement at no cost to Owner.

### 3.5 ADJUSTING

- A. 'Touch-up' minor abraded surfaces.

### 3.6 CLEANING

- A. Remove from site debris connected with work of this Section.

**END OF SECTION**

**BLANK PAGE**

**SECTION 09 6513****RESILIENT BASE AND ACCESSORIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But Not Limited To:
  - 1. Resilient base as described in Contract Documents.
    - a. .

**1.2 REFERENCES**

- A. Definitions:
  - 1. Flame Spread: Propagation of flame over a surface.
  - 2. Flame Spread Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
  - 3. Resilient Wall Base Classification:
    - a. Type:
      - 1) TS: Rubber, vulcanized thermoset.
      - 2) TP: Rubber, thermoplastic.
      - 3) TV: Vinyl, thermoplastic.
    - b. Group:
      - 1) Group 1: Solid (homogeneous).
      - 2) Group 2: Layered (multiple layers).
    - c. Styles:
      - 1) Style A: Straight.
      - 2) Style B: Cove.
      - 3) Style C: Butt-to.
  - 4. Smoke-Developed Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
- B. Reference Standards:
  - 1. ASTM International:
    - a. ASTM E84-15a, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
    - b. ASTM F1861-08(2012), 'Standard Specification for Resilient Wall Base'.
  - 2. Underwriters Laboratories, Inc.:
    - a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (2010 - Tenth Edition).

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate completion of resilient base and accessories installation with other trades.
- B. Pre-Installation Conference:
  - 1. Participate in pre-installation conference as specified in Section 09 0503 and held jointly with Section 09 6813 and Section 09 6816 pre-installation conference.

**1.4 SUBMITTALS**

- A. Action Submittals:

1. Product Data:
  - a. Manufacturer's literature or cut sheet on base and adhesive.
  - b. Color selection.

## 1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
  1. Fire-Test-Response Characteristics:
    - 1) Surface-Burning Characteristics: Base shall have Class B flame spread rating in accordance with ASTM E84 or UL 723.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
  1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
  1. Store materials in dry space protected from weather at not less than 55 deg F or more than 85 deg F or as per Manufacturer's recommendation.
  2. Materials from containers which have been distorted, damaged or opened prior to installation will be rejected.

## 1.7 FIELD CONDITIONS

- A. Ambient Conditions:
  1. Store materials at not less than 70 deg F for at least twenty four (24) hours before installation.
  2. Do not apply in temperatures below 70 deg F.

## PART 2 - PRODUCTS

### 2.1 SYSTEMS

- A. Manufacturers:
  1. Manufacturers Contact List:
    - a. Burke Flooring, San Jose, CA [www.burkemercer.com](http://www.burkemercer.com).
    - b. Flexco Corporation, Tuscumbia, AL [www.marleyflexco.com](http://www.marleyflexco.com).
    - c. Johnsonite, Chagrin Falls, OH or Johnsonite (Canada), Waterloo, ON [www.johnsonite.com](http://www.johnsonite.com).
    - d. Roppe Corporation, Fostoria, OH [www.roppe.com](http://www.roppe.com).
    - e. VPI, Corporation, Sheboygan, WI [www.vpicorp.com](http://www.vpicorp.com).
- B. Materials:
  1. Wall Base:
    - a. General:
      - 1) Size:
        - a) Minimum body thickness: 1/8 inch by 4 inch Length: not less than normal Corners:
          - b) Use preformed, molded external corners for both inside and outside corners.
          - c) Butt joint interior corners.
          - d) Corners must meet same height and thickness requirements as wall base.
    - b. Design Criteria:
      - 1) Meet requirements of ASTM F1861, Type TP or TS, Group 1 (solid), Style B (cove).
      - 2) Free from objectionable odors, blisters, cracks, and other defects affecting appearance or serviceability of rubber, and not containing fabric.
      - 3) Style: Cove.
    - c. Colors:



- 1) Color pigments used shall be highly fade-resistant, insoluble in water, and resistant to light, alkali, and cleaning agents.
- 2) Colors as selected by Architect from Manufacturer's standard colors.
- d. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
  - 1) RubberMyte Wall Base by Burke.
  - 2) Base 2000 Wall Base by Flexco.
  - 3) Rubber Wall Base by Johnsonite.
  - 4) Rubber Wall Base by Roppe.
  - 5) Rubber Wall Base by VPI.
2. Adhesive:
  - a. Use products recommended by Manufacturer for conditions of use.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification Of Conditions:
  1. Inspect surfaces for conditions not suitable for installation. Surface to receive specified items shall be sound, clean, free from foreign matter, tightly nailed, and dry.
  2. Notify Architect of unsuitable conditions in writing:
    - a. Do not start work until defects are corrected.
  3. Commencement of Work by installer is considered acceptance of substrate.

### **3.2 PREPARATION**

- A. Surface Preparation:
  1. Remedy cracks and minor irregularities in substrate in accordance with Manufacturer's recommendations.

### **3.3 INSTALLATION**

- A. Base:
  1. Install in manner to produce smooth, even finished surfaces tightly jointed and accurately aligned.
  2. Fit specified items tightly. Use fillers where necessary. Fit neatly against projections, piping, electrical service outlets, etc.
  3. Secure specified items with specified adhesive. Cement substantially to vertical surfaces including rubber base to cabinet work base.
  4. Line up top and bottom lines of base throughout.
  5. Do not stretch base during installation.
  6. Roll until firm bond has been established. Leave level, free from buckles, cracks, and projecting edges.
  7. In wall runs longer than **12 inches**, install no lengths of base shorter than **12 inches** long.

### **3.4 FIELD QUALITY CONTROL**

- A. Non-Conforming Work:
  1. Replace damaged materials at no additional cost to Owner.
  2. Damaged materials are defined as having cuts, gouges, scrapes or tears, and not fully adhered.

### **3.5 ADJUSTING**

- A. Inspect and make necessary adjustments within one (1) month after mechanical heat or other heat has been supplied continuously in finished areas.

**3.6 CLEANING**

- A. General:
  - 1. Base:
    - a. Clean all exposed surfaces of base of adhesive spatter before it sets in accordance with Manufacturer's cleaning instructions.
    - b. Damp-mop surfaces to remove marks and soil.
  - 2. Adjacent Work:
    - a. Clean all exposed surfaces of adjoining areas of adhesive spatter before it sets.

**3.7 PROTECTION**

- A. Base:
  - 1. Cover material until Substantial Completion.
  - 2. Keep traffic away until adhesive has set.

**END OF SECTION**

**SECTION 09 6813****TILE CARPETING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But Is Not Limited To:
  - 1. Coordination, sequencing, and scheduling for installation of Owner-Furnished carpet tiles and carpet base used in entry vestibules using walk-off carpet tile as described in contract documents and including following:
    - a. Schedule Testing Agency testing of Alkalinity and Concrete Moisture of concrete slab before Pre-Installation Conference as specified in Section 09 0503 'Floor Substrate Preparation'.
    - b. Schedule Pre-Installation Conference held in conjunction with Section 09 6816.
    - c. Maintain Building Ambient Conditions including normal levels of humidity, lighting, heating, and air conditioning for acceptability for beginning floor preparation and carpet installation.
    - d. Protection of carpet after installation of carpeting as required.
- B. Products Furnished But Not Installed Under This Section:
  - 1. Carpet Tiles.
- C. Related Requirements:
  - 1. Section 01 1200: Owner will furnish and install carpet tiles and carpet base. This Section establishes quality of materials and installation for information of Contractor, Architect, and Owner's Representatives.
  - 2. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
  - 3. Section 03 3111: 'Cast-In-Place Structural Concrete' for provision of acceptable concrete substrate.
  - 4. Section 07 2616: 'Below-Grade Vapor Retarders' for Installation of vapor retarder.
  - 5. Section 09 0503: 'Flooring Substrate Preparation' for:
    - a. Floor substrate preparation.
    - b. Field Testing for Alkalinity and Concrete Moisture of concrete slab.
    - c. Pre-installation conference for Sections under 09 6000 heading 'Flooring'.
  - 6. Section 09 6513: 'Resilient Base And Accessories' for resilient base installed at Tile Carpeting.
  - 7. Section 09 6816: 'Sheet Carpeting' for:
    - a. Installation of Carpet Tile and Carpet Base:
    - b. Cleaning and Disposal requirements.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. American Concrete Institute, Farmington Hills, MI [www.concrete.org](http://www.concrete.org). Abstracts of ACI Periodicals and Publications.
    - a. ACI 302.2R-06, 'Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials' (August 15, 2006).
  - 2. NSF International:
    - a. NSF International, Ann Arbor, MI [www.nsf.org](http://www.nsf.org).
      - 1) NSF 140-2015, 'Sustainable Assessment for Carpet'.
  - 3. The Carpet and Rug Institute Inc. (CRI), Dalton, GA [www.carpet-rug.org](http://www.carpet-rug.org):
    - a. CRI Indoor Air Quality (IAQ):
      - 1) CRI Green Label Plus Certification.
- B. Definitions:
  - 1. Adhesive: Substance that dries to film capable of holding materials together by surface attachment.
  - 2. Antimicrobial: Chemical treatment added to carpet or reduce growth of common bacteria, fungi, yeast, mold and mildew.
  - 3. Appearance Retention: Ability of a fabric to retain its original aesthetics, color, and construction integrity.

4. Backing: Materials comprising back of carpet as opposed to carpet pile or face.
  - a. Tufted carpets: (1) Primary backing, woven or nonwoven fabric in which pile yarn is inserted by tufting needles. (2) Secondary backing, Fabric laminated to back of carpet to reinforce and increase dimensional stability.
  - b. Woven carpets: Backings are 'construction yarns' comprising chain warp, stuffer warp, and shot or fill, which are interwoven with face yarn during carpet fabric formation.
5. Backing Fabric: Fabric into which pile yarn is inserted, or reinforcing layer that is adhered to reverse side of fabric.
6. Bonding Agent (Backcoating): Application of latex or adhesive to back of carpet to anchor tufts usually followed immediately by addition of secondary backing material such as nonwoven polypropylene or poly-urethane attached cushion.
7. Carpet: Heavy fabric used to cover floor and made from variety of fibers.
8. Change In Surface Appearance: Cumulative change in surface appearance between unexposed and exposed specimens due to crushing, loss of tuft definition, and matting.
9. Colorfastness: Ability of fiber or carpet to retain color when exposed to (1) ultraviolet light, (2) crocking (wet or dry) and (3) atmospheric conditions.
10. Commercial Match: Matching of colors with acceptable tolerance, or with color variation that is barely detectable to naked eye.
11. Crockfastness: Resistance of transfer of colorant from surface of colored yarn or fabric to another surface, or to an adjacent area of same fabric, principally by rubbing.
12. Crushing: Collapsing of pile yarns, resulting in carpet matting and loss of resilience due to traffic.
13. Delamination: Form of deterioration of tufted carpet in which primary back and face yarns separate from secondary back.
14. Density: Amount of pile yarn per area of carpet or closeness of tufts. Higher density carpet improves resistance to crushing and matting.
15. Dimensional Stability: Ability of carpet to retain its size and shape once installed.
16. Face Weight: Total weight of face (above backing) yarns in carpet.
17. Fiber: Fundamental unit of carpet made from nylon, polyester, cotton, acrylics, wool, and recycled material.
18. Flammability: Procedures that have been developed for assessing flame resistance of carpets.
19. Foot Traffic Classification: Process that classifies areas of intended use and minimum carpeting texture appearance for particular areas of use established for each application based on level of expected foot traffic in specific areas. Classifications are Moderate, Heavy and Severe.
20. Fuzzing: Fluffy particles appear on carpet surfaces caused by fibers that loosen because of weak twist or snags.
21. Lightfastness: Degree of resistance of dyed textile materials to color destroying influence of sunlight.
22. Loss of Tuft Definition: Bursting, opening, and untwisting of pile yarn and/or decrimping of fibers in surface pile of pile yarn floor covering.
23. Matting: Loss of pile definition of a textile floor covering due to entanglement and compression of pile fibers.
24. Modification Ratio: Ratio between circumference of inner core of multi lobar fiber's cross section, and circumference of circle drawn around outer edges of fibers cross sections' outer lobes or tips.
25. Pile: Visible surface of carpet, consisting of yarn tufts in loop and/or cut configuration. Sometimes called face or nap.
26. Relative Humidity (RH) Testing: Testing of concrete slabs is defined as ratio of actual amount of water vapor present in volume of air at given temperature to maximum amount that air could hold at that temperature, expressed as percentage.
  - a. Relative Humidity test method covers quantitative determination of percent relative humidity in concrete slabs for field or laboratory tests.
  - b. Moisture test results indicate moisture condition of slab only at time of test.
27. Resilience: Ability of carpet to spring back to its original texture and thickness after being walked on or compressed weight of furniture.
28. Soil Resistance: Ability of carpet fiber to resist dry soil and maintain its original appearance after intermittent or restorative cleanings.
29. Soiling: Occurs when dirt particles build up in carpet fibers.
30. Stain Resistance: Ability of carpet fiber to resist absorption of stain and maintain its original appearance.
31. Texture: Visual and tactile surface characteristics of carpet pile, including such aesthetic and structural elements.

32. Tile: Carpet module usually **18 inch x 18 inch or 24 inch x 24 inch** in size. Extremely dense construction with heavy reinforced backing.
33. Tuft: Cluster of yarns drawn through fabric and projecting from surface in form of cut yarns or loops.
34. Tuft Bind: Force (usually measured in pounds) required to pull tuft from carpet backing.
35. Tufted Carpet: Carpet produced by tufting machine instead of loam.
36. Twist: Winding of yarn around itself. More twist improves carpet performance (especially in cut pile).
37. Woven Carpet: Carpet produced on a loom through weaving process by which lengthwise (warp) yarns and widthwise (weft or filling) yarns are interlaced to form fabric.
38. Woven: Interlacing strands of fiber into yarn forms woven carpet.
39. Yarn: Fibers that are twisted together to form a continuous strand.

C. Reference Standards:

1. American Association of Textile Chemists and Colorists (AATCC):
  - a. Test Method:
    - 1) AATCC 16.3-2014, 'Colorfastness to Light: Xenon-Arc'.
    - 2) AATCC 107-2013, 'Colorfastness to Water'.
    - 3) AATCC 134-2011, 'Electrostatic Propensity of Carpets'.
    - 4) AATCC 165- 2013, 'Colorfastness to Crocking: Textile Floor Coverings--Crockmeter Method'.
    - 5) AATCC 174-2011, 'Antimicrobial Activity Assessment of Carpets'.
    - 6) AATCC 175-2013, 'Stain Resistance: Pile Floor Coverings'.
2. ASTM International:
  - a. ASTM D1335-12, 'Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings'.
  - b. ASTM D2646-11, 'Standard Test Methods for Backing Fabric Characteristics of Pile Yarn Floor Coverings'.
  - c. ASTM D3676-13, 'Standard Specification for Rubber Cellular Cushion Used for Carpet or Rug Underlay'.
  - d. ASTM D3936-12, 'Standard Test Method for Resistance to Delamination of the Secondary Backing of Pile Yarn Floor Covering'.
  - e. ASTM D5116-10, 'Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products'.
  - f. ASTM D5252-15, 'Standard Practice for the Operation of the Hexapod Drum Tester'.
  - g. ASTM D5848-10e1, 'Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Coverings'.
  - h. ASTM D6962-12, 'Standard Practice for Operation of a Roller Chair Tester for Pile Yarn Floor Coverings'.
  - i. ASTM D7330-15, 'Standard Test Method for Assessment of Surface Appearance Change in Pile Floor Coverings Using Standard Reference Scales'.
  - j. ASTM E648-15, 'Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source'.
  - k. ASTM E662-15a, 'Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials'.
3. British Spill Test:
  - a. Test with protocol but not standardized test (Developed several years ago by West End Medical Association in Great Britain and since has been adopted by several U.S. Manufactures).
4. International Organization for Standardization (ISO).
  - a. ISO 2551:1981, 'Machine-made textile floor coverings - Determination of dimensional changes due to the effects of varied water and heat conditions'.
5. National Fire Protection Association (NFPA):
  - a. NFPA (Fire) 253, 'Standard Method of Test for Critical Radiant Flux of Floor Covering Systems using a Radiant Heat Energy Source' (2015 Edition).
6. The Carpet and Rug Institute (CRI):
  - a. CRI 104, 'Standard For Installation of Commercial Carpet' (Sept 2015).
  - b. CRI TM-101, 'Assessment of Carpet Surface Appearance Change using the CRI Reference Scales'.
  - c. CRI TM-102, 'School Carpet Minimum Average Specifications'.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate completion of flooring installation with other trades.
- B. Pre-Installation Conference:
  - 1. Participate in pre-installation conference as specified in Section 09 0503 and held jointly with Section 09 6816 pre-installation conference.
  - 2. Schedule pre-installation conference after Concrete Moisture testing and before installation of flooring system.
  - 3. Conference may be held at project site or other convenient site. Participants may also attend by video or audio conference if approved by Project Manager.
  - 4. Schedule conference after substrate preparation and ONE (1) week before installation of flooring system.
  - 5. In addition to agenda items specified in Section 01 3100 and Section 09 0503, review following:
    - a. Review Testing Agency testing report of Alkalinity and Concrete Moisture of concrete slab:
      - 1) Follow Testing Agency report regarding Alkalinity and Concrete Moisture of concrete slab as specified in Section 09 0503 'Floor Substrate Preparation'.
    - b. Review Owner's Representative schedule for furnishing and installation carpet.
    - c. Review Flooring Manufacturer's installation conditions verification procedure and requirements.
    - d. Review Building Ambient Conditions including normal levels of humidity, lighting, heating, and air conditioning for acceptability for beginning floor preparation and carpet installation.
    - e. Review cleaning and disposal requirements.
    - f. Review protection requirements of carpet after installation of carpeting.
- C. Scheduling:
  - 1. Testing Agency to provide testing for Alkalinity and Concrete Moisture of concrete slab as specified in Section 09 0503 'Floor Substrate Preparation'.
  - 2. Notify Flooring Installer when Building Ambient Conditions requirements are met before installation of flooring system.
  - 3. Notify Owner's Representative to coordinate installation of carpet.

**1.4 SUBMITTALS**

- A. Informational Submittals:
  - 1. Manufacturer Instructions:
    - a. Published installation instructions.
- B. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Warranty Documentation:
      - 1) Copy of Warranty.
    - b. Record Documentation:
      - 1) Owner will provide Project Carpet Request Documentation forms in both hard copy and digital format:
        - a) Carpet Request Information Sheet.
        - b) Carpet Vendor Quotation.
        - c) Carpet Preinstallation Meeting Agenda.
        - d) Carpet Installation Notice to Proceed or Cancel.
        - e) Carpet Inspection and Completion.
        - f) Carpet Overage Report and Completion.
        - g) Carpet Quotation Change Request.
      - 2) Owner to provide Testing Agency Testing Report of Alkalinity and Concrete Moisture testing for project.
- C. Maintenance Material Submittals:
  - 1. Extra Stock Materials:
    - a. Leave carpet tiles equivalent to 15 percent of number installed as attic stock.
    - b. Tie securely and wrap in protective cover.

## 1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
  - 1. All products provided will meet requirements of all federal, state, and local codes having jurisdiction.
  - 2. Label meeting Federal Labeling Requirements, as stated in Textile Products Identification Act under Federal Trade Commission, shall be attached to certification samples and products delivered.
- B. Qualifications: Section 01 4301 applies, but is not limited to following:
  - 1. Carpet Manufacturer Qualifications:
    - a. Not less than five (5) years of production experience, whose published literature clearly indicates general compliance of products with requirements of this section.
    - b. VMR Approved Carpet Manufacturers:
      - 1) Approval subject to VMR agreement process approval.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
  - 1. Deliver materials and accessories necessary for completion of carpet installation to site before beginning installation of carpet.
  - 2. Do not deliver materials before date scheduled for installation.
- B. Storage And Handling Requirements:
  - 1. Store carpet and related materials in a climate-controlled, dry space.
  - 2. Protect carpet from soil, dust, moisture and other contaminants.

## 1.7 FIELD CONDITIONS

- A. Ambient Conditions:
  - 1. Building Conditions:
    - a. Conditions inside building shall be brought to levels to be normal at occupancy of building. Conditions include normal levels of humidity, lighting, heating, and air conditioning.
      - 1) Carpet installation is not to begin until HVAC system is operational and following conditions are maintained for at least forty eight (48) hours before, during and seventy two (72) hours after completion:
        - a) Carpet is to be installed when indoor temperature is between 65° - 95° F with maximum relative humidity of 65%.
        - b) Substrate surface temperature should not be less than 65° F at time of installation.
        - c) Do not allow temperature of indoor carpeted areas to fall below 50° F, regardless of age of installation.
      - 2) Maintain fresh air ventilation after installation for seventy two (72) hours minimum or until lingering odors are gone.
  - 2. Concrete Slab:
    - a. General:
      - 1) Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have Alkalinity range and Concrete Moisture Vapor Emission Rate (MVER) as specified in Section 09 0503 'Floor Substrate Preparation'.
      - 2) Final determination as to whether or not concrete slab is dry enough for flooring installation should be based on evaluating both Alkalinity and Concrete Moisture Vapor Emission Rate (MVER) testing as specified in Section 09 0503 'Floor Substrate Preparation'.
    - b. Alkalinity:
      - 1) Do not install sheet carpeting if alkalinity of concrete surface exceeds pH level 9. Corrective procedures are required.
    - c. Concrete Moisture Vapor Emission Rate (MVER):
      - 1) Testing conditions inside building shall be brought to same ambient temperature and relative humidity levels to be normal at occupancy of building. Conditions include normal levels of humidity, lighting, heating, and air conditioning.

- 2) Follow requirements specified in Section 09 0503 'Floor Substrate Preparation' before installation of carpet.

## 1.8 WARRANTY

### A. Manufacturer Warranty:

1. Provide Carpet Manufacturer's standard Warranty which includes following:
  - a. Warranty shall cover defects in installation, workmanship, and installation materials.
  - b. Warranty includes specific workmanship warranties for delamination, edge raveling, fuzzing, pilling, and other textural changes which can be controlled through proper manufacturing (no fraying, zippering, delamination, edge raveling, fuzzing, pilling in carpet is acceptable for any reason).
  - c. Warranty terms will include inspection of defective area within fifteen (15) days of receipt of written notice from Owner and completion of corrective work within forty five (45) days, unless other arrangements are made in writing with Owner on case-by-case basis.
  - d. If carpet defect or installation defect continues to appear after two (2) separate notices for correction from Owner, replace carpet where defects have occurred.
  - e. If Carpet Manufacturer follows installation requirements of Section 09 0503 'Floor Substrate Preparation' Carpet Manufacture accepts liability of carpet installation for said given time as outlined in Special Warranty regardless of any climate or condition changes affecting RH levels of floor substrate.
2. Special Warranty:
  - a. Modular Carpeting:
    - 1) General:
      - a) Appearance Retention to be provided with Special Warranty requirements if not already included in Standard Warranty.
    - 2) Meetinghouse, Mission Office, S&I Module, and O&M / R&I:
      - a) Owner Carpet Program Product: Provide fifteen (15) year minimum or Carpet Manufacturer's better Warranty on carpet system.

## PART 2 - PRODUCTS

### 2.1 OWNER-FURNISHED PRODUCTS

- ### A. Category One VMR Manufacturers. See Section 01 6200 for definitions of Categories:
1. Lees, Division of Mohawk Carpets, Glasgow, VA:
    - a. Contact Information: Help Line (800) 523-5555 or (801) 397-5626.
  2. Mannington Commercial Carpets, Calhoun, GA:
    - a. Contact Information: Help Line Voice Mail (800) 241-2262, ext 8045 or Mannington Installation Services, email lds@mannington.com or (855) 466-2664.
  3. Tandus Flooring Inc., Dalton, GA [www.tandus.com](http://www.tandus.com).
    - a. Contact Information: Tracy Riddle - cell (801) 580-5147 fax (866) 861-7522 [www.triddle@tandus.com](mailto:www.triddle@tandus.com).
- ### B. Design Criteria:
1. General:
    - a. Commercial Match:
      - 1) Colors, texture and pile of any product selected as carpet standard or custom designed specifically for Owner needs to be consistent in appearance.
      - 2) When new carpet is installed next to existing carpet, two pieces need to be within tolerance acceptable as commercial match.
      - 3) Regardless of reason, if commercial match is not achievable, existing carpet needs to be replaced to acceptable breaking point approved by Owner's Representative.
      - 4) If changes in supply chains or unforeseen circumstances require standard pattern to be re-engineered, new carpet must be made close to original as possible.
      - 5) New product must be approved by Owner.
    - b. Compatibility:
      - 1) Materials supplied for carpet installation shall be complete package from specified Carpet Manufacturer. Do not mix items from material packages of different carpet Manufacturers.



- 2) Provide carpet, seam sealers, adhesives, and other related materials that are compatible with one another and with substrates under conditions of service and application.
    - c. Tested Products:
      - 1) New technology and products not allowed unless pre-approved by Owner.
  2. Carpet Material Requirements:
    - a. Carpet Backing:
      - 1) Modular - PVC Hardback or Cushion:
        - a) Manufacturer's preference that meets or exceeds specification and life cycle warranty expectation.
    - b. Cushion Thickness:
      - 1) Attached cushion thickness shall be 0.10 inch minimum when tested in accordance with ASTM D3676.
    - c. Fiber:
      - 1) Meetinghouse, Mission Office, and O&M / R&I:
        - a) Antron Lumina and/or Legacy only.
      - 2) S&I Module and O&M / R&I:
        - a) Institute:
          - (1) Antron Lumina and/or Legacy only.
        - b) Seminary:
          - (1) Antron Lumina and/or Legacy only.
        - c) Antron Lumina and/or Legacy only.
    - d. Life Expectancy (Modular Carpeting):
      - 1) Meetinghouse, Mission Office, and O&M / R&I: : twenty (20) years minimum.
      - 2) S&I and O&M / R&I:
        - a) Institute: fifteen (15) years minimum.
        - b) Seminary: twenty (20) years minimum.
    - e. Modification Ratio:
      - 1) Meetinghouse, Mission Office, and O&M / R&I: 1.5 or less.
      - 2) S&I Module and O&M / R&I:
        - a) Institute: 1.5 or less.
        - b) Seminary: 1.5 or less.
    - f. Pile Yarn Floor Construction:
      - 1) Meet standard for average pile yarn weight tested under ASTM D5848.
        - a) Carpet will retain eighty five (85) percent of these amounts at end of the warranty period.
  3. Carpet Physical Performance:
    - a. Appearance Retention Requirements:
      - 1) Foot Traffic Classification and Testing Requirements:
        - a) Heavy Traffic Criteria:
          - (1) Carpet is to be tested in accordance to ASTM D5252 with an Actionbac secondary backing meeting short term cycles (4000) grading scale of 3.0 and long term cycles (12000) grading scale of 3.0 with appearance retention measured according.
          - (2) Carpet needs to be able to maintain 3.0 rating for eighty five (85) percent of its warranty expected life cycle in accordance to ASTM D7330.
        - b) Severe Traffic Criteria:
          - (1) Carpet is to be tested in accordance to ASTM D5252 with an Actionbac secondary backing meeting short term cycles (4000) grading scale of 3.5 and long term cycles (12000) grading scale of 3.5 with appearance retention measured according.
          - (2) Carpet needs to be able to maintain 3.5 rating for eighty five (85) percent of its warranty expected life cycle in accordance to ASTM D7330.
      - 2) Severe Traffic:
        - a) Meetinghouse, Mission Office, and O&M / R&I.
        - b) S&I Module and O&M / R&I.
    - b. British Spill Test:
      - 1) Carpet must past British Spill Test (formally known as the National Health Service Patient Area Requirement for the United Kingdom, Method E: Part 2):

- a) Test involves controlled spilling of blue dyed liquid from 1-meter (39 inches) height onto carpet product.
- b) Spill is allowed to stand for period of twenty four (24) hours, after which cuts are made through carpet in area of spill to establish whether there was penetration into or through carpet composite.
- c. Colorfastness:
  - 1) Colorfastness to Crocking: AATCC 165:
    - a) Color transfer Class 4 minimum, wet and dry, when tested as specified.
  - 2) Colorfastness to Light: AATCC 16.3:
    - a) Not less than 4 after 40 AFU (AATCC fading units). Colorfastness to Light, Xenon-Arc (60 AFU) (AATCC Fading Unit).
  - 3) Colorfastness to Water: AATCC 107:
    - a) Color transfer Class 4 minimum, AATCC Transference Scale (only yarn dyed carpets) (grade change in color and staining).
- d. Compression Resistance and Compression Set Attached Cushion:
  - 1) Minimum CLD of 7 lb per cu in at 25 percent deflection, and maximum compression set of 10 percent after 50 percent constant compression when tested in accordance with ASTM D3676 with modification to allow recovery at 158 deg F instead of room temperature for thirty (30) minutes.
- e. Critical Radiant Flux (CRF):
  - 1) Meet requirements of ASTM E648 Standard Test Method - Minimum Class 1 Critical Radiant Flux (CRF) of 0.45 watts/cm<sup>2</sup> or greater when tested in accordance with flooring radiant panel test using ASTM E648 Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source as the test method.
- f. Delamination:
  - 1) Resistance to Delamination (Actionbac secondary backing): Not less than 3.5 lbf/in (15 N/mm) when tested in accordance with ASTM D3936.
  - 2) Resistance to Delamination (Attached Cushion): Not less than 15,000 cycles when tested in accordance with ASTM D6963.
- g. Dimensional Stability:
  - 1) 0.2 percent or less when tested in accordance with ISO 2551, 'Dimensional Stability (Aachen Test)'.
- h. Dry Breaking Strength:
  - 1) Not less than 100 lbs (445 N) when tested in accordance with ASTM D2646.
- i. Electrostatic Propensity of Carpets:
  - 1) Electrostatic shock propensity with maximum 3.5 kV when tested in accordance with AATCC 134, 'Step Method'.
- j. Flammability and Smoke Resistant:
  - 1) Smoke Density:
    - a) Smoke density generated from carpet and backing must not exceed 450 when tested in the flaming mode using ASTM E662, 'Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials'.
    - or
    - b) ASTM E662, 'Standard Research Test Method for Determining Smoke Generation of Solid Materials as test methods'.
- k. Indoor Air Quality (IAQ):
  - 1) CRI Test Program ASTM D5116.
  - 2) Method for determination of VOC emitted from carpet using specific sorbent tube and thermal desorption/gas chromatography as per ASTM 7339.
  - 3) Carpet, adhesives, and seam sealers shall be VOC compliant as certified with CRI Indoor Air Quality Carpet Testing Program Green Label Plus or tested for compliance to meet the CRI IAQ Carpet Testing Program requirements and criteria as per ASTM D5116 CRI Test Program.
- l. Soil Resist Treatment:
  - 1) Minimum average of 350 ppm fluorine on the pile fiber when 3 separate tests are conducted in accordance with CRI TM-102 test method.
  - 2) Installed carpet shall exhibit stain resisting ability equal to or exceeding that of any other premium carpet available at time of manufacture allowing removal of most foreign substances using generally accepted cleaning procedures and more aggressive

cleaning procedures for stubborn stains without leaving any more visible stain and/or change in color than the most stain resistant premium carpet available at time of manufacture.

- m. Stain Resistance:
    - 1) Minimum stain resistance rating of 8 when tested in accordance with AATCC 175, 'Stain Resistance: Pile Floor Coverings.
  - n. Tuff Bind (dry):
    - 1) Not less than 10 lbs (45 N) when tested in accordance with ASTM D1335.
- C. Materials:
- 1. Carpet Tiles (walk-off) Vestibules only:
    - a. Carpet OPTION A or B (based on moisture testing specified in Section 09 0503):
      - 2) Size: **18 inch or 24 inch** square, at Manufacturer's option. Trim: Provide trim around unrestrained edges of carpet tiles.
      - 3) Category Four Approved Manufacturer and Color / Patterns. See Section 01 6200 for definitions of Categories:
        - a) StepUp Modular DD762 by Lees Commercial Carpets.
          - (1) Color: 508 Mineral.
        - b) LDS Entry Guard by Mannington Commercial.
          - (1) Color: Black.
    - b. Carpet OPTION C (based on moisture testing specified in Section 09 0503):
      - 1) Carpet Tiles are not approved. Use following carpeting specified in Section 09 6816, 'Sheet Carpeting'.
      - 2) Category Four Approved Manufacturer and Color / Patterns. See Section 01 6200 for definitions of Categories:
        - a) Garnet 4 Scheme: Tandus (formally CNA), 04346 Ensign, color Garnet 81072.
        - b) Garnet 5 Scheme: Tandus (formally CNA), 04346 Ensign, color Garnet 81072.
        - c) Sapphire 4 Scheme: Tandus (formally CNA), Style 04346 Ensign, color Sapphire 86608.
        - d) Sapphire 5 Scheme: Tandus (formally CNA), Style 04346 Ensign, color Sapphire 86608.
  - 2. Carpet Base (entry vestibules using walk-off carpet tile):
    - a. **4-1/2 inch** wide base without cushion backing. Top edge of base serged with **1-1/4 inch** polyester binding fabric. Roll edges of binding fabric under and sew along top edge of carpet cove base.
    - b. Carpet OPTION A or B (based on moisture testing specified in Section 09 0503):
      - 1) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
        - a) Manufacturer: Bigelow Commercial:
          - (1) Style Name: Spectrum V 30.
          - (2) Color: 7234 Ebony Domino.
          - (3) Provided by:
            - (a) Lees Commercial Carpets.
            - (b) Mannington Commercial Carpets.
    - c. Carpet OPTION C (based on moisture testing specified in Section 09 0503):
      - 1) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
        - a) Garnet 4 Scheme: Tandus (formally CNA), 04346 Ensign, color Garnet 81072.
        - b) Garnet 5 Scheme: Tandus (formally CNA), 04346 Ensign, color Garnet 81072.
        - c) Sapphire 4 Scheme: Tandus (formally CNA), Style 04346 Ensign, color Sapphire 86608.
        - d) Sapphire 5 Scheme: Tandus (formally CNA), Style 04346 Ensign, color Sapphire 86608.

## 2.2 SOURCE QUALITY CONTROL

- A. Tests:
  - 1. Carpet:
    - a. Appearance Retention Rating:
      - 1) Hexapod Test Method: ASTM D5252.
      - 2) Grading: ASTM D7330.
    - b. Antimicrobial Activity: AATCC 174.

- c. British Spill Test: Test Protocol.
  - d. Colorfastness:
    - 1) Crocking: AATCC 165.
    - 2) Light: AATCC 16.3.
    - 3) Water: AATCC 107.
  - e. Delamination: ASTM D3936 and ASTM D6962.
  - f. Dimensional Stability: ISO 2551.
  - g. Dry Breaking Strength: ASTM 2646.
  - h. Electrostatic Propensity of Carpets: AATCC 134.
  - i. Flame and Smoke Resistant. Provide carpet complying with ratings as indicated for following:
    - 1) Flooring Radiant Panel Test (Critical Radiant Flux), ASTM E648, NFPA 253.
    - 2) Smoke Density Test: ASTM E662.
  - j. Indoor Air Quality:
    - 1) ASTM 7339.
    - 2) Indoor Air Quality: CRI Test Program ASTM D5116.
  - k. Pile Yarn Weight: ASTM D5848.
  - l. Soil Resist Treatment: CRI TM-102.
  - m. Stain Resistance: AATCC 175.
  - n. Turf Bind: ASTM D1335.
2. Attached Backing:
- a. Carpet Backing: ASTM D3676.
  - b. Compression Resistance (constant deflection): ASTM D3676.
  - c. Compression Set (constant force): ASTM D3676.
  - d. Cushion Density: ASTM D3676.
  - e. Cushion Thickness: ASTM D3676.

### **PART 3 - EXECUTION**

#### **3.1 APPROVED INSTALLER**

- A. Same Installer of Section 09 6816: 'Sheet Carpeting' shall install Section 09 6813: 'Tile Carpeting'.

#### **3.2 EXAMINATION**

- A. Verification Of Conditions:
- 1. Verify concrete moisture content is within acceptable levels before beginning installation.
- B. Evaluation And Assessment:
- 1. Concrete Slab:
    - a. Variation In Grade: Plus or minus **1/8 inch** in any **10 foot** of floor slab and distance between high point and low point of slab of **1/2 inch**.
    - b. Testing Procedure: Place ends of straightedge on **3/8 inch** high shims. Floor is satisfactory if **1/4 inch** diameter steel rod rolled under straightedge will not touch anywhere along **10 foot** length and **1/2 inch** diameter steel rod will not fit under straightedge anywhere along **10 foot** length.
    - c. Notify Facilities Manager in writing if floor surface is not acceptable to install carpet. Do not lay carpet over unsuitable surface. Commencing installation constitutes acceptance of floor and approval of existing conditions.

#### **3.3 PREPARATION**

- A. Flooring Preparation:
- 1. Prepare floor substrate in accordance with Carpet And Rug Institute (CRI) best practices to receive carpet installation and to provide installation that meets Carpet Manufacturer's warranty requirements:
    - a. Concrete floor slab patching:
      - 1) Cracks, chips and joints must be properly patched or repaired.
    - b. Concrete surface cured, clean, dry, and free of foreign substances that will compromise carpet and/or other flooring installations.

- 1) Removal of curing compounds.
  - 2) Remove paint, sealer, grease, oil, silicone sealants, and other materials incompatible with flooring adhesives.
  - 3) Removal of overspray from painted walls (essential so glue will stick).
2. Moisture vapor emission tests and alkalinity test of concrete slab has been preformed.
  3. Vacuum and damp mop floor areas to receive flooring before flooring installation.

B. Carpet Accessories:

1. Sundry items, such as adhesives, shall be conditioned to building ambient conditions before use.

### 3.4 INSTALLATION

A. Carpet:

1. General:
  - a. Install carpet and carpet base in accordance with CRI Carpet Installation Standard and manufacturer's written instructions supplied with product.
  - b. Install carpet under edge of metal thresholds where possible. Use specified carpet accessories at exposed edges.

B. Carpet Base:

1. Precut base so seams occur only at inside corners.
2. Scribe base to floor.
3. Spread adhesive over back side of base up to bottom of serging on edge or apply three **3/16 inch** .minimum diameter beads of adhesive placed one inch apart on back of base with top bead placed **2 inch** down from serged edge of base and spread adhesive over back surface of base up to bottom edge of serging.
  - a. Bird's mouth finish should only be required when door frame is flush with wall.
  - b. If bird's mouth is required, terminate at door frames or vertical trim with 45 degree angle, bird mouth cut so serged edge turns down to contact frame or trim.
4. Do not allow adhesive beyond edge of base. Remove excess adhesive.
5. Do not use staples, nails, screws or other mechanical fasteners.
6. Set carpet base on brick walls at height either above or below horizontal mortar joint line.

### 3.5 FIELD QUALITY CONTROL

A. Field Tests:

1. See Section 09 0503.02-FM 'Flooring Substrate Preparation' for Field Testing for Alkalinity and Concrete Moisture of concrete slab.

B. Field Inspections:

1. Unacceptable carpet after installation shall include but not be limited to:
  - a. Delaminating carpet from backings.
  - b. Fiber loss less than specified.
  - c. Edge raveling.
  - d. Fuzzing of carpet fibers.
  - e. Pilling of carpet fibers.
  - f. Appearance retention less than control samples attached to Agreement.
  - g. Dye bleeding.
  - h. Zippering fibers in carpet.
  - i. Color streaking.
  - j. Irregular tufts of fiber.
2. Unacceptable workmanship shall include but not be limited to:
  - a. Improper floor preparation before installation.
  - b. Failure of adhesive to completely adhere carpet to floor resulting in bubbles, ridges, or ripples where carpet has separated from floor.
  - c. Failure to properly install carpet next to walls and door frames to eliminate gaps or puckering of carpet.
  - d. Use of unspecified carpet.

- e. Carpet base ends not finished to terminate at door frames or vertical trim shall have 45 degree angle 'birdsmouth' finish.
  - f. Adhesive exposed on carpet, on carpet base, beyond edges of carpet base, and on other surfaces of building.
  - g. Carpet base that is not scribed to fit against floor with no gaps.
  - h. Carpet base attached by means other than acceptable carpet base adhesive.
- C. Non-Conforming Work:
- 1. Basis of Acceptable Carpeting: Source Quality Control Testing:
    - a. Carpet products not meeting Design Criteria and Source Quality Control Testing of this specification will be considered unacceptable carpeting.
  - 2. Unacceptable Carpeting:
    - a. Unacceptable carpeting will be rejected and shall be repaired or replaced at no additional cost to Owner. Owner's Representative will determine reasonable location of acceptable transition points for removal of unacceptable carpet.

### 3.6 CLEANING

- A. General:
- 1. Carpet Installer's Responsibility:
    - a. Clean all exposed surfaces of adjoining areas of adhesive spatter before it sets.
    - b. Carpeting:
      - 1) Remove any soiling and/or staining from carpet.
      - 2) Remove excessive adhesive with manufacturer recommended adhesive removers.
- B. Damage to building:
- 1. Carpeting:
    - a. Carpet Installer's Responsibility:
      - 1) Clean and repair of all damaged surfaces to their original condition from carpet installation.
- C. Waste Management:
- 1. Carpet Installer's Responsibility:
    - a. All work areas are to be kept clean, clear and free of debris at all times.
    - b. Provide adequate waste receptacles and dispose of materials including all rubbish, wrapping paper, scraps, and trimmings from building and property in approved manner as specified in Section 01 7400 unless pre-arrangements have been made with Owner and estimated costs are included on estimate and Purchase Order (PO).

### 3.7 PROTECTION

- A. Protection of Carpeting:
- 1. Owner Representative's Responsibility:
    - a. No traffic of any kind on newly installed carpet for minimum of twenty four (24) hours after installation is completed.
    - b. No wheeled traffic of any kind placement of furniture or equipment on carpet for minimum of forty eight (48) hours after completion of carpet installation.
    - c. Protect carpet from abuse, vandalism, or damage occurring after installation is complete.
    - d. Protect carpet adequately from soil, dust, moisture and other contaminants after carpet installation.

**END OF SECTION**

**SECTION 09 6816****SHEET CARPETING: Back Cushion, Direct Glue****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But Is Not Limited To:
  - 1. Coordination, sequencing, and scheduling for installation of Owner-Furnished carpet, carpet base, carpet accessories, leveling compounds as described in Contract Documents and including following:
    - a. Testing of Alkalinity and Concrete Moisture of concrete slab as specified in Section 09 0503 'Floor Substrate Preparation'.
    - b. Pre-Installation Conference held in conjunction with Section 09 6813.
    - c. Maintain Building Ambient Conditions including normal levels of humidity, lighting, heating, and air conditioning for acceptability for beginning floor preparation and carpet installation.
    - d. Protection of carpet after installation of carpeting as required.
- B. Products Installed But Not Furnished Under This Section:
  - 1. Carpet Tile.
- C. Related Requirements:
  - 1. Section 01 1200: 'Multiple Contract Summary' for carpet and carpet base excluded from Contract and furnished and installed by Owner. This Section establishes quality of materials and installation for information of Contractor, Architect, and Owner's Representatives.
  - 2. Section 01 3100: 'Project Management and Control'.
  - 3. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
  - 4. Section 01 4301: 'Quality Assurance – Qualifications' for minimum qualification levels required.
  - 6. Section 01 7800: 'Closeout Submittal'. Section 03 3111: 'Cast-In-Place Structural Concrete' for provision of acceptable concrete substrate.
  - 7. Section 07 2616: 'Below-Grade Vapor Retarders' for Installation of vapor retarder.
  - 8. Section 09 0503: 'Flooring Substrate Preparation' for:
    - a. Floor substrate preparation.
    - b. Field Testing for Alkalinity and Concrete Moisture of concrete slab.
    - c. Pre-installation conference for Sections under 09 6000 heading 'Flooring'.
  - 9. Section 09 6513: 'Resilient Base And Accessories' for resilient base.
  - 10. Section 09 6813: 'Tile Carpeting' for:
    - a. Tile carpeting and carpet base used in entry vestibules using walk-off carpet tile.
- D. Association Publications:
  - 1. American Concrete Institute, Farmington Hills, MI [www.concrete.org](http://www.concrete.org). Abstracts of ACI Periodicals and Publications.
    - a. ACI 302.2R-06, *Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials* (August 15, 2006).
  - 2. NSF International:
    - a. NSF International, Ann Arbor, MI [www.nsf.org](http://www.nsf.org).
      - 1) NSF 140-2015, 'Sustainability Assessment for Carpet'.
  - 3. The Carpet and Rug Institute (CRI), Dalton, GA [www.carpet-rug.org](http://www.carpet-rug.org). Standard for Installation Specification of Commercial Carpet:
    - a. CRI Indoor Air Quality (IAQ):
      - 1) CRI Green Label Plus Certification.
- E. Definitions:
  - 1. Adhesive: Substance that dries to film capable of holding materials together by surface attachment.

2. Antimicrobial: Chemical treatment added to carpet or reduce growth of common bacteria, fungi, yeast, mold and mildew.
3. Appearance Retention: Ability of a fabric to retain its original aesthetics, color, and construction integrity.
4. Backing: Materials comprising back of carpet as opposed to carpet pile or face.
  - a. Tufted carpets: (1) Primary backing, woven or nonwoven fabric in which pile yarn is inserted by tufting needles. (2) Secondary backing, Fabric laminated to back of carpet to reinforce and increase dimensional stability.
  - b. Woven carpets: Backings are 'construction yarns' comprising chain warp, stuffer warp, and shot or fill, which are interwoven with face yarn during carpet fabric formation.
5. Backing Fabric: Fabric into which pile yarn is inserted, or reinforcing layer that is adhered to reverse side of fabric.
6. Bonding Agent (Backcoating): Application of latex or adhesive to back of carpet to anchor tufts usually followed immediately by addition of secondary backing material such as nonwoven polypropylene or poly-urethane attached cushion.
7. Carpet: Heavy fabric used to cover floor and made from variety of fibers.
8. Change In Surface Appearance: Cumulative change in surface appearance between unexposed and exposed specimens due to crushing, loss of tuft definition, and matting.
9. Colorfastness: Ability of fiber or carpet to retain color when exposed to (1) ultraviolet light, (2) crocking (wet or dry) and (3) atmospheric conditions.
10. Commercial Match: Matching of colors with acceptable tolerance, or with color variation that is barely detectable to naked eye.
11. Crockfastness: Resistance of transfer of colorant from surface of colored yarn or fabric to another surface, or to an adjacent area of same fabric, principally by rubbing.
12. Crushing: Collapsing of pile yarns, resulting in carpet matting and loss of resilience due to traffic.
13. Delamination: Form of deterioration of tufted carpet in which primary back and face yarns separate from secondary back.
14. Density: Amount of pile yarn per area of carpet or closeness of tufts. Higher density carpet improves resistance to crushing and matting.
15. Dimensional Stability: Ability of carpet to retain its size and shape once installed.
16. Face Weight: Total weight of face (above backing) yarns in carpet.
17. Fiber: Fundamental unit of carpet made from nylon, polyester, cotton, acrylics, wool, and recycled material.
18. Flammability: Procedures that have been developed for assessing flame resistance of carpets.
19. Foot Traffic Classification: Process that classifies areas of intended use and minimum carpeting texture appearance for particular areas of use established for each application based on level of expected foot traffic in specific areas. Classifications are Moderate, Heavy and Severe.
20. Fuzzing: Fluffy particles appear on carpet surfaces caused by fibers that loosen because of weak twist or snags.
21. Lightfastness: Degree of resistance of dyed textile materials to color destroying influence of sunlight.
22. Loss of Tuft Definition: Bursting, opening, and untwisting of pile yarn and/or decrimping of fibers in surface pile of pile yarn floor covering.
23. Matting: Loss of pile definition of a textile floor covering due to entanglement and compression of pile fibers.
24. Modification Ratio: Ratio between circumference of inner core of multi lobar fiber's cross section, and circumference of circle drawn around outer edges of fibers cross sections' outer lobes or tips.
25. Pile: Visible surface of carpet, consisting of yarn tufts in loop and/or cut configuration. Sometimes called face or nap.
26. Relative Humidity (RH) Testing: Testing of concrete slabs is defined as ratio of actual amount of water vapor present in volume of air at given temperature to maximum amount that air could hold at that temperature, expressed as percentage.
  - a. Relative Humidity test method covers quantitative determination of percent relative humidity in concrete slabs for field or laboratory tests.
  - b. Moisture test results indicate moisture condition of slab only at time of test.
27. Resilience: Ability of carpet to spring back to its original texture and thickness after being walked on or compressed weight of furniture.
28. Soil Resistance: Ability of carpet fiber to resist dry soil and maintain its original appearance after intermittent or restorative cleanings.
29. Soiling: Occurs when dirt particles build up in carpet fibers.



30. Stain Resistance: Ability of carpet fiber to resist absorption of stain and maintain its original appearance.
31. Texture: Visual and tactile surface characteristics of carpet pile, including such aesthetic and structural elements.
32. Tile: Carpet module usually 18 inch x 18 inch or 24 inch x 24 inch in size. Extremely dense construction with heavy reinforced backing.
33. Tuft: Cluster of yarns drawn through fabric and projecting from surface in form of cut yarns or loops.
34. Tuft Bind: Force (usually measured in pounds) required to pull tuft from carpet backing.
35. Tufted Carpet: Carpet produced by tufting machine instead of loam.
36. Twist: Winding of yarn around itself. More twist improves carpet performance (especially in cut pile).
37. Woven Carpet: Carpet produced on a loom through weaving process by which lengthwise (warp) yarns and widthwise (weft or filling) yarns are interlaced to form fabric.
38. Woven: Interlacing strands of fiber into yarn forms woven carpet.
39. Yarn: Fibers that are twisted together to form a continuous strand.

F. Reference Standards:

1. American Association of Textile Chemists and Colorists (AATCC):
  - a. Test Method:
    - 1) AATCC 16.3-2014, 'Colorfastness to Light: Xenon-Arc'.
    - 2) AATCC 107-2013, 'Colorfastness to Water'.
    - 3) AATCC 134-2011, 'Electrostatic Propensity of Carpets'.
    - 4) AATCC 165- 2013, 'Colorfastness to Crocking: Textile Floor Coverings--Crockmeter Method'.
    - 5) AATCC 174-2011, 'Antimicrobial Activity Assessment of Carpets'.
    - 6) AATCC 175-2013, 'Stain Resistance: Pile Floor Coverings'.
2. ASTM International:
  - a. ASTM D1335-12, 'Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings'.
  - b. ASTM D2646-11, 'Standard Test Methods for Backing Fabric Characteristics of Pile Yarn Floor Coverings'.
  - c. ASTM D3676-13, 'Standard Specification for Rubber Cellular Cushion Used for Carpet or Rug Underlay'.
  - d. ASTM D3936-12, 'Standard Test Method for Resistance to Delamination of the Secondary Backing of Pile Yarn Floor Covering'.
  - e. ASTM D5116-10, 'Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products'.
  - f. ASTM D5252-15, 'Standard Practice for the Operation of the Hexapod Drum Tester'.
  - g. ASTM D5848-10e1, 'Standard Test Method for Mass Per Unit Area of Pile Yarn Floor Coverings'.
  - h. ASTM D6962-12, 'Standard Practice for Operation of a Roller Chair Tester for Pile Yarn Floor Coverings'.
  - i. ASTM D7330-15, 'Standard Test Method for Assessment of Surface Appearance Change in Pile Floor Coverings Using Standard Reference Scales'.
  - j. ASTM E648-15, 'Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source'.
  - k. ASTM E662-15a, 'Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials'.
3. British Spill Test:
  - a. Test with protocol but not standardized test (Developed several years ago by West End Medical Association in Great Britain and since has been adopted by several U.S. Manufactures).
4. International Organization for Standardization (ISO).
  - a. ISO 2551:1981, 'Machine-made textile floor coverings - Determination of dimensional changes due to the effects of varied water and heat conditions'.
5. National Fire Protection Association (NFPA):
  - a. NFPA (Fire) 253, 'Standard Method of Test for Critical Radiant Flux of Floor Covering Systems using a Radiant Heat Energy Source' (2015 Edition).
6. The Carpet and Rug Institute (CRI):
  - a. CRI 104, 'Standard For Installation of Commercial Carpet' (Sept 2015).

- b. CRI TM-101, 'Assessment of Carpet Surface Appearance Change using the CRI Reference Scales'.
- c. CRI TM-102, 'School Carpet Minimum Average Specifications'.

## 1.2 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate completion of carpet installation with other trades.
- B. Pre-Installation Conference:
  - 1. Participate in pre-installation conference as specified in Section 09 0503 and held jointly with Section 09 6813 pre-installation conference.
  - 2. Schedule pre-installation conference before installation of flooring system.
  - 3. Conference may be held at project site or other convenient site. Participants may also attend by video or audio conference if approved by Project Manager.
  - 4. Schedule conference after substrate preparation and ONE (1) week before installation of flooring system.
  - 5. In addition to agenda items specified Section 01 3100 and Section 09 0503, review following:
    - a. Review Testing Agency testing report of Alkalinity and Concrete Moisture of concrete slab.
      - 1) Follow Testing Agency report regarding Alkalinity and Concrete Moisture of concrete slab as specified in Section 09 0503 'Floor Substrate Preparation'.
    - b. Review Owner's Representative schedule for furnishing and installation carpet.
    - c. Review Flooring Manufacturer's installation conditions verification procedure and requirements.
    - d. Review Building Ambient Conditions including normal levels of humidity, lighting, heating, and air conditioning for acceptability for beginning floor preparation and carpet installation.
    - e. Review cleaning and disposal requirements.
    - f. Review protection requirements of carpet after installation of carpeting.
- C. Scheduling:
  - 1. Testing Agency to provide testing for Alkalinity and Concrete Moisture of concrete slab as specified in Section 09 0503 'Floor Substrate Preparation'.
  - 2. Notify Flooring Installer when Building Ambient Conditions requirements are met before installation of flooring system.
  - 3. Notify Owner's Representative to coordinate installation of carpet.

## 1.3 SUBMITTALS

- A. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Warranty Documentation:
      - 1) Copy of Warranty.
    - b. Record Documentation:
      - 1) Owner will provide Project Carpet Request Documentation forms in both hard copy and digital format:
        - a) Carpet Request Information Sheet.
        - b) Carpet Vendor Quotation.
        - c) Carpet Preinstallation Meeting Agenda.
        - d) Carpet Installation Notice to Proceed or Cancel.
        - e) Carpet Inspection and Completion.
        - f) Carpet Overage Report and Completion.
        - g) Carpet Quotation Change Request.
      - 2) Owner to provide Testing Agency Testing Report of Alkalinity and Concrete Moisture testing for project.
- B. Maintenance Material Submittals:
  - 1. Extra Stock Materials:
    - a. Leave excess pieces of carpet, 6 feet square or larger and 25 lineal feet minimum of carpet cove base.

- b. Roll up and tie securely.

## 1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
  - 1. All products provided will meet requirements of all federal, state, and local codes having jurisdiction.
  - 2. Label meeting Federal Labeling Requirements, as stated in Textile Products Identification Act under Federal Trade Commission, shall be attached to certification samples and products delivered.
- B. Qualifications: Section 01 4301 applies, but is not limited to following:
  - 1. Carpet Installer Qualifications:
    - a. Certified CFI Master or Contract II grade installer or FCIB certified.
    - b. Not less than five (5) years of experience in installation of commercial carpet tile of type, quantity and installation methods similar to work of this section.
    - c. Qualified and approved by Carpet Manufacturer.
  - 2. Carpet Manufacturer Qualifications:
    - a. Not less than five (5) years of production experience, whose published literature clearly indicates general compliance of products with requirements of this section.
    - b. VMR Approved Carpet Manufacturers:
      - 1) Approval subject to VMR agreement process approval.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. General:
  - 1. Comply with instructions and recommendations of Manufacturer for special delivery, storage, and handling requirements.
- B. Delivery And Acceptance Requirements:
  - 1. Deliver materials and accessories necessary for completion of carpet installation to site before beginning installation of carpet.
  - 2. Do not deliver materials before date scheduled for installation.
  - 3. Transport carpet in manner that prevents damage and distortion. Bending or folding individual carpet rolls or cuts from rolls is not recommended. When bending or folding is unavoidable for delivery purposes, carpet is required to be unrolled and allowed to lie flat immediately upon arrival at installation site.
- C. Storage And Handling Requirements:
  - 1. Store carpet and related materials in a climate-controlled, dry space.
  - 2. Protect carpet from soil, dust, moisture and other contaminants and store on a flat surface.
  - 3. Stacking heavy objects on top of carpet rolls or stacking more than three rolls is prohibited.

## 1.6 FIELD CONDITIONS

- A. Ambient Conditions:
  - 1. Building Conditions:
    - a. Conditions inside building shall be brought to levels to be normal at occupancy of building. Conditions include normal levels of humidity, lighting, heating, and air conditioning. (HVAC must be in operation thru out carpet installation):
      - 1) Carpet installation is not to begin until HVAC system is operational and following conditions are maintained for at least forty eight (48) hours before, during and seventy two (72) hours after completion:
        - a) Carpet is to be installed when indoor temperature is between 65° - 95° F with maximum relative humidity of 65%.
        - b) Substrate surface temperature should not be less than 65° F at time of installation.
        - c) Do not allow temperature of indoor carpeted areas to fall below 50° F, regardless of age of installation.

- 2) Maintain fresh air ventilation after installation for seventy two (72) hours minimum or until lingering odors are gone.
2. Concrete Slab:
  - a. General:
    - 1) Do not install carpet over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have Alkalinity range and Concrete Moisture Vapor Emission Rate (MVER) as specified in Section 09 0503 'Floor Substrate Preparation'.
    - 2) Final determination as to whether or not concrete slab is dry enough for flooring installation should be based on evaluating both Alkalinity and Concrete Moisture Vapor Emission Rate (MVER) testing as specified in Section 09 0503 'Floor Substrate Preparation'.
  - b. Alkalinity:
    - 1) Do not install sheet carpeting if alkalinity of concrete surface exceeds pH level 9. Corrective procedures are required.
  - c. Concrete Moisture Vapor Emission Rate (MVER):
    - 1) Testing conditions inside building shall be brought to same ambient temperature and relative humidity levels to be normal at occupancy of building. Conditions include normal levels of humidity, lighting, heating, and air conditioning.
    - 2) Follow requirements specified in Section 09 0503 'Floor Substrate Preparation' before installation of carpet.

## 1.7 WARRANTY

### A. Manufacturer Warranty:

1. Provide Carpet Manufacturer's standard Warranty which includes following:
  - a. Warranty shall cover defects in installation, workmanship, and installation materials.
  - b. Warranty includes specific workmanship warranties for delamination, edge raveling, fuzzing, pilling, and other textural changes which can be controlled through proper manufacturing (no fraying, zippering, delamination, edge raveling, fuzzing, pilling in carpet is acceptable for any reason).
  - c. Warranty terms will include inspection of defective area within fifteen (15) days of receipt of written notice from Owner and completion of corrective work within forty five (45) days, unless other arrangements are made in writing with Owner on case-by-case basis.
  - d. Carpet defect or installation defect:
    - 1) Carpet Manufacturer may use any reasonable means to cure first three (3) breaches of warranty affecting an area of carpeting bounded by natural breaks such as doorways, stairs, rostrum and stage ('affected carpet area'). Such cure must preserve as uniform a blended appearance, acceptable to Carpet Manufacturer and Owner, as exists throughout Installation Site at time of breach.
    - 2) If carpet defect or installation defect continues to appear after three (3) separate notices for correction from Owner, replace carpet where defects have occurred.
  - e. If Carpet Manufacturer follows installation requirements of Section 09 0503 'Floor Substrate Preparation' Carpet Manufacture accepts liability of carpet installation for said given time as outlined in Special Warranty regardless of any climate or condition changes affecting RH levels of floor substrate.
2. Special Warranty:
  - a. Sheet Carpeting:
    - 1) General:
      - a) Appearance Retention to be provided with Special Warranty requirements if not already included in Standard Warranty.
    - 2) Meetinghouse, Mission Office, and O&M / R&I:
      - a) Owner Carpet Program Product: Provide twenty (20) year minimum or Carpet Manufacturer's better Warranty on carpet system.
    - 3) CES, S&I Module, and O&M / R&I:
      - a) Institute:
        - (1) Owner Carpet Program Product: Provide twenty-five (25) year minimum or Carpet Manufacturer's better Warranty on carpet system.
      - b) Seminary:

- (1) Owner Carpet Program Product: Provide twenty-five (25) year minimum or Carpet Manufacturer's better Warranty on carpet system.

## PART 2 - PRODUCTS

### 2.1 OWNER-FURNISHED PRODUCTS

- A. Category One VMR Manufacturers. See Section 01 6200 for definitions of Categories:
1. Materials supplied for carpet installation shall be complete package from specified Carpet Manufacturer:
    - a. Lees, Division of Mohawk Carpets, Glasgow, VA:
      - 1) Contact Information: Help Line (800) 523-5555 or (801) 397-5626.
    - b. Mannington Commercial Carpets, Calhoun, GA:
      - 1) Contact Information: Help Line Voice Mail (800) 241-2262, ext 8045 or Mannington Installation Services, email lds@mannington.com or (855) 466-2664.
    - c. Tandus Flooring Inc., Dalton, GA [www.tandus.com](http://www.tandus.com).
      - 1) Contact Information: Tracy Riddle - cell (801) 580-5147 fax (866) 861-7522 [www.triddle@tandus.com](mailto:www.triddle@tandus.com).
- B. Design Criteria:
1. General:
    - a. Commercial Match:
      - 1) Colors, texture and pile of any product selected as carpet standard or custom designed specifically for Owner needs to be consistent in appearance.
      - 2) When new carpet is installed next to existing carpet, two pieces need to be within tolerance acceptable as commercial match (Two shade variations maximum).
      - 3) Regardless of reason, if commercial match is not achievable, existing carpet needs to be replaced to acceptable breaking point approved by Owner's Representative.
      - 4) If changes in supply chains or unforeseen circumstances require standard pattern to be re-engineered, new carpet must be made close to original as possible.
      - 5) New product must be approved by Owner.
    - b. Compatibility:
      - 1) Materials supplied for carpet installation shall be complete package from specified Carpet Manufacturer. Do not mix items from material packages of different carpet Manufacturers.
      - 2) Provide carpet, seam sealers, adhesives, and other related materials that are compatible with one another and with substrates under conditions of service and application.
    - c. Tested Products:
      - 1) New technology and products not allowed unless pre-approved by Owner.
  2. Carpet Material Requirements:
    - a. Carpet Backing:
      - 1) Broadloom - Attached Cushion.
        - a) Manufacturer's preference that meets or exceeds specification and life cycle warranty expectation.
    - b. Cushion Thickness:
      - 1) Attached cushion thickness shall be 0.10 inch minimum when tested in accordance with ASTM D3676.
    - c. Fiber:
      - 1) Meetinghouse, Mission Office, and O&M / R&I:
        - a) Antron Lumina and/or Legacy only.
      - 2) CES, S&I Module, and O&M / R&I:
        - a) Institute:
          - (1) Antron Lumina and/or Legacy only.
        - b) Seminary:
          - (1) Antron Lumina and/or Legacy only.
        - c) Antron Lumina and/or Legacy only.
    - d. Life Expectancy (Sheet Carpeting):
      - 1) Meetinghouse, Mission Office, and O&M / R&I: twenty (20) years minimum.
      - 2) CES, S&I Module, and O&M / R&I:

- a) Institute: twenty-five (25) years minimum.
    - b) Seminary: twenty-five (25) years minimum.
  - e. Modification Ratio:
    - 1) Meetinghouse, Mission Office, and O&M / R&I: 1.5 or less.
    - 2) CES, S&I Module, and O&M / R&I:
      - a) Institute: 1.5 or less.
      - b) Seminary: 1.5 or less.
  - f. Pile Yarn Floor Construction:
    - 1) Meet standard for average pile yarn weight tested under ASTM D5848.
      - a) Carpet will retain eighty five (85) percent of these amounts at end of the warranty period.
- 3. Carpet Physical Performance:
  - a. Appearance Retention Requirements:
    - 1) Foot Traffic Classification and Testing Requirements:
      - a) Severe Traffic Criteria:
        - (1) Carpet is to be tested in accordance to ASTM D5252 with an Actionbac secondary backing meeting short term cycles (4000) grading scale of 3.5 and long term cycles (12000) grading scale of 3.5 with appearance retention measured according.
        - (2) Carpet needs to be able to maintain 3.5 rating for eighty five (85) percent of its warranty expected life cycle in accordance to ASTM D7330.
      - 2) Severe Traffic:
        - a) Meetinghouse, Mission Office, and O&M / R&I.
        - b) CES, S&I Module, and O&M / R&I.
    - b. British Spill Test:
      - 1) Carpet must pass British Spill Test (formally known as the National Health Service Patient Area Requirement for the United Kingdom, Method E: Part 2):
        - a) Test involves controlled spilling of blue dyed liquid from 1-meter (39 inches) height onto carpet product.
        - b) Spill is allowed to stand for period of twenty four (24) hours, after which cuts are made through carpet in area of spill to establish whether there was penetration into or through carpet composite.
    - c. Colorfastness:
      - 1) Colorfastness to Crocking: AATCC 165:
        - a) Color transfer Class 4 minimum, wet and dry, when tested as specified.
      - 2) Colorfastness to Light: AATCC 16.3:
        - a) Not less than 4 after 40 AFU (AATCC fading units). Colorfastness to Light, Xenon-Arc (60 AFU) (AATCC Fading Unit).
      - 3) Colorfastness to Water: AATCC 107:
        - a) Color transfer Class 4 minimum, AATCC Transference Scale (only yarn dyed carpets) (grade change in color and staining).
    - d. Compression Resistance and Compression Set Attached Cushion:
      - 1) Minimum CLD of 7 lb per cu in at 25 percent deflection, and maximum compression set of 10 percent after 50 percent constant compression when tested in accordance with ASTM D3676 with modification to allow recovery at 158 deg F instead of room temperature for thirty (30) minutes.
    - e. Critical Radiant Flux (CRF):
      - 1) Meet requirements of ASTM E648 Standard Test Method - Minimum Class 1 Critical Radiant Flux (CRF) of 0.45 watts/cm<sup>2</sup> or greater when tested in accordance with flooring radiant panel test using ASTM E648 Standard Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source as the test method.
    - f. Delamination:
      - 1) Resistance to Delamination (Actionbac secondary backing): Not less than 3.5 lbf/in (15 N/mm) when tested in accordance with ASTM D3936.
      - 2) Resistance to Delamination (Attached Cushion): Not less than 15,000 cycles when tested in accordance with ASTM D6963.
    - g. Dimensional Stability:
      - 1) 0.2 percent or less when tested in accordance with ISO 2551, 'Dimensional Stability (Aachen Test)'.

- h. Dry Breaking Strength:
    - 1) Not less than 100 lbs (445 N) when tested in accordance with ASTM D2646.
  - i. Electrostatic Propensity of Carpets:
    - 1) Electrostatic shock propensity with maximum 3.5 kV when tested in accordance with AATCC 134, 'Step Method'.
  - j. Flammability and Smoke Resistant:
    - 1) Smoke Density:
      - a) Smoke density generated from carpet and backing must not exceed 450 when tested in the flaming mode using ASTM E662, 'Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials'.
      - or
      - b) NFPA 258, 'Standard Research Test Method for Determining Smoke Generation of Solid Materials as test methods'.
  - k. Indoor Air Quality (IAQ):
    - 1) CRI Test Program ASTM D5116.
    - 2) Method for determination of VOC emitted from carpet using specific sorbent tube and thermal desorption/gas chromatography as per ASTM 7339.
    - 3) Carpet, adhesives, and seam sealers shall be VOC compliant as certified with CRI Indoor Air Quality Carpet Testing Program Green Label Plus or tested for compliance to meet the CRI IAQ Carpet Testing Program requirements and criteria as per ASTM D5116 CRI Test Program.
  - l. Soil Resist Treatment:
    - 1) Minimum average of 350 ppm fluorine on the pile fiber when 3 separate tests are conducted in accordance with CRI TM-102 test method.
    - 2) Installed carpet shall exhibit stain resisting ability equal to or exceeding that of any other premium carpet available at time of manufacture allowing removal of most foreign substances using generally accepted cleaning procedures and more aggressive cleaning procedures for stubborn stains without leaving any more visible stain and/or change in color than the most stain resistant premium carpet available at time of manufacture.
  - m. Stain Resistance:
    - 1) Minimum stain resistance rating of 8 when tested in accordance with AATCC 175, 'Stain Resistance: Pile Floor Coverings'.
  - n. Tuff Bind (dry):
    - 1) Not less than 10 lbs (45 N) when tested in accordance with ASTM D1335.
- C. Materials:
- 1. Carpet:
    - a. Carpet OPTION A (based on moisture testing specified in Section 09 0503):
      - 1) Category Four Approved Manufacturer and Color / Patterns. See Section 01 6200 for definitions of Categories:
        - a) Emerald '1':
          - (1) Lees/Mohawk: Nauvoo II, 121 Forest II.
        - b) Emerald '2':
          - (1) Lees/Mohawk: Nauvoo II, 407 Columbine II.
        - c) Emerald '3':
          - (1) Mannington: LDS New Horizon, New Grove.
        - d) Garnet '1':
          - (1) Lees/Mohawk: Nauvoo II, 407 Columbine II.
        - e) Garnet '2':
          - (1) Mannington: LDS New Horizon, New Medallion.
        - f) Garnet '3':
          - (1) Mannington: LDS New Horizon, New Seasons.
        - g) Sapphire '1':
          - (1) Lees/Mohawk: Nauvoo II, 405 Bountiful II.
        - h) Sapphire '2':
          - (1) Mannington: LDS New Horizon, New Ocean.
        - i) Sapphire '3':
          - (1) Lees/Mohawk: Nauvoo II, 417 Meadow II.
    - b. Carpet OPTION B (based on moisture testing specified in Section 09 0503):



- 1) Category Four Approved Manufacturer and Color / Patterns. See Section 01 6200 for definitions of Categories:
  - a) Emerald '1':
    - (1) Lees/Mohawk: Nauvoo II, 121 Forest II.
    - (2) Tandus (formally CNA): Style 04425 Ensign, color Emerald 86074.
  - b) Emerald '2':
    - (1) Lees/Mohawk: Nauvoo II, 407 Columbine II.
    - (2) Tandus (formally CNA): Style 04425 Ensign, color Emerald 86074.
  - c) Emerald '3':
    - (1) Mannington: LDS New Horizon, New Grove.
    - (2) Tandus (formally CNA): Style 04425 Ensign, color Emerald 86074.
  - d) Garnet '1':
    - (1) Lees/Mohawk: Nauvoo II, 407 Columbine II.
    - (2) Tandus (formally CNA): 04346 Ensign, color Garnet 81072.
  - e) Garnet '2':
    - (1) Mannington: LDS New Horizon, New Medallion.
    - (2) Tandus (formally CNA): 04346 Ensign, color Garnet 81072.
  - f) Garnet '3':
    - (1) Mannington: LDS New Horizon, New Seasons.
    - (2) Tandus (formally CNA): Style 04448 Ensign, color Jasper 87638.
  - g) Sapphire '1':
    - (1) Lees/Mohawk: Nauvoo II, 405 Bountiful II.
    - (2) Tandus (formally CNA): Style 04346 Ensign, color Sapphire 86608.
  - h) Sapphire '2':
    - (1) Mannington: LDS New Horizon, New Ocean.
    - (2) Tandus (formally CNA): Style 04346 Ensign, color Sapphire 86608.
  - i) Sapphire '3':
    - (1) Lees/Mohawk: Nauvoo II, 417 Meadow II.
    - (2) Tandus (formally CNA): Style 04346 Ensign, color Sapphire 86608.
- c. Carpet OPTION C (based on moisture testing specified in Section 09 0503):
  - 1) Category Four Approved Manufacturer and Color / Patterns. See Section 01 6200 for definitions of Categories:
    - a) Emerald '1':
      - (1) Tandus (formally CNA): Style 04425 Ensign, color Emerald 86074.
    - b) Emerald '2':
      - (1) Tandus (formally CNA): Style 04425 Ensign, color Emerald 86074.
    - c) Emerald '3':
      - (1) Tandus (formally CNA): Style 04425 Ensign, color Emerald 86074.
    - d) Garnet '1':
      - (1) Tandus (formally CNA): 04346 Ensign, color Garnet 81072.
    - e) Garnet '2':
      - (1) Tandus (formally CNA): 04346 Ensign, color Garnet 81072.
    - f) Garnet '3':
      - (1) Tandus (formally CNA): Style 04448 Ensign, color Jasper 87638.
    - g) Sapphire '1':
      - (1) Tandus (formally CNA): Style 04346 Ensign, color Sapphire 86608.
    - h) Sapphire '2':
      - (1) Tandus (formally CNA): Style 04346 Ensign, color Sapphire 86608.
    - i) Sapphire '3':
      - (1) Tandus (formally CNA): Style 04346 Ensign, color Sapphire 86608.
2. Carpet Base:
  - a. **4-1/2 inch** wide base made of same carpet from Manufacturer as used in each room, but without cushion backing. Top edge of base serged with **1-1/4 inch** polyester binding fabric to coordinate with Owner's color scheme. Roll edges of binding fabric under and sew along top edge of carpet cove base.

## 2.2 ACCESSORIES

- A. Carpet Accessories: Snap-in vinyl reducer strips and vinyl track.



- B. Floor Leveling Compound, Floor Patching Compound, And Latex Underlayment: As recommended and approved by Carpet Manufacturer.

## 2.3 SOURCE QUALITY CONTROL

- A. Tests:
1. Carpet:
    - a. Appearance Retention Rating:
      - 1) Hexapod Test Method: ASTM D5252.
      - 2) Grading: ASTM D7330.
    - b. Antimicrobial Activity: AATCC 174.
    - c. British Spill Test: Test Protocol.
    - d. Colorfastness:
      - 1) Crocking: AATCC 165.
      - 2) Light: AATCC 16.3.
      - 3) Water: AATCC 107.
    - e. Delamination: ASTM D3936 and ASTM D6962.
    - f. Dimensional Stability: ISO 2551.
    - g. Dry Breaking Strength: ASTM 2646.
    - h. Electrostatic Propensity of Carpets: AATCC 134.
    - i. Flame and Smoke Resistant. Provide carpet complying with ratings as indicated for following:
      - 1) Flooring Radiant Panel Test (Critical Radiant Flux), ASTM E648, NFPA 253.
      - 2) Smoke Density Test: ASTM E662.
    - j. Indoor Air Quality:
      - 1) ASTM 7339.
      - 2) Indoor Air Quality: CRI Test Program ASTM D5116.
    - k. Pile Yarn Weight: ASTM D5848.
    - l. Soil Resist Treatment: CRI TM-102.
    - m. Stain Resistance: AATCC 175.
    - n. Turf Bind: ASTM D1335.
  2. Attached Backing:
    - a. Carpet Backing: ASTM D3676.
    - b. Compression Resistance (constant deflection): ASTM D3676.
    - c. Compression Set (constant force): ASTM D3676.
    - d. Cushion Density: ASTM D3676.
    - e. Cushion Thickness: ASTM D3676.

## PART 3 - EXECUTION

### 3.1 APPROVED INSTALLER

- A. Same installer of Section 09 6816: 'Sheet Carpeting' shall install Section 09 6813: 'Tile Carpeting'.

### 3.2 EXAMINATION

- A. Verification of Conditions:
1. Carpet Areas:
    - a. Verify concrete surfaces are sufficiently cured and moisture content is within acceptable levels before beginning installation as specified in Section 09 0503, 'Floor Substrate Preparation'. If test results exceed limitations, do not proceed with installation, until problem has been corrected:
      - 1) Notify Owner's Representative in writing if floor surface is not acceptable to install carpet:
        - a) Do not lay carpeting over unsuitable surface. Commencing installation constitutes acceptance of floor and approval of existing conditions.
- B. Evaluation And Assessment:

1. Carpet Areas:
  - a. Variation In Grade:
    - 1) Plus or minus **1/8 inch** in any **10 foot** of floor slab and distance between high point and low point of slab of **1/2 inch**.
  - b. Testing Procedure:
    - 1) Place ends of straightedge on **3/8 inch** high shims.
    - 2) Floor is satisfactory if **1/4 inch** diameter steel rod rolled under straightedge will not touch anywhere along **10 foot** length and **1/2 inch** diameter steel rod will not fit under straightedge anywhere along **10 foot** length.
  - c. Notify Owner's Representative in writing if floor surface is not acceptable to install carpet:
    - 1) Do not lay carpet over unsuitable surface. Commencing installation constitutes acceptance of floor and approval of existing conditions.

### 3.3 PREPARATION

- A. Carpet Areas:
  1. Flooring Preparation:
    - a. Owner-Furnished Product Supplier's Responsibility:
      - 1) Prepare floor substrate in accordance with 'CRI Carpet Installation Standard' best practices to receive carpet installation and to provide installation that meets warranty requirements.
      - 2) Verify concrete surface cured, clean, dry, and free of foreign substances that will compromise carpet and/or installation.
    - b. Concrete floor slab patching:
      - 1) Cracks, chips and joints must be properly patched or repaired.
    - c. Concrete surface cured, clean, dry, and free of foreign substances that will compromise carpet and/or other flooring installations:
      - 1) Removal of curing compounds.
      - 2) Remove paint, sealer, grease, oil, silicone sealants, and other materials incompatible with flooring adhesives.
      - 3) Removal of overspray from painted walls (essential so glue will stick).
    - d. Moisture vapor emission tests and alkalinity test of concrete slab has been preformed.
    - e. Vacuum and damp mop floor areas to receive flooring before flooring installation.
  2. Relaxing / Conditioning Carpet:
    - a. Highly recommended that carpet be unrolled and allowed to relax in installation area for time period that conforms to requirements of manufacturer of product being installed:
    - b. Protect carpet adequately from soil, dust, moisture and other contaminants.
    - c. Sundry items, such as adhesives, should also be conditioned.
  3. Carpet Accessories:
    - a. Owner-Furnished Product's Responsibility:
      - 1) Sundry items, such as adhesives, shall be conditioned to building ambient conditions before use.

### 3.4 INSTALLATION

- A. Carpet:
  1. General:
    - a. Install carpet and carpet base in accordance with 'CRI Carpet Installation Standard' and Manufacturer's written instructions supplied with product.
    - b. Adhesion of carpet cushion (or secondary backing) to floor substrate and adhesion of carpet primary and secondary backings shall be continuous on floor surface so there are no bubble, ridges, or any separation of carpet from backings or backing from floor substrate caused by failure of carpet, backings or cushion, and adhesives as a system.
    - c. Install carpet under edge of metal thresholds where possible. Use specified carpet accessories at exposed edges.
  2. Seaming Requirements:
    - a. Seal seams in accordance with Carpet Manufacturer's instructions and according to CRI Carpet Installation Standard (2009) as applicable. Seam carpet base only at inside corners.

- b. No seam separation in carpet and no more observable seams from any standing position than that which is unavoidable using best seaming materials and practices available at time of installation.
  - c. Lay rooms parallel to respective Corridors. Seam to permit best use of available carpet.
  - d. Quarter turning allowed only at cross-Corridors longer than **24 feet**.
  - e. Use single or double seams at doorways (single seams preferred). Run nap of pieced carpet in same direction.
- B. Carpet Base:
- 1. Precut base so seams occur only at inside corners.
  - 2. Scribe base to floor.
  - 3. Spread adhesive over back side of base up to bottom of serging on edge or apply three **3/16 inch** .minimum diameter beads of adhesive placed one inch apart on back of base with top bead placed **2 inch** down from serged edge of base and spread adhesive over back surface of base up to bottom edge of serging.
    - a. Bird's mouth finish should only be required when door frame is flush with wall.
    - b. If bird's mouth is required, terminate at door frames or vertical trim with 45 degree angle, bird mouth cut so serged edge turns down to contact frame or trim.
  - 4. Do not allow adhesive beyond edge of base. Remove excess adhesive.
  - 5. Do not use staples, nails, screws or other mechanical fasteners.
  - 6. Set carpet base on brick walls at height either above or below horizontal mortar joint line.

### 3.5 FIELD QUALITY CONTROL

- A. Field Tests:
- 1. Carpeting:
    - a. See Section 09 0503 'Flooring Substrate Preparation' for Field Testing for Alkalinity and Concrete Moisture of concrete slab.
- B. Field Inspections:
- 1. Carpeting:
    - a. Unacceptable carpet after installation shall include but not be limited to:
      - 1) Delaminating carpet from backings.
      - 2) Fiber loss less than specified.
      - 3) Edge raveling.
      - 4) Fuzzing of carpet fibers.
      - 5) Pilling of carpet fibers.
      - 6) Appearance retention less than control samples attached to Agreement.
      - 7) Dye bleeding.
      - 8) Zippering fibers in carpet.
      - 9) Color streaking.
      - 10) Irregular tufts of fiber.
    - b. Unacceptable workmanship shall include but not be limited to:
      - 1) Improper floor preparation before installation.
      - 2) Failure of adhesive to completely adhere carpet to floor resulting in bubbles, ridges, or ripples where carpet has separated from floor.
      - 3) Seams that do not comply with specified requirements:
        - a) Raveled or untrimmed seams.
        - b) Seams not sealed, level, straight, or even.
        - c) Open seams.
        - d) Seams visibly open when viewed by Project Manager from standing position.
      - 4) Sequence rolls, commercial match issues created by rolls being installed out of sequence will require correction or replacement.
      - 5) Failure to properly install carpet next to walls and door frames to eliminate gaps or puckering of carpet.
      - 6) Use of unspecified carpet.
      - 7) Carpet base ends not finished to terminate at door frames or vertical trim shall have 45 degree angle 'birdsmouth' finish.
      - 8) Adhesive exposed on carpet, on carpet base, beyond edges of carpet base, and on other surfaces of building.

- 9) Carpet base that is not scribed to fit against floor with no gaps.
- 10) Carpet base attached by means other than acceptable carpet base adhesive.

C. Non-Conforming Work:

1. Carpeting:

- a. Basis of Acceptable Carpeting: Source Quality Control Testing:
  - 1) Carpet products not meeting Design Criteria and Source Quality Control Testing of this specification will be considered unacceptable carpeting.
- b. Unacceptable Carpeting:
  - 1) Unacceptable carpeting will be rejected and shall be repaired or replaced at no additional cost to Owner. Owner's Representative will determine reasonable location of acceptable transition points for removal of unacceptable carpet. Minimum replacement size shall be:
    - a) Between nearest existing seams.
    - b) Between natural transition points or 12 feet of running length.

### 3.6 CLEANING

A. General:

1. Carpeting:

- a. Carpet Installer's Responsibility:
  - 1) Remove any soiling and/or staining from carpet.
  - 2) Remove excessive adhesive with manufacturer recommended adhesive removers.

B. Damage to building:

1. Carpeting:

- a. Carpet Installer's Responsibility:
  - 1) Carpet Installer responsible for cleaning and repair of all damaged surfaces to their original condition from carpet installation.

C. Waste Management:

1. Contractor's Responsibility:

- a. Provide adequate waste receptacles (dumpsters) and dispose of Owner Furnished materials from building and property as specified in Section 01 7400.

2. Carpet Installer's Responsibility:

- a. All work areas are to be kept clean, clear and free of debris at all times.
- b. Disposal of rubbish, wrapping paper, scraps, and trimmings in provided dumpster(s).

### 3.7 PROTECTION

A. Protection of Carpeting:

1. Contractor's Responsibility:

- a. No traffic of any kind on newly installed carpet for minimum of twenty four (24) hours after installation is completed.
- b. No wheeled traffic of any kind placement of furniture or equipment on carpet for minimum of forty eight (48) hours after completion of carpet installation.
- c. Protect carpet adequately from soil, dust, moisture and other contaminants after carpet installation.
- d. Protect carpet from abuse, vandalism, or damage occurring after installation is complete.

**END OF SECTION**

**SECTION 09 7226****SISAL WALL COVERING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnishing and installing wall covering 'Type A' (Sisal) as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 06 4512: 'Architectural Woodwork Wood Trim' for wood trim for sisal wall covering.
  - 2. Section 09 2900: 'Gypsum Board' for priming of gypsum board.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Class A: Fire classification for product with flame spread rating of no more than 25 and smoke developed rating not exceeding 50, when tested in accordance with ASTM E84 or UL 723.
  - 2. Flame Spread: The propagation of flame over a surface.
  - 3. Flame Spread Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
  - 4. Smoke-Developed Index: The numerical value assigned to a material tested in accordance with ASTM E84 or UL 723.
  - 5. Surface Burning Characteristic: Rating of interior and surface finish material providing indexes for flame spread and smoke developed, based on testing conducted according to ASTM Standard E84 or UL 723.
- B. Reference Standards:
  - 1. ASTM International:
    - a. ASTM E84-14, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
  - 2. International Building Code (IBC) (2009 and 2012 Edition):
    - a. Chapter 8, 'Interior Finishes':
      - 1) Section 803, 'Wall And Ceiling Finishes':
        - a) 803.1.1, 'Interior Wall and Ceiling Finish Materials'.
        - b) 803.1.3, 'Room Corner Test for Textile Wall Coverings and Expanded Vinyl Wall Coverings'.
        - c) 803.1.4, 'Acceptance Criteria for Textile and Expanded Vinyl Wall Coverings Tested to ASTM E84 or UL 723'.
  - 3. Underwriters Laboratories, Inc.:
    - a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (2010 - Tenth Edition).

**1.3 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Manufacturer's literature or cut sheet.
    - b. Maintenance instructions.
    - c. Color and pattern selection.
- B. Informational Submittals:
  - 1. Test And Evaluation Reports:

- a. Copies of Quality Assurance requirements for 'Class A' flame spread rating and 'Room-Corner Test'.
- 2. Qualification Statement:
  - a. Installer:
    - 1) Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Operations and Maintenance Data:
      - 1) Cleaning and maintenance instructions.
    - b. Record Documentation:
      - 1) Manufacturers Documentation:
        - a) Manufacturer's literature or cut sheets.
        - b) Color and pattern selections.

#### 1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
  - 1. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by qualified testing agency. Identify products with appropriate markings of applicable testing agency.
    - a. Surface-Burning Characteristics:
      - 1) Wall covering shall have Class A flame spread rating in accordance with ASTM E84 or UL 723 Type 1.
        - a) Class A (Flame spread index 0-25; Smoke-developed index 0-450).
        - b) Flash point: None.
  - 2. Passage of 'Room-Corner Test' as recognized by AHJ, is required for system. Adhesive cited in test literature is required for installation of wall covering on Project.
    - 1) Room Corner Tests: ASTM E84, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
    - 2) IBC 803.1.3, 'Room Corner Test for Textile Wall Coverings and Expanded Vinyl Wall Coverings'.
    - 3) IBC 803.1.4, 'Acceptance Criteria for Textile and Expanded Vinyl Wall Coverings Tested to ASTM E84 or UL 723'.
    - 4) ISO 9705, 'Room/Corner Test: Simulations, Correlations and Heat Flux Measurements'. Contribution of Textile Coverings on Full Height Panels and Walls'.
    - 5) UL 723, 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'.
- B. Qualifications:
  - 1. Installer: Requirements of Section 01 4301 applies, but not limited to following:
    - a. Minimum three (3) years experience in wall covering installations.
    - b. Minimum five (5) years satisfactorily completed projects of comparable quality, similar size, and complexity in past three (3) years before bidding.
    - c. Agree to view DVD titled 'No-Flame Sisal Wall Covering Recommended Installation Procedures' provided by Owner. This may be waived by Owner, if Installer has viewed DVD before or can document at least two (2) satisfactorily completed projects of comparable size using sisal wall coverings in past three (3) years before bidding.
    - d. Upon request, submit documentation.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
  - 1. Deliver materials in sealed containers with Manufacturer's labels intact.
- B. Storage And Handling Requirements:

1. Store materials in protected area at temperatures below 90 deg F and above 50 deg F. Keep from freezing.
2. Keep container tightly closed in a well ventilated area, and store upright when not in use.
3. Shelf life: One (1) year minimum - Unopened containers.

## 1.6 FIELD CONDITIONS

### A. Ambient Conditions:

1. Apply when the temperature is between 50 deg F minimum and 100 deg F maximum and relative humidity is less than seventy five (75) percent.
2. Provide good ventilation.

## 1.7 WARRANTY

### A. Manufacturer Warranty:

1. Provide five (5) year warranty against manufacturing defects.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

#### A. Manufacturer Contact List:

1. Design Materials Inc, Kansas City, KS [www.dmikc.com](http://www.dmikc.com).
2. Fibreworks, Louisville, KY [www.fibreworks.com](http://www.fibreworks.com).

### 2.2 DESCRIPTION

#### A. Colors:

1. Category Four Approved Colors. See Section 01 6200 for definitions of Categories.

SCHEME	Design Materials	Fibreworks
Emerald '1'	0280 Emerald	331 Emerald
Emerald '2'	0250 Jacinth	334 Jacinth
Emerald '3'	0280 Emerald	331 Emerald
Garnet '1'	0250 Jacinth	334 Jacinth
Garnet '2'	0240 Garnet	332 Garnet
Garnet '3'	0240 Garnet	332 Garnet
Sapphire '1'	0230 Sapphire	333 Sapphire
Sapphire '2'	0230 Sapphire	333 Sapphire
Sapphire '3'	0270 Topaz	335 Topaz

### 2.3 MATERIALS

#### A. Sisal Wall Covering:

1. 100 percent fire-treated sisal yarn.
2. 1/4 inch pile height, 48 oz/sq yd minimum. Sisal to be installed full height on walls shall be furnished in 9 or 13 foot wide goods.
3. Reversible weave type, without backing.

**2.4 ACCESSORIES**

- A. Wall Covering Adhesive:
  - 1. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
    - a. 257 Sisal Adhesive by Fibreworks.
    - b. Sisal Adhesive No. 1-422 by Design Materials.
- B. Seam Cement:
  - 1. Type Two Acceptable Products:
    - a. 8415 Glue-Down Carpet Seam Adhesive by Roberts Consolidated Industries, Div QEP, Henderson, NV [www.robertsconsolidated.com](http://www.robertsconsolidated.com).
    - b. Equal as recommended by Wall Covering Manufacturer with approval of Architect before installation. See Section 01 6200.

**PART 3 - EXECUTION****3.1 INSTALLERS**

- A. Acceptable Installers:
  - 1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

**3.2 EXAMINATION**

- A. Verification Of Conditions:
  - 1. Examine substrate and verify that it is suitable for installation of sisal wall covering.
  - 2. Notify Architect of unsuitable conditions in writing.
    - a. Do not install over unsuitable conditions.
  - 3. Commencement of Work by installer is considered acceptance of substrate.

**3.3 INSTALLATION**

- A. Apply wall covering in accordance with Manufacturer's instructions, available on DVD from Owner through Architect. See Quality Assurance Installer Qualifications as specified in Part 1 of this specification.
- B. Using specified adhesive, glue continuously to surface to be covered with wall covering. Apply adhesive in accordance with Manufacturer's recommendations.
- C. Run 'ribs' in weaving horizontally (panel style) when installing wall covering full height. If sisal installed only as wainscoting, 'ribs' may be installed vertically. Install wall covering so it extends to within **1/8 inch** of floor slab.
- D. Carry sisal around corners approximately **6 inch** making no outside corner cuts.
- E. Apply wall covering in one piece on walls adjacent to stairs leading to Platform to avoid unsightly and challenging seams.

**END OF SECTION**



**SECTION 09 9001****COMMON PAINTING AND COATING REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Common procedures and requirements for field-applied painting and coating.
- B. Related Requirements:
1. Section 05 0503: 'Shop-Applied Metal Coatings' for quality of shop priming of steel and iron.
  2. Section 07 9213: 'Elastomeric Joint Sealants' for quality of Elastomeric Joint Sealants.
  3. Sections under 09 9000 heading 'Paints and Coatings'.
    - a. Pre-Installation conferences held jointly with Section 09 9001.
  4. Divisions 22 and 23: Painting of plumbing and HVAC identification, refrigerant line insulation, and duct interiors.

**1.2 REFERENCES**

- A. Definitions:
1. Damage Caused By Others: Damage caused by individuals other than those under direct control of Painting Applicator (MPI(a), PDCA P1.92).
  2. Gloss Levels:
    - a. Specified paint gloss level shall be defined as sheen rating of applied paint, in accordance with following terms and values, unless specified otherwise for a specific paint system.

Gloss Level '1'	Traditional matte finish - flat	0 to 5 units at 60 degrees to 10 units maximum at 85 degrees.
Gloss Level '2'	High side sheen flat - 'velvet-like' finish	10 units maximum at 60 degrees and 10 to 35 units at 85 degrees.
Gloss Level '3'	Traditional 'eggshell-like' finish	10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees.
Gloss Level '4'	'Satin-like' finish	20 to 35 units at 60 degrees and 35 units minimum at 85 degrees.
Gloss Level '5'	Traditional semi-gloss	35 to 70 units at 60 degrees.
Gloss Level '6'	Traditional gloss	70 to 85 units at 60 degrees.
Gloss Level "7"	High gloss	More than 85 units at 60 degrees.

3. Properly Painted Surface:
    - a. Surface that is uniform in appearance, color, and sheen and free of foreign material, lumps, skins, runs, sags, holidays, misses, strike-through, and insufficient coverage. Surface free of drips, spatters, spills, and overspray caused by Paint Applicator. Compliance will be determined when viewed without magnification at a distance of **5 feet** minimum under normal lighting conditions and from normal viewing position (MPI(a), PDCA P1.92).
  4. Latent Damage: Damage or conditions beyond control of Painting Applicator caused by conditions not apparent at time of initial painting or coating work.
- B. Reference Standards:
1. The latest edition of the following reference standard shall govern all painting work:
    - a. MPI(a), 'Architectural Painting Specification Manual' by Master Painters Institute (MPI), as issued by local MPI Accredited Quality Assurance Association having jurisdiction.

- b. MPI(r), 'Maintenance Repainting Manual' by Master Painters Institute (MPI), as issued by local MPI Accredited Quality Assurance Association having jurisdiction.

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
  - 1. Schedule painting pre-installation conference after delivery of paint or coatings and before or at same time as application of field samples.
    - a. Coordinate pre-installation conferences of all related painting and coating Sections under 09 9000 heading 'Paints and Coatings'.
    - b. Schedule conference before preparation of control samples as specified in Sections under 09 9000 heading 'Paints and Coatings'.
    - c. Conference to be held at same time as Section 09 2900 to review gypsum board finish preparation.
  - 2. In addition to agenda items specified in Section 01 3100, review following:
    - a. Review Quality Assurance for Approval requirements.
    - b. Review Quality Assurance Field Sample requirements.
    - c. Review Submittal requirements for compliance for MPI Approved Products.
    - d. Review Design Criteria requirements.
    - e. Review Cleaning requirements.
    - f. Review painting schedule.
    - g. Review safety issues.
  - 3. Review additional agenda items from Sections under 09 9000 heading 'Paints and Coatings'.

### 1.4 SUBMITTALS

- A. Action Submittals:
  - 1. Product Data:
    - a. Include following information for each painting product, arranged in same order as in Project Manual.
      - 1) Manufacturer's cut sheet for each product indicating ingredients and percentages by weight and by volume, environmental restrictions for application, and film thicknesses and spread rates.
      - 2) Provide one (1) copy of 'MPI Approved Products List' showing compliance for each MPI product specified.
        - a) MPI Information is available from MPI Approved Products List using the following link: <http://www.paintinfo.com/mpi/approved/index.shtml>.
      - 3) Confirmation of colors selected and that each area to be painted or coated has color selected for it.
  - 2. Samples: Provide two 4 inch by 6 inch minimum draw-down cards for each paint or coating color selected for this Project.
- B. Informational Submittals:
  - 1. Manufacturer Instructions:
    - a. Manufacturer's substrate preparation instructions and application instruction for each painting system used on Project.
  - 2. Qualification Statement:
    - a. Applicator:
      - 1) Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Record Documentation:
      - 1) Manufacturer's documentation:
        - a) Manufacturer's cut sheet for each component of each system.
        - b) Schedule showing rooms and surfaces where each system was used.

**D. Maintenance Materials Submittals:****1. Extra Stock Materials:**

- a. Provide painting materials in Manufacturer's original containers and with original labels in each color used. Label each can with color name, mixture instructions, date, and anticipated shelf life.
- b. Provide one (1) quart of each finish coat and one (1) pint of each primer and of each undercoat in each color used.

**1.5 QUALITY ASSURANCE****A. Regulatory Agency Sustainability Approval:**

1. Conform to work place safety regulations and requirements of those authorities having jurisdiction for storage, mixing, application and disposal of all paint and related hazardous materials.
2. Paint and painting materials shall be free of lead and mercury, and have VOC levels acceptable to local jurisdiction.
3. Master Painters Institute (MPI) Standards:
  - a. Products: Comply with MPI standards indicated and listed in 'MPI Approved Products List'.
  - b. Preparation and Workmanship: Comply with requirements in 'MPI Architectural Painting Specification Manual' for products and coatings indicated.

**B. Qualifications:**

1. Applicator: Requirements of Section 01 4301 applies, but not limited to following:
  - a. Minimum five (5) years experience in painting installations.
  - b. Minimum five (5) satisfactorily completed projects of comparable quality, similar size, and complexity in past three (3) years before bidding.
  - c. Maintain qualified crew of painters throughout duration of the Work.
  - d. Upon request, submit documentation.

**1.6 DELIVERY, STORAGE, AND HANDLING****A. Delivery And Acceptance Requirements:**

1. Deliver specified products in sealed, original containers with Manufacturer's original labels intact on each container.
2. Deliver amount of materials necessary to meet Project requirements in single shipment.
3. Notify Architect two working days before delivery of coatings.

**B. Storage And Handling Requirements:**

1. Store materials in single place.
2. Keep storage area clean and rectify any damage to area at completion of work of this Section.
3. Maintain storage area at **55 deg F** minimum.

**1.7 FIELD CONDITIONS****A. Ambient Conditions:**

1. Perform painting operations at temperature and humidity conditions recommended by Manufacturer for each operation and for each product for both interior and exterior work.
2. Apply painting systems at lighting level of 540 Lux (50 foot candles) minimum on surfaces to be painted.
  - a. Inspection of painting work shall take place under same lighting conditions as application.
  - b. If painting and coating work is applied under temporary lighting, deficiencies discovered upon installation of permanent lighting will be considered latent damage as defined in MPI Manual, PDCA P1-92.

**PART 2 - PRODUCTS****2.1 SYSTEMS****A. Performance:****1. Design Criteria:**

- a. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
- b. All materials, preparation and workmanship shall conform to requirements of 'Architectural Painting Specification Manual' by Master Painters Institute (MPI).
- c. All paint manufacturers and products used shall be as listed under Approved Product List section of MPI Painting Manual.
- d. Provide Premium Grade systems (2 top coats) as defined in MPI Architectural Painting Specification Manual, except as otherwise indicated.
- e. Where specified paint system does not have Premium Grade, provide Budget Grade.
- f. Provide products of same manufacturer for each coat in coating system.
- g. Where required to meet LEED (Leadership in Energy and Environmental Design) program requirements, use only MPI listed materials having an "L" rating designation.
- h. Color Levels:
  - 1) Color Level II:
    - a) Number and placement of interior and exterior paint colors and gloss levels shall be as defined by Color Level II from MPI Manual, PDCA P3-93 as modified in following paragraph.
    - b) No more than one paint color or gloss level will be selected for same substrate within designated interior rooms or exterior areas.
  - 2) Color Level III:
    - a) Number and placement of interior and exterior paint colors and gloss levels shall be Color Level III from MPI Manual, PDCA P3-93 as modified in following paragraph.
    - b) Several paint colors or gloss levels will be selected for same substrate within designated interior rooms or exterior areas.

**B. Materials:**

1. Materials used for any painting system shall be from single manufacturer unless approved otherwise in writing by painting system manufacturers and by Architect. Include manufacturer approvals in Product Data submittal.
2. Linseed oil, shellac, turpentine, and other painting materials shall be pure, be compatible with other coating materials, bear identifying labels on containers, and be of highest quality of an approved manufacturer listed in MPI manuals. Tinting color shall be best grade of type recommended by Manufacturer of paint or stain used on Project.

**PART 3 - EXECUTION****3.1 APPLICATORS****A. Approved Applicators:**

1. Meet Quality Assurance Applicator Qualifications as specified in Part 1 of this specification.

**3.2 EXAMINATION****A. Verification Of Conditions:**

1. Directing applicator to begin painting and coating work will indicate that substrates to receive painting and coating materials have been previously inspected as part of work of other Sections

and are complete and ready for application of painting and coating systems as specified in those Sections.

B. Pre-Installation Testing:

1. Before beginning work of this Section, examine, and test surfaces to be painted or coated for adhesion of painting and coating systems.
2. Report in writing to Architect of conditions that will adversely affect adhesion of painting and coating work.
3. Do not apply painting and coating systems until party responsible for adverse condition has corrected adverse condition.

C. Evaluation And Assessment:

1. Report defects in substrates that become apparent after application of primer or first finish coat to Architect in writing and do not proceed with further work on defective substrate until such defects are corrected by party responsible for defect.

### 3.3 PREPARATION

A. Protection Of In-Place Conditions:

1. Protect other finish work and adjacent materials during painting. Do not splatter, drip, or paint surfaces not intended to be painted. These items will not be spelled out in detail but pay special attention to the following:
  - a. Do not paint finish copper, bronze, chromium plate, nickel, stainless steel, anodized aluminum, or monel metal except as explicitly specified.
  - b. Keep cones of ceiling speakers completely free of paint. In all cases where painting of metal speaker grilles is required, paint without grilles mounted to speakers and without grilles on ceiling.
  - c. On existing work where ceiling is to be painted, speakers and grilles are already installed, and ceiling color is not being changed, mask off metal grilles installed on ceiling speakers. If ceiling color is being changed, remove metal grilles and paint, and mask off ceiling speakers.

B. Surface Preparation:

1. Prepare surfaces in accordance with MPI requirements and requirements of Manufacturer for each painting system specified, unless instructed differently in Contract Documents. Bring conflicts to attention of Architect in writing.
2. Fill minor holes and cracks in wood surfaces to receive paint or stain.
3. Surfaces to be painted shall be clean and free of loose dirt. Clean and dust surfaces before painting or finishing.
4. Do no exterior painting while surface is damp, unless recommended by Manufacturer, nor during rainy or frosty weather. Interior surfaces shall be dry before painting. Moisture content of materials to be painted shall be within tolerances acceptable to Paint Manufacturer.
5. Sand woodwork smooth in direction of grain leaving no sanding marks. Clean surfaces before proceeding with stain or first coat application.

### 3.4 APPLICATION

A. Interface With Other Work:

1. Coordinate with other trades for materials and systems that require painting before installation.
2. Schedule painting and coating work to begin when work upon which painting and coating work is dependent has been completed. Schedule installation of pre-finished and non-painted items, which are to be installed on painted surfaces, after application of final finishes.

B. Paint or finish complete all surfaces to be painted or coated as described in Contract Documents, including but not limited to following items.

1. Finish casework and wood trims that are specified to be installed under Section 06 2001 and that are not called out to be factory-or shop-finished. Back prime wood elements to be installed against concrete or masonry or that may be subjected to moisture.
  2. Paint mechanical, electrical, and audio/visual items that require field painting as indicated in Contract Documents. These include but are not limited to:
    - a. Gas pipe from gas meter into building.
    - b. Mechanical flues and pipes penetrating roof.
    - c. Electrical panel and disconnect enclosures.
    - d. Metal protective structures for refrigerant lines.
  3. Metal reveals at ceiling access doors.
  4. Paint inside of chases in occupied spaces flat black for **18 inches** or beyond sightline, whichever is greater.
- C. Apply sealant in gaps **3/16 inch** and smaller between two substrates that are both to be painted or coated. Sealants in other gaps furnished and installed under Section 07 9213.
- D. On wood to receive a transparent finish, putty nail holes in wood after application of stain using natural colored type to match wood stain color. Bring putty flush with adjoining surfaces.
- E. In multiple coat paint work, tint each succeeding coat with slightly lighter color, but approximating shade of final coat, so it is possible to check application of specified number of coats. Tint final coat to required color.
- F. Spread materials smoothly and evenly. Apply coats to not less than wet and dry film thicknesses and at spreading rates for specified products as recommended by Manufacturer.
- G. Touch up suction spots after application of first finish coat.
- H. Paint shall be thoroughly dry and surfaces clean before applying succeeding coats.
- I. Use fine sandpaper between coats as necessary to produce even, smooth surfaces.
- J. Make edges of paint adjoining other materials or colors clean, sharp, and without overlapping.
- K. Finished work shall be a 'Properly Painted Surface' as defined in this Section.

### 3.5 FIELD QUALITY CONTROL

- A. Non-Conforming Work:
1. Correct deficiencies in workmanship as required to leave surfaces in conformance with 'Properly Painted Surface,' as defined in this Section.
  2. Correction of 'Latent Damage' and 'Damage Caused By Others,' as defined in this Section, is not included in work of this Section.

### 3.6 CLEANING

- A. General:
1. As work proceeds and upon completion of work of any painting Section, remove paint spots from floors, walls, glass, or other surfaces and leave work clean, orderly, and in acceptable condition.
- B. Waste Management:
1. Remove rags and waste used in painting operations from building each night. Take every precaution to avoid danger of fire.
  2. Paint, stain and wood preservative finishes and related materials (thinners, solvents, caulking, empty paint cans, cleaning rags, etc.) shall be disposed of subject to regulations of applicable authorities having jurisdiction.
  3. Remove debris caused by work of paint Sections from premises and properly dispose.

4. Retain cleaning water and filter out and properly dispose of sediments.

**END OF SECTION**

**ATTACHMENTS**

**PART 4 - PAINT COLOR SCHEDULE****A. Related Requirements:**

1. Section 09 9112 'Exterior Painted Ferrous Metal'.
2. Section 09 9122 'Interior Painted CMU'.
3. Section 09 9123 'Interior Painted Gypsum Board-Plaster'.
4. Section 09 9124 'Interior Painted Metal'.
5. Section 09 9324 'Interior Clear-Finished Hardwood'.

**B. Colors:****1. Interior:****a. Interior Poured Concrete (See Section 09 9121):**

- 1) Class One Color Quality Standard. See Section 01 6200:

- a) <Insert Product and Color> by <Insert Manufacturer>.

**b. Interior Clear Finished Wood (See Section 09 9324):**

- 1) Match other interior clear finished wood building elements.

**c. Interior CMU (See Section 09 9122):**

- 1) Class One Color Quality Standard. See Section 01 6200:

Scheme	One	Two	Three	Manufacturer
Emerald	SW6098	SW6098	SW6098	Sherwin Williams
Garnet	SW6070	SW6070	SW6098	
Sapphire	SW6098	SW6098	SW6385	

**d. Interior Gypsum Board, Plaster (See Section 09 9123):**

- 1) Class One Color Quality Standard. See Section 01 6200:

Scheme	One	Two	Three	Manufacturer
Emerald	SW6098	SW6098	SW6098	Sherwin Williams
Garnet	SW6070	SW6070	SW6098	
Sapphire	SW6098	SW6098	SW6385	

**e. Interior Metal (See Section 09 9124):**

- 1) Class One Color Quality Standard. See Section 01 6200:

Scheme	One	Two	Three	Manufacturer
Emerald	SW6098	SW6098	SW6098	Sherwin Williams
Garnet	SW6070	SW6070	SW6098	
Sapphire	SW6098	SW6098	SW6385	

**f. Interior Painted Wood (See Section 09 9125):**

- 1) Class One Color Quality Standard. See Section 01 6200:

Scheme	One	Two	Three	Manufacturer
Emerald	SW6098	SW6098	SW6098	Sherwin Williams
Garnet	SW6070	SW6070	SW6098	
Sapphire	SW6098	SW6098	SW6385	

**2. Exterior:****a. Exterior Metal (See Section 09 9112):**

- 1) Class One Color Quality Standard. See Section 01 6200.
- a) Match existing/adjacent.



**SECTION 09 9123****INTERIOR PAINTED GYPSUM BOARD, PLASTER****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Preparing, priming, and finish painting new interior gypsum board and plaster surfaces as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 09 2900: 'Gypsum Board' for:
    - a. Priming new interior gypsum board surfaces to receive sheet wall covering system or texturing.
    - b. Pre-installation conference.
  - 2. Section 09 9001: 'Common Painting And Coating Requirements':
    - a. Pre-installation conference for Sections under 09 9000 heading 'Paints and Coatings'.
    - b. 'Attachment: Paint Color Schedule' for O&M / R&I Projects.
  - 3. Section 09 9413: 'Interior Textured Finishing' for textured finishes.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conferences:
  - 1. Participate in pre-installation conference as specified in Section 09 2900.
    - a. In addition to agenda items specified in Section 01 3100 and Section 09 2900, review following:
      - 1) Review finish level requirements of gypsum wallboard as specified in Section 09 2900.
  - 2. Participate in pre-installation conference as specified in Section 09 9001.

**PART 2 - PRODUCTS****2.1 SYSTEM**

- A. Manufacturers:
  - 1. Category Four Approved Manufacturers and Products. See Section 01 6200 for definitions of Categories.
    - a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.
- B. Description:
  - 1. Rest Rooms, Font Rooms, And Custodial Rooms:
    - a. New Surfaces: Use MPI(a) INT 9.2F Waterborne Epoxy Finish system.
    - b. Previously Finished Surfaces: Use MPI(r) RIN 9.2E Waterborne Epoxy Finish system.
  - 2. All Other:
    - a. New Surfaces: Use MPI(a) INT 9.2B Latex Finish system.
    - b. Previously Finished Work: Use MPI(r) RIN 9.2B Latex Finish system.
- C. Performance:
  - 1. Design Criteria:
    - a. New Surfaces: MPI Premium Grade finish requirements.

- b. Deteriorated Existing Surfaces: MPI Premium Grade finish requirements.
  - c. Sound Existing Surfaces: MPI Custom Grade requirements.
  - d. Gloss / Sheen Required:
    - 1) Rest Rooms And Custodial Rooms: Gloss Level 6.
    - 2) Remaining Painted Surfaces: Gloss Level 5.
- D. Materials:
- 1. Primers:
    - a. MPI Product 50, 'Primer Sealer, Latex, Interior'.
  - 2. Finish Coats:
    - a. Rest Rooms, Font Room, And Custodial Rooms:
      - 1) Buildings with CMU and Gypsum Board surfaces in same rooms:
        - a) MPI Product 77, 'Epoxy, Gloss'.
    - b. Remaining Painted Surfaces:
      - 1) MPI Product 141, 'Latex, Interior, High Performance Architectural, Semi-Gloss (MPI Gloss Level 5)'.

## **PART 3 - EXECUTION**

### **3.1 APPLICATION**

- A. General: See appropriate paragraphs of Section 09 9001.
- B. New Surfaces:
  - 1. Primer: Apply primer to be covered with other paint coats with roller only, or with spray gun and back-rolled.
- C. Existing Painted Surfaces:
  - 1. Remove deteriorated existing paint down to sound substrate by scraping or sanding. Feather edges of existing paint by sanding to be smooth with adjacent surfaces.
  - 2. Clean surface with mild soap and water, or with tri-sodium phosphate (TSP). Wash surfaces that have been defaced with marking pens, crayons, lipstick, etc, with solvent recommended by Paint Manufacturer. Spot prime such surfaces.
  - 3. Spackle and tape cracks. Sand to smooth finish and spot prime.
  - 4. Sand or chemically etch existing painted surface as required to prepare surface to accept new paint.
  - 5. Re-clean surface.
  - 6. Apply primer coat.
  - 7. Apply finish coats.

**END OF SECTION**

**SECTION 09 9124****INTERIOR PAINTED METAL****PART 1 - GENERAL****1.1 SUMMARY**

1. Includes But Not Limited To: Preparing and painting new interior metal surfaces as described in Contract Documents.
- B. Related Requirements:
  1. Section 05 5871: 'Metal Brackets'.
  2. Section 09 9001: 'Common Painting And Coating Requirements':
    - a. Pre-installation conference for Sections under 09 9000 heading 'Paints and Coatings'.
    - b. 'Attachment: Paint Color Schedule' for O&M / R&I Projects.
  3. Section 23 0553: 'I. D. For HVAC Piping And Equipment' for field painting requirements of HVAC piping and equipment.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conferences:
  1. Participate in pre-installation conference as specified in Section 09 9001.
- B. Sequencing:
  1. Paint brackets furnished under Section 05 5871 before installation of bracket.

**PART 2 - PRODUCTS****2.1 SYSTEM**

- A. Manufacturers:
  1. Category Four Approved Products and Manufacturers. See Section 01 6200 for definitions of Categories.
    - a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.
- B. Description:
  1. Ferrous Metal:
    - a. New Surfaces: Use MPI(a) INT 5.1B Waterborne Light Industrial Finish system.
    - b. Previously Finished Surfaces: Use MPI(r) RIN 5.1B Waterborne Light Industrial Finish system.
  2. Galvanized Metal:
    - a. New Surfaces: Use MPI(a) INT 5.3J Latex Finish system
    - b. Previously Finished Surfaces: Use MPI(r) RIN 5.3AH Latex Finish system.
  3. Aluminum:
    - a. New Surfaces: Use MPI(a) INT 5.4E Waterborne Light Industrial Finish system.
    - b. Previously Finished Surfaces: Use MPI(r) REX 5.4E Light Industrial Finish system.
- C. Performance:
  1. Design Requirements:
    - a. New Surfaces: MPI Premium Grade finish requirements.
    - b. Deteriorated Existing Surfaces: MPI Premium Grade finish requirements.
    - c. Sound Existing Surfaces: MPI Custom Grade finish requirements.

- d. Gloss / Sheen Level Required: Gloss Level 5.
- D. Materials:
  - 1. Primers:
    - a. Ferrous Metal: MPI Product 107, 'Primer, Rust-Inhibitive, Water Based'.
    - b. Galvanized Metal: MPI Product 134: 'Primer, Galvanized, Water Based'.
    - c. Aluminum: MPI Product 95: 'Primer, Quick Dry, for Aluminum'.
  - 2. Finish Coats: MPI Product 153: 'Light Industrial Coating, Interior, Water Based, Semi-Gloss (MPI Gloss Level 5)'.

## **PART 3 - EXECUTION**

### **3.1 APPLICATION**

- A. General:
  - 1. See appropriate paragraphs of Section 09 9001.
  - 2. Systems specified are in addition to prime coats furnished under other Sections.
- B. New Surfaces: Remove rust spots by sanding and immediately spot prime. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying full primer coat.

**END OF SECTION**

**SECTION 09 9324****INTERIOR CLEAR-FINISHED HARDWOOD****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Preparing and finishing of new interior clear finished hardwood as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 06 2210: 'Miscellaneous Wood Trim'.
  - 2. Section 06 4114: 'Wood-Veneer-Faced Architectural Cabinets'.
  - 3. Section 06 4512: 'Architectural Woodwork Wood Trim'.
  - 4. Section 08 1429: 'Interior Flush Wood Doors'.
  - 5. Section 09 9001: 'Common Painting And Coating Requirements':
    - a. Pre-installation conference for Sections under 09 9000 heading 'Paints and Coatings'.
    - b. 'Attachment: Paint Color Schedule' for O&M / R&I Projects.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. Architectural Woodwork Institute / Architectural Woodwork Manufacturers Association of Canada, 46179 Westlake Drive, Suite 120, Potomac Falls, VA [www.awinet.org](http://www.awinet.org).
    - a. Architectural Woodwork Standards (AWS), 1st Edition, 2009.
- B. Reference Standards:
  - 1. Kitchen Cabinet Manufacturers Association / American National Standards Institute:
    - a. ANSI/KCMA A161.1-2000 (R2005) 23-Jan-2001 'Recommended Performance and Construction Standards for Kitchen and Vanity Cabinets.'

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conferences:
  - 1. Participate in pre-installation conference as specified in Section 09 9001.
  - 2. In addition to agenda items specified in Section 01 3100 and Section 09 9001, review following:
    - a. Review control sample.

**1.4 SUBMITTALS**

- A. Action Submittals:
  - 1. Samples:
    - a. Interior Hardwood for Transparent Finish:
      - 1) Requirements for samples are specified in Related Requirement Sections listed above.
    - b. Design Criteria:
      - 1) Sample will be used as performance standard for evaluating finish provided.
- B. Informational Submittals:
  - 1. Test And Evaluation Reports:
    - a. Before beginning finish work, submit Finish Manufacturer's literature or certification that finish material meets requirements of ANSI / KCMA A161.1.

**PART 2 - PRODUCTS****2.1 SYSTEM**

- A. Materials:

1. Stain: MPI 90, 'Stain, Semi-Transparent, for Interior Wood'.
2. Clear Finish Coats:
  - a. Field Finished:
    - 1) Chemcraft International Inc:
      - a) First, Second, And Third Coats: 20 Sheen Opticlear Pre-Catalyzed Lacquer.
    - 2) ICI Dulux / Trinity:
      - a) First Coat: ICE Vinyl Sanding Sealer.
      - b) Second And Third Coats: ICI Pre-Catalyzed Lacquer.
    - 3) Lilly / Valspar:
      - a) First, Second, And Third Coats: 20 Sheen Pre-Catalyzed Lacquer 587E208.
    - 4) Sherwin-Williams:
      - a) First Coat: T67F3 Vinyl Sealer.
      - b) Second And Third Coats: T77F38 Sherwood Pre-Catalyzed Lacquer DRE.
  - b. Mill Finished: Architectural Woodwork finished in a mill may use one (1) coat of Vinyl Sealer and two (2) coats of Conversion Varnish or three (3) coats of Conversion Varnish from one (1) of the approved Finish Manufacturers, as recommended by Finish Manufacturer.
  - c. Products meeting testing requirements for finishes of ANSI / KCMA A161.1 may be used upon approval of submission by Architect before use. See Section 01 6200.
3. Color:
  - a. Design Criteria:
    - 1) Finish to match Owner selected sample.
  - b. Approved Finish:
    - 1) Performance standard: Owner provided sample of existing wood item from existing project to be used as Control Sample.

B. Performance:

1. Design Criteria: General: See appropriate paragraphs of Section 09 9001.

## **PART 3 - EXECUTION**

### **3.1 APPLICATION**

- A. General:
  1. See appropriate paragraphs of Section 09 9001.
  2. Sand entire exposed surface of item to be finished lightly with 120 to 150 non-stearated sandpaper and clean before applying dye or stain.
  3. Apply stain in accordance with Manufacturer's recommendations and as necessary to attain correct color.
  4. Scuff sand with 220 non-stearated sandpaper between application of application stain and first finish coat.
  5. If wood is finished before installation, finish cut ends and other unfinished, exposed surfaces same as previously finished surfaces after installation of wood.
- B. Where back-priming is required, apply one coat of finish material.
- C. Architectural Woodwork Door Surfaces:
  1. Finish tops, bottoms, and edges before faces.
  2. Finish architectural woodwork doors with no hardware applied to doors.
- D. Softwood Components:
  1. Where Douglas Fir serves as a component part (shelves, backs, etc) of hardwood cabinets, use same specification as for hardwood finish, but as sufficient 1:1 mix of sanding sealer / Mineral spirits with stain to make color of Pine or Douglas Fir grains approximate color of finish hardwood.
  2. Coat interior surfaces of Drawers with one (1) coat high gloss urethane varnish.

## **END OF SECTION**

**SECTION 09 9413****INTERIOR TEXTURED FINISHING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and apply texturing on walls and ceilings as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 09 2900: 'Gypsum Board' for priming.
  - 2. Section 09 9001: 'Common Painting And Coating Requirements' for:
    - a. Pre-installation conference for Sections under 09 9000 heading 'Paints and Coatings'.
  - 3. Section 09 9123: 'Interior Painted Gypsum Board, Plaster' for finish painting.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Drywall Texture: Compound rolled, sprayed, or troweled onto sheetrock after taping and floating of joints is complete. Uses same material as joint compound, but thinned down with water and applied to wall surface:
    - a. Light Orange Peel: Sprayed texture leaves light splatter on walls. Resembles peel of orange. If done with fine spray, can be one of the lightest, least noticeable of the texture styles.
    - b. Smooth - Smooth application of texture over sheetrock wall that feathers out sheetrock joints, and creates even, non-textured wall.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conferences:
  - 1. Participate in pre-installation conference as specified in Section 09 9001.
  - 2. In addition to agenda items specified in Section 01 3100 and Section 09 9001, review following:
    - a. Review control samples.

**1.4 SUBMITTALS**

- A. Action Submittals:
  - 1. Samples:
    - a. Light Orange Peel Texture:
      - 1) Provide minimum of three (3) 24 inch square control samples on primed gypsum wallboard of 'light orange peel' texture to show possible variations.

**1.5 QUALITY ASSURANCE**

- A. Field Samples:
  - 1. Before performing work of this Section, prepare control samples.
  - 2. Architect will inspect control sample at pre-installation conference following preparation of control sample. When sample is approved, work of this Section may proceed. Approved samples will be kept at site at all times work of this section is being performed.

**PART 2 - PRODUCTS****2.1 SYSTEM**

- A. Manufacturers:
  - 1. Manufacturer Contact List:
    - a. National Gypsum, Charlotte, NC [www.nationalgypsum.com](http://www.nationalgypsum.com).
    - b. U S Gypsum Co, Chicago, IL [www.usg.com](http://www.usg.com).
- B. Materials:
  - 1. Class Two Quality Standards: See Section 01 6200.
    - a. ProForm Perfect Spray EM/HF by National Gypsum.
    - b. Sheetrock Wall & Ceiling Texture by U S Gypsum.

**PART 3 - EXECUTION****3.1 APPLICATION**

- A. Location:
  - 1. Walls:
    - a. Light Orange Peel Texture:
      - 1) All areas except those listed in following paragraph.
    - b. Smooth:
      - 1) Restrooms. Mechanical Rooms, Storage Rooms, and other Utility Areas.
  - 2. Ceilings:
    - a. Light Orange Peel Texture:
      - 1) High Council Rooms Areas where there is exposed gypsum board (includes soffit and fascia of coffered area at perimeter).
    - b. Smooth Finish (no applied texture) to be applied to the following ceilings:
      - 1) Mechanical Rooms, Storage Rooms, and other Utility Areas.
      - 2) Restrooms.
- B. Finishing:
  - 1. Light Orange Peel Texture:
    - a. After gypsum board is taped, sanded, and primed, apply texture. Closely match samples accepted by Architect.
  - 2. Smooth:
    - a. After gypsum board is taped, sanded, and primed, apply texture.

**END OF SECTION**



**SECTION 10 1116****FIXED MARKERBOARDS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Installed But Not Supplied Under This Section:
  - 1. Markerboard units: Visual Display Board Type 3.
- B. Related Requirements:
  - 1. Section 01 6400: Owner will furnish Markerboards. PART 2 of this Section establishes quality of materials for information of Contractor, Architect, and Owner's Representatives.
  - 2. Section 06 1100: 'Wood Framing' for blocking.
  - 3. Section 06 2001: 'Common Finish Carpentry Requirements' for installation.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. Porcelain Enamel Institute, Inc., Norcross, GA [www.porcelainenamel.com](http://www.porcelainenamel.com).
    - a. PEI-1002, *Manual and Performance Specifications for Porcelain Enamel Writing Surfaces (Whiteboards and Chalkboards)* 2002.

**1.3 SUBMITTALS**

- A. Informational Submittals:
  - 1. Manufacturer Instructions:
    - a. Published installation instructions.
    - b. Printed cleaning instructions.
- B. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Operations and Maintenance Data:
      - 1) Maintenance instructions.
      - 2) Printed cleaning instructions.
    - b. Warranty Documentation:
      - 1) Manufacturer Warranty.
    - c. Record Documentation:
      - 1) Manufacturer's documentation:
        - a) Manufacturer's product literature.

**1.4 WARRANTY**

- A. Manufacturer Warranty:
  - 1. Letter from Manufacturer certifying Contract Documents have been complied with and guarantee against faulty workmanship and materials for five (5) years.

**PART 2 - PRODUCTS****2.1 OWNER FURNISHED PRODUCTS**

- A. Category Two National Contract Manufacturers. See Section 01 6200 for definitions of Categories:
  - 1. ADP Lemco Corporation, West Jordan, UT [www.adplemco.com](http://www.adplemco.com).
- B. Description:

1. Color: White.

C. Markerboard:

1. Face shall be steel, **28 ga** minimum, coated two (2) sides with fused ground coat, and finished one (1) side with vitreous porcelain enamel.
2. Coatings shall meet requirements of PEI-1002:
  - a. All Rooms:
    - 1) Coatings shall be for marker use.
3. Core shall be mat-formed particleboard.
  - a. **3/8 inch** thick medium-density.
  - b. **1/2 inch** thick low-density minimum.
4. Backing:
  - a. Backing shall be **0.005 inch** minimum aluminum foil.
5. Trim:
  - a. Extruded 6063-T5 alloy aluminum with satin etched, natural aluminum anodized finish.
  - b. Extrusions shall match thickness of units without wedging.
  - c. Round all sharp edges.
  - d. **2 inch** ( high map rail.
6. Trays:
  - a. Provide **2 inch** radius rounded ends on marker trays.
  - b. Marker trays with squared, sharp ends are not acceptable.
7. Map Clips:
  - a. Manufacturer's standard.
  - b. Provide two map clips on markerboards.
8. Mounting Hardware:
  - a. Suitable for wall conditions.

D. Fabrication:

1. Prefabricate units at factory and ship to jobsite in one piece, except for marker trays.
2. Units shall be of first quality and lamination done by approved standards of industry.
3. Furnish printed cleaning instructions with each shipment.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Mount boards square and level.
  1. Shim as necessary to provide permanent installation and smooth operation.
  2. Anchor boards securely to wall following Manufacturer's printed installation instructions.
  3. Anchor concealed hangers with screws at **24 inches** on center.
- B. Mounting fasteners shall penetrate framing lumber or blocking **1-1/2 inch** minimum. Use toggle bolts or expansion bolts in masonry walls.
- C. After attaching map clips, apply permanently attached end cap or screw to prevent removal of map clips.

**END OF SECTION**

**SECTION 10 1123****FIXED TACKBOARDS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Installed But Not Supplied Under This Section:
  - 1. Tackboards and specified hardware: Visual Display Board Type 2.
- B. Related Requirements:
  - 1. Section 01 6400: Owner will furnish Tackboards. PART 2 of this Section establishes quality of materials for information of Contractor, Architect, and Owner's Representatives.
  - 2. Section 06 1100: 'Wood Framing' for blocking.
  - 3. Section 06 2001: 'Common Finish Carpentry Requirements' for installation.

**1.2 REFERENCES**

- A. Reference Standard:
  - 1. ASTM International:
    - a. ASTM E84-14, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
  - 2. Federal Specifications and Standards:
    - a. FS CCC-W-408D Wall Covering, Vinyl-Coating / 14 Jan 1994 (amended 18 Dec 2003).

**1.3 SUBMITTALS**

- A. Informational Submittals:
  - 1. Manufacturer Instructions:
    - a. Published installation instructions.
    - b. Printed cleaning instructions.
- B. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Operations and Maintenance Data:
      - 1) Maintenance instructions.
      - 2) Printed cleaning instructions.
    - b. Warranty Documentation:
      - 1) Manufacturer Warranty.
    - c. Record Documentation:
      - 1) Manufacturer's documentation:
        - a) Manufacturer's product literature.
        - b) Color selection.

**1.4 WARRANTY**

- A. Manufacturer Warranty:
  - 1. Letter from Manufacturer certifying Contract Documents have been complied with and guarantee against faulty workmanship and materials for five years.

**PART 2 - PRODUCTS****2.1 OWNER FURNISHED PRODUCTS**

- A. Manufacturer:
  - 1. Category Two National Contract Manufacturers. See Section 01 6200 for definitions of Categories:
    - a. ADP Lemco Corporation, West Jordan, UT [www.adplemco.com](http://www.adplemco.com).
- B. Description:
  - 1. Color:
    - a. Sterling.
- C. Tackboard:
  - 1. **1/4 inch** natural cork faced with **15 oz** cloth supported vinyl meeting requirements of Federal Specifications and Standards FS CCC-W-408 Type 2 (medium duty) and UL rated for 25 flame spread minimum when tested in accordance with the requirements of ASTM E84.
  - 2. Backing:
    - a. C-D grade plugged and touch sanded plywood or particle board, back primed or foil covered.
  - 3. Trim:
    - a. Extruded 6063-T5 alloy aluminum with satin etched, natural aluminum anodized finish.
    - b. Extrusions shall match thickness of units without wedging.
    - c. Round all sharp edges.
    - d. **2 inch** high map rail.
  - 4. Map Clips:
    - a. Manufacturer's standard.
    - b. Provide two map clips on each tackboard.
  - 5. Mounting Hardware:
    - a. Suitable for wall conditions.
- D. Fabrication:
  - 1. Prefabricate units at factory and ship to jobsite in one piece.
  - 2. Units shall be of first quality and lamination done by approved standards of industry.
  - 3. Furnish printed cleaning instructions with each shipment.

**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Mount boards square and level.
  - 1. Shim as necessary to provide permanent installation.
  - 2. Anchor boards securely to wall following Manufacturer's printed installation instructions.
  - 3. Anchor concealed hangers with screws at **24 inches** on center.
- B. Mounting fasteners shall penetrate framing lumber or blocking **1-1/2 inch** minimum. Use toggle bolts or expansion bolts in masonry walls.
- C. After attaching map clips, apply permanently attached end cap or screw to prevent removal of map clips.

**END OF SECTION**

**SECTION 10 1495****MISCELLANEOUS INTERIOR SIGNAGE****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Installed But Not Furnished Under This Section:
  - 1. Owner-furnished interior signs.
- B. Related Requirements:
  - 1. Section 01 6400: Owner will furnish designated interior signs. This Section establishes quality of materials and installation for information of Contractor, Architect, and Owner's Representatives.

**PART 2 - PRODUCTS****2.1 OWNER FURNISHED PRODUCTS**

- A. Category Four Approved Standard Interior Signs. See Section 01 6200 for definitions of Categories:
  - 1. Visual Identity Office:
    - a. Contact Information:
      - 1) 50 E. North Temple St. Rm. 2350, Salt Lake City, UT 84150-3232.
      - 2) Phone: 1-801-240-1302.
      - 3) Fax: 1-801-240-5997.
      - 4) [vidoffice@ldschurch.org](mailto:vidoffice@ldschurch.org).
  - 2. Room Signs: Molded clear acrylic sub-surface graphics sign with set-screw to attach to included mounting bracket.
    - a. Provide tactile / braille features in signage.
  - 3. Cabinet Door Signs: Flat clear acrylic sub-surface graphics sign with mounting adhesive in position.
  - 4. Color:
    - a. Background: Blue.
    - b. Lettering: White.

**2.2 MANUFACTURED UNITS**

- A. Signs:
  - 1. Class Two Quality Standards. See Section 01 6200.
    - a. Match existing:
    - b. Room And Cabinet Door Signs: Flat clear acrylic sub-surface graphics sign with mounting adhesive in position.
    - c. Color:
      - 1) Background: Brown.
      - 2) Lettering: Gold.

**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Install interior signs square and plumb:
  - 1. Room Signs:

- a. Install bracket using two screws. Use proper anchor for substrate.
  - b. Attach sign to bracket using set-screw.
  - c. Mount signs as described in Contract Drawings.
2. Cabinet Signs:
- a. Remove adhesive protective layer.
  - b. Position sign correctly and apply to door.
  - c. Roll sign to secure to door, taking care not to damage sign.
  - d. Mount signs as described in Contract Drawings.

**END OF SECTION**

**SECTION 10 2113****METAL TOILET COMPARTMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install metal toilet compartments as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 06 1100: 'Wood Framing' for blocking in wood framing for compartment installation and door bumper.
  - 2. Section 06 1100: 'Wood Framing' for blocking in wood framing for compartment installation, ceiling support for urinal partitions, and door bumper.
  - 3. Section 10 2813: 'Commercial Toilet Accessories'.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Stainless Steel: Stainless steels are alloys of iron to which at least 10 percent chromium has been added to increase corrosion resistance and will not rust when exposed to weather. To obtain greater corrosion resistance, more nickel and chromium are added to the alloy. Along with iron and chromium, all stainless steels contain some carbon to make it stronger.
    - a. Stainless Steel Alloys:
      - 1) Type 304 (UNS S30400): Austenitic stainless steel with non-magnetic properties in annealed condition that provide good corrosion resistance to both chemical and atmospheric exposures, with high resistance to oxidations. Most common and widely used stainless steel.
- B. Reference Standards:
  - 1. ASTM International:
    - a. ASTM A167-99(2009), 'Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.'
    - b. ASTM A484/A484M-12, 'Standard Specification for General Requirements for Stainless Steel Bars, Billets, and Forgings'.

**1.3 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Color selection.
- B. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Warranty Documentation:
      - 1) Final, executed copy of Warranty.
    - b. Record Documentation:
      - 1) Manufacturers documentation:
        - a) Manufacturer's literature or cut sheet.
        - b) Color selection.

**1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery And Acceptance Requirements:
  - 1. Materials shall be delivered in original, unopened packages with labels intact.
- B. Storage And Handling Requirements:
  - 1. Store and handle in compliance with Manufacturer's instructions and recommendations.

**1.5 WARRANTY**

- A. Manufacturer Warranty:
  - 1. Manufacturer's standard warranty.

**PART 2 - PRODUCTS****2.1 MANUFACTURERS**

- A. Type One Acceptable Manufacturers:
  - 1. Accurate Partitions Inc, Lyons, IL [www.accuratepartitions.com](http://www.accuratepartitions.com).
  - 2. AMPCO Products Inc, Miami, FL [www.ampco.com](http://www.ampco.com).
  - 3. Columbia Partitions, Columbia, SC [www.psisc.com](http://www.psisc.com).
  - 4. Flush-Metal Partition Corp, Maspeth, NY [www.flushmetal.com](http://www.flushmetal.com).
  - 5. Global Steel Products Corp, Eastanollee, GA [www.globalpartitions.com](http://www.globalpartitions.com).
  - 6. Hadrian Inc, Mentor, OH [www.hadrian-inc.com](http://www.hadrian-inc.com).
  - 7. Knickerbocker Partitions Corp, Freeport, NY [www.knickerbockerpartition.com](http://www.knickerbockerpartition.com).
  - 8. Metpar, Westbury, NY [www.metpar.com](http://www.metpar.com).
  - 9. Equal as Approved by Architect before bidding. See Section 01 6200.

**2.2 MANUFACTURED UNITS**

- A. Toilet And Miscellaneous Partitions:
  - 1. Floor-mounted, overhead-braced.
  - 2. Panels:
    - a. Galvanized bonderized steel sheets (minimum 0.00015 inch zinc coating).
    - b. Edges bound interlocked with drawn molding welded on corners.
    - c. Corners welded and ground smooth.
    - d. Sound deadening honeycomb core.
    - e. Provide wood blocking on all panels that have grab bars.
    - f. Gauge:
      - 1) Doors: 22 ga minimum.
      - 2) Panels: 22 ga minimum.
      - 3) Pilasters: 22 ga minimum.
      - 4) Screens: 22 ga minimum.
  - 3. Posts:
    - a. 20 ga minimum of same construction and finish as panels.
  - 4. Headrails:
    - a. Aluminum.
    - b. 20 ga minimum of same construction and finish as panels.
    - c. Anti-grip design.
  - 5. Plinths:
    - a. 20 ga Type 304 stainless steel, Number 4 finish.
    - b. 3 inch minimum high, secured with concealed clips.
    - c. All fasteners used to attach Plinths, Posts and Pilasters to the floor shall be Type 304 stainless steel.
  - 6. Anchorages and fasteners:



- a. Concealed: Non-corrosive, protective finish.
- b. Tamper resistant Torx Head with pin screws.
- 7. Hardware:
  - a. Each door:
    - 1) Gravity type hinges with double handed, nylon bottom cam, adjustable for partial door closing position, bottom hinge finished flush with door bottom.
    - 2) Sliding or concealed door bolt with emergency access.
    - 3) Door strike and keeper with rubber bumper.
    - 4) Coat hook / door bumper.
  - b. Finish: Chrome plated.
  - c. Meet requirements of ASTM B86, Alloy AG 40A.
- B. Urinal Partition:
  - 1. Basic construction same as panels above, floor mounted
  - 2. Width to be **16 inches** minimum.

## 2.3 FINISHES

- A. Finish And Color:
  - 1. Powder-coated paint finish.
  - 2. Class One Color Quality Standards. See Section 01 6200.
- a. As selected by Architect to match existing.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification Of Conditions:
  - 1. Field verify dimensions.
  - 2. Verify that necessary blocking has been installed in framed walls for partition installation and for place where coat hook / door bumper will strike wall.

### 3.2 INSTALLATION

- A. Install pilasters rigid, plumb, and level. Maintain proper door openings. Anchor pilaster to floor with Type 304 stainless steel fasteners embedded **2 inches** into concrete slab below setting bed.
- B. Secure panels to walls with two stirrup brackets minimum attached near top and bottom of each panel. Use fasteners of length to provide **one inch** embedment into blocking or masonry.
- C. Secure overhead brace to face sheets with two fasteners minimum per face. Set door tops parallel with brace. Set door bottom **12 inches** above floor.
- D. Plinth to be level with and snug to floor.

### 3.3 FIELD QUALITY CONTROL

- A. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
  - 1. Correct any work found defective or not complying with contract document requirements at no additional cost to the Owner.
  - 2. Replace damaged or severely scratched materials with new materials at no additional cost to the Owner.

**3.4 ADJUSTING**

- A. Lubricate hardware as recommended by Manufacturer.
- B. Set hinges on out-swinging doors to return to nearly closed position.
- C. Perform final adjustments to pilaster leveling devices, door hardware, and other operating parts of partition assembly just before Substantial Completion.

**3.5 CLEANING**

- A. Remove protective masking. Clean exposed surfaces of partitions, hardware, fittings, and accessories.
- B. Touch-up minor scratches and other finish imperfections using materials and methods recommended by Manufacturer.

**END OF SECTION**

**SECTION 10 2813****COMMERCIAL TOILET ACCESSORIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Included But Is Not Limited To:
  - 1. Selected accessories for Rest Rooms:
    - a. Grab Bars.
    - b. Mirrors.
    - c. Sanitary Napkin Disposal Container.
    - d. Shelf.
    - e. Single Robe Hook.
- B. Related Requirements:
  - 1. Section 06 1100: 'Wood Framing' for blocking.
  - 2. Section 06 2001: 'Common Finish Carpentry Requirements' for installation.
- C. Products Furnished But Not Installed Under This Section:
  - 1. Selected accessories for Rest Rooms:
    - a. Automatic touchless towel dispensers.
    - b. Soap dispensers.
    - c. Toilet tissue dispensers.
- D. Related Requirements:
  - 1. Section 01 1200: 'Multiple Contract Summary' soap dispensers, paper towel dispensers, and toilet tissue dispensers furnished and installed by Owner (FM Group).

**1.2 REFERENCES**

- A. Association Publications:
  - 1. United States Access Board:
    - a. Americans with Disabilities Act (ADA):
      - 1) ADA Standards:
        - a) ADA Accessibility Guidelines (ADAAG) (2004 or latest version).
- B. Definitions:
  - 1. Stainless Steel: Stainless steels are alloys of iron to which at least 10 percent chromium has been added to increase corrosion resistance and will not rust when exposed to weather. To obtain greater corrosion resistance, more nickel and chromium are added to the alloy. Along with iron and chromium, all stainless steels contain some carbon to make it stronger.
    - a. Austenitic Stainless Steel: Most popular of the stainless steels because of their ductility, ease of working and good corrosion resistance. Widely known as the 300 series.
  - 2. Stainless Steel Alloys:
    - a. Type 304 (UNS S30400): Austenitic stainless steel with non-magnetic properties in annealed condition that provide good corrosion resistance to both chemical and atmospheric exposures, with high resistance to oxidations. Most common and widely used stainless steel.
- C. Reference Standards:
  - 1. ASTM International:
    - a. A153/A153M-09, 'Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware'.

- b. ASTM A653/A653M-13, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
  - c. ASTM A666-15, 'Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar'.
  - d. ASTM C1036-11, 'Standard Specification for Flat Glass'.
  - e. ASTM F446-85(2009), 'Standard Consumer Safety Specification for Grab Bars and Accessories Installed in the Bathing Area'.
- 2. International Code Council / American National Standards Institute:
    - a. ICC/ANSI A117.1-2009, 'Accessible and Usable Buildings and Facilities'.
  - 3. International Standard Organization:
    - a. ISO 25537:2008, 'Glass in Building - Silvered Flat Glass Mirror'.

### 1.3 SUBMITTALS

- A. Action Submittals:
  - 1. Product Data:
    - a. Manufacturer's product data sheets indicating operating characteristics, materials and finishes.
    - b. Mounting requirements and rough-in dimensions.
  - 2. Shop Drawings:
    - a. Schedule showing items used, location where installed, and proper attaching devices for substrate.
- B. Informational Submittals:
  - 1. Manufacturers' Instructions:
    - a. Provide operation, care and cleaning instructions.
- C. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Warranty Documentation:
      - 1) Final, executed copy of Warranty for each product.
    - b. Record Documentation:
      - 1) Manufacturers documentation:
        - a) Manufacturer's literature or cut sheets.

### 1.4 QUALITY ASSURANCE

- A. Source Limitations:
  - 1. For products listed together in same Part 2 articles, obtain products from single source from single manufacturer.

### 1.5 WARRANTY

- A. Manufacturer Warranty:
  - 1. Manufacturer's standard warranty.
- B. Special Mirror Warranty:
  - 1. Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage or frame corrosion defects within specified warranty period:
    - a. Warranty Period: fifteen (15) years from date of Substantial Completion.

**PART 2 - PRODUCTS****2.1 OWNER FUNISHED PRODUCTS**

- A. Furnish and Install by Owner:
  - 1. Automatic Touchless Towel Dispensers:
    - a. Mount Towel Dispenser in 'Recessed Waste Receptacle Cabinet'.
    - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories: Georgia-Pacific enMotion model no. 59460:
      - 1) Size: 14.8 inches wide x 9.75 inches deep x 16.75 inches high.
      - 2) Power source: battery.
      - 3) Color: splash blue.
  - 2. Soap dispensers.
  - 3. Toilet tissue dispensers.

**2.2 MANUFACTURED UNITS**

- A. Manufacturers:
  - 1. Manufacturer Contact List:
    - a. AJW Architectural Products, A&J Washroom Accessories, Inc., New Windsor, NY [www.ajwashroom.com](http://www.ajwashroom.com).
    - b. American Specialties Inc (ASI), Yonkers, NY [www.americanspecialties.com](http://www.americanspecialties.com).
    - c. Bobrick Washroom Equipment Inc, North Hollywood, CA [www.bobrick.com](http://www.bobrick.com) or Bobrick Washroom Equipment of Canada Ltd, Scarborough, ON (416) 298-1611.
    - d. Bradley Corp, Menomonee Falls, WI [www.bradleycorp.com](http://www.bradleycorp.com).
    - e. General Accessory Manufacturing Co (GAMCO), Durant, OK [www.gamcousa.com](http://www.gamcousa.com).
- B. Materials:
  - 1. Design Criteria:
    - a. Stainless Steel: ASTM A666 Type 304 (18-8); satin finish exposed surfaces unless otherwise indicated.
    - b. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after fabrication.
    - c. Fasteners:
      - 1) Exposed: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant.
      - 2) Concealed: Galvanized Steel.
  - 2. Rest Rooms:
    - a. Mirrors:
      - 1) Channel-Frame Mirror:
        - a) Frame: Type 304 or Type 430, 20 gauge stainless steel channel frame.
        - b) Roll-formed one piece construction.
        - c) Exposed surfaces have #4 satin finish.
        - d) Edges and corners are burr free.
        - e) Glass: 1/4 inch silver coated and hermetically sealed. Guaranteed for 15 years against silver spoilage. Mirrors meet ASTM C1036 requirements.
        - f) Concealed surface mounted wall hanger.
      - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
        - a) AJW Architectural Products: Model U711.
        - b) American Specialties (ASI): Model 0620.
        - c) Bobrick: Model B-165.
        - d) Bradley: Model 781.
        - e) General Accessory (GAMCO): Model C Series.
    - b. Sanitary Napkin Disposal Container:
      - 1) Design Criteria:
        - a) Surface mounted type 304, 22 gauge stainless steel with #4 satin finish. Seamless construction with radius and hemmed edges.

- b) Stainless steel piano hinge.
- 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
  - a) AJW Architectural Products: Model U590.
  - b) American Specialties (ASI): Model 0852.
  - c) Bobrick: Model B-270.
  - d) Bradley: Model 4781-15.
  - e) General Accessory (GAMCO): Model ND-1.
- c. Single Robe Hook:
  - 1) Surface mounted type 304, 22 gauge stainless steel with #4 satin finish.
  - 2) Concealed mounting bracket.
  - 3) Stainless steel locking setscrew on bottom.
  - 4) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a) AJW Architectural Products: Model UX110SF.
    - b) American Specialties (ASI): Model 7340-S.
    - c) Bobrick: Model B6717.
    - d) Bradley: Model 9114.
    - e) General Accessory (GAMCO): Model 76717.
- d. Grab Bars:
  - 1) Configuration shown on Contract Drawings. Include center support for longer lengths when required:
  - 2) Design Criteria:
    - a) Comply with ADA guidelines and ADAAG accessible design for structural strength and local and state codes.
    - b) Concealed mount.
    - c) 18 ga type 304 stainless steel tubing.
    - d) 1-1/2 inch diameter.
    - e) Provide center support when required.
    - f) Snap-on flange covers.
    - g) Peened (non-slip) finish.
    - h) Sustain loads in excess of 900 lbs.
  - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a) AJW Architectural Products: Model UG3 Series.
    - b) American Specialties (ASI): Model 3800 Series.
    - c) Bobrick: Model B-6806 Series.
    - d) Bradley: Model 812 Series.
    - e) General Accessory (GAMCO): Model 150 Series.
- e. Shelf:
  - 1) Design Criteria:
    - a) 18 ga, stainless steel with No. 4 Satin finish.
    - b) 6 inches wide.
  - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a) AJW Architectural Products: Model U776.
    - b) American Specialties (ASI): Model 0692.
    - c) Bobrick: Model B-296.
    - d) Bradley: Model 756.
    - e) General Accessory (GAMCO): Model S-6.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with ADA Accessibility Guidelines and installation heights as shown on Contract Drawings.
- B. Assemble fixtures and associated fittings and trim in accordance with manufacturer's instructions.
- C. Install using mounting devices proper for base structure.

- D. Install equipment level, plumb, and firmly in place in accordance with manufacturer's rough-in drawings.
- E. Where possible, mount like items in adjoining compartments back-to-back on same partition.
- F. Grab Bars:
  - 1. Install as per Manufacturers written installation instructions.
  - 2. Install grab bars to withstand downward force of not less than 250 lbf per ASTM F446.

### **3.2 REPAIR**

- A. Repair or replace defective work, including damaged equipment and components.
- B. Repair or replace malfunctioning equipment, or equipment with parts that bind or are misaligned.

### **3.3 CLEANING**

- A. Clean unit surfaces, and leave in ready-to-use condition.

### **3.4 ADJUSTING**

- A. Test each piece of equipment provided with moving parts to assure proper operation, freedom of movement, and alignment. Install new batteries in battery-powered items.

### **3.5 CLOSEOUT ACTIVITIES**

- A. Turn over keys, tools, maintenance instructions, and maintenance stock to Owner.

**END OF SECTION**

**BLANK PAGE**



**SECTION 10 2814****BABY-CHANGING STATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Section Includes But Is Not Limited To:
  - 1. Coordination and sequencing of Owner-Furnished baby-changing station as described in Contract Documents.
- B. Products Installed But Not Supplied Under This Section:
  - 1. Baby-changing station.
- C. Related Sections:
  - 1. Section 01 6400: 'Owner-Furnished Products', Owner will furnish baby-changing station. PART 2 PRODUCTS of this Section establishes quality of materials for information of Contractor, Architect, and Owner's representatives.
  - 2. Section 06 1100: 'Wood Framing' for blocking in wood stud framed walls for baby-changing stations.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. American National Standards Institute:
    - a. ANSI Z535.4-2011. 'Product Safety Signs and Labels'.
  - 2. ASTM International:
    - a. ASTM G21-13, 'Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi'.
    - b. ASTM F2285-04(2010), 'Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use'.
  - 3. International Code Council / American National Standards Institute:
    - a. ICC/ANSI A117.1-2009, 'Accessible and Usable Buildings and Facilities'.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate the efforts of various trades affected by Work of this Section.
  - 2. Coordinate completions of solid blocking in walls.
- B. Sequencing:
  - 1. Install baby-changing stations after following has been completed:
    - a. Adjacent walls and ceilings are finished and painted.

**1.4 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Provide product literature or cut sheet on baby-changing station.
- B. Informational Submittals:
  - 1. Certificates:
    - a. Manufacturer to provide \$10,000,000 minimum 'Certificate of Liability Insurance' policy.

- 1) Policy on file at Church Headquarters. For questions, notify Mark Douglass at [markdouglass@ldschurch.org](mailto:markdouglass@ldschurch.org).
2. Manufacturer Instructions:
  - a. Printed installation instructions.
- C. Closeout Submittals:
  1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Warranty Documentation:
      - 1) Include copy of final, executed warranty for defects in material and workmanship.
    - b. Record Documentation:
      - 1) Manufacturers Documentation:
        - a) Manufacturer's literature or cut sheets.

## 1.5 WARRANTY

- A. Manufacturer Warranty:
  1. Manufacturer's standard warranty for baby-changing station to be free from defects in material and workmanship under normal use and service, with proper maintenance, for five (5) years.

## PART 2 - PRODUCTS

### 2.1 OWNER-FURNISHED PRODUCTS

- A. Category Two National Contract Manufacturers. See Section 01 6200 for definition of Categories.
  1. Koala, Denver, CO [www.koalabear.com](http://www.koalabear.com).
- B. Baby Changing Station:
  1. Description:
    - a. Molded high impact polyethylene with integral straps for securing baby.
  2. Design Criteria:
    - a. Manufacture to provide 'Certificate of Liability Insurance' policy.
    - b. Surface mounted.
    - c. Child protection straps.
    - d. Antimicrobial bed surface
    - e. Support **200 lbs** with minimal deflection.
    - f. Meet ADA regulations of ICC/ANSI A117.1 when properly installed.
    - g. Conform to ANSI Z535.4 for safety signs and labels, ASTM G21 for antifungal standards, and ASTM F2285 for consumer safety performance standard.
  3. Approved Products. See Section 01 6200 for definition of Categories:
    - a. Horizontal: Koala Kare model number KB200 by Koala.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification Of Conditions:
  1. Verify that solid blocking has been installed in wall framing where changing station is to be installed.
  2. Do not install unit by any other means other than screws or lag bolts into solid blocking.

### 3.2 INSTALLATION

- A. Install items in accordance with Manufacturer's submitted, written instructions for screws or lag bolts into solid substrate capable of supporting **200 lbs**. Install using mounting devices proper for base structure.

**END OF SECTION**

**SECTION 10 4400**  
**FIRE PROTECTION SPECIALTIES**

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. Wall hung extinguishers and brackets.
  - 2. Extinguishers with cabinets.
- B. Related Requirements:
  - 1. Section 06 1100: 'Wood Framing' for blocking in wood-framed walls.
  - 2. Section 06 2001: 'Common Finish Carpentry Requirements' for installation.
  - 3. Section 09 2216: 'Non-Structural Metal Framing' for blocking in metal-framed walls.

**1.2 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Manufacturer's literature or cut sheets for cabinets and extinguishers.
- B. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Warranty Documentation:
      - 1) Include copy of final, executed warranty.
    - b. Record Documentation:
      - 1) Testing and Inspection Reports:
        - a) Testing Agency Inspecting Reports of Drilled-In Mechanical Anchors / Adhesive Anchors / Screw Anchors.

**1.3 QUALITY ASSURANCE**

- A. Regulatory Agency Sustainability Approvals:
  - 1. Fire extinguishers shall be inspected and have annual inspection tag attached before Substantial Completion.

**1.4 WARRANTY**

- A. Manufacturer Warranty:
  - 1. Manufacturer's standard, written warranty on fire extinguisher.

**PART 2 - PRODUCTS**

**2.1 EQUIPMENT**

- A. Manufacturers:
  - 1. Fire Extinguishers:
    - a. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.

- 1) Amerex Corp, Trussville, AL [www.amerex-fire.com](http://www.amerex-fire.com).
  - 2) Ansul Incorporated, Marinette, WI [www.ansul.com](http://www.ansul.com).
  - 3) Buckeye Fire Equipment, Kings Mountain, NC [www.buckeyef.com](http://www.buckeyef.com).
  - 4) Extinguishers private-labeled by manufacturers approved above are approved, with appropriate documentation.
2. Cabinets And Brackets:
    - a. Type One Acceptable Manufacturers:
      - 1) J L Industries, Bloomington, MN [www.jlindustries.com](http://www.jlindustries.com).
      - 2) Larsen's Manufacturing Co, Minneapolis, MN [www.larsensmfg.com](http://www.larsensmfg.com).
      - 3) Modern Metal Products / Technico, Owatonna, MN [www.modern-metal.com](http://www.modern-metal.com).
      - 4) National Fire Equipment Ltd, Scarborough, ON [www.nationalfire.com](http://www.nationalfire.com).
      - 5) Potter-Roemer, Cerritos, CA [www.potterroemer.com](http://www.potterroemer.com).
      - 6) Samson Products Inc, City of Commerce, CA [www.samsonproducts.com](http://www.samsonproducts.com).
      - 7) Seton Inc, Richmond Hill, ON (905) 764-1122.
      - 8) Equal as approved by Architect before bidding. See Section 01 6200.
- B. Type One Acceptable Distributors:
    1. W.W. Grainger, Inc., Lake Forest, IL [www.grainger.com](http://www.grainger.com).
    2. Equal as approved by Architect before bidding. See Section 01 6200.
- C. Fire Extinguishers:
    1. Design Criteria:
      - a. Ten pound dry chemical ABC stored pressurized type equipped with pressure gauge and which does not need recharging except after use.
      - b. Instructions for repairs, maintenance, and recharging shall be attached.
      - c. Unit shall be tested and approved by UL and have minimum 4A:60-B:C UL rating. UL rating shall appear on extinguisher labels and be attached to and a part of fire extinguisher units.
- D. Fire Extinguisher Cabinets:
    1. Design Criteria:
      - a. Two-piece, semi-recessed or flush type depending on wall thickness, and have white baked enameled steel tubs with white baked enamel return trim and doors, clear acrylic glazing, 'Safe-T-Lock,' and cylinder locks.
      - b. Supply each cabinet with one specified fire extinguisher.
    2. Type One Acceptable Manufacturers:
      - a. Basis of Design Product: Ambassador 1017 G10 by J L Industries.
      - b. Equal as approved by Architect before bidding from Acceptable Manufacturer's equivalent product. See Section 01 6200.
- E. Wall-Mounted Brackets:
    1. Design Criteria:
      - a. Heavy duty with minimum of double strap/bracket.
    2. Category Four Approved Bracket. See Section 01 6200 for definitions of Categories:
      - a. Basis of Design Product: No. 846 by Larsen's.
      - b. Equal as approved by Architect before bidding from Approved Manufacturer's equivalent product.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Special Techniques:
  1. Securely mount cabinets and hangers plumb with wall surfaces.
  2. Trim for cabinets shall be neat in appearance.

**END OF SECTION**

**SECTION 12 2200****CURTAINS AND DRAPES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To
  - 1. Furnish and install draperies, curtains, and hardware as described in Contract Documents.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Flame-proofing: Process of treating materials chemically so that they will not support combustion.
  - 2. Inherently Flame Resistant: Material that meets requirements set forth in NFPA 701. Inherently flame resistant fabric is woven from fibers that are non-combustible for life of material.
- B. Reference Standards:
  - 1. National Fire Protection Association:
    - a. NFPA 701, 'Methods of Fire Tests for Flame Propagation of Textiles and Films' (2015 Edition).

**1.3 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Flame-proofing literature.
  - 2. Samples:
    - a. **24 inch** wide and **48 inch** high sample including all specified elements of finished curtains, including flame retardant certification tag. Do not fabricate Project drapes until sample has been reviewed and approved by Architect.
    - b. Submit sample with Product Data submittal. Sample will serve as standard by which to evaluate Project curtains.
- B. Informational Submittals:
  - 1. Certificates:
    - a. Certificate of flame proofing.
  - 2. Qualification Statement:
    - a. Fabricator / Installer:
      - 1) Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Operations and Maintenance Data:
      - 1) Operating and maintenance instructions.
    - b. Record Documentation:
      - 1) Manufacturers documentation:
        - a) Fabric Supplier's literature or cut sheets on fabric.
        - b) Curtain Rod Manufacturer's literature or cut sheets.
        - c) Color and style selection.
        - d) Certificate of flame-proofing.

**1.4 QUALITY ASSURANCE**

- A. Regulatory Agency Sustainability Approvals:
  - 1. Material used shall be inherently flame retardant with a flame spread rating meeting code requirements when tested in accordance with NFPA 701.
  - 2. Attach permanent tag to each panel attesting to flame retardant quality of material used.
- B. Qualifications:
  - 1. Fabricator / Installer: Requirements of Section 01 4301 applies, but not limited to following:
    - a. Minimum three (3) satisfactorily completed installations of comparable quality, scope, similar size, and complexity in past two (2) years before bidding.
    - b. Upon request, submit documentation.

**PART 2 - PRODUCTS****2.1 ASSEMBLIES**

- A. Manufacturers / Suppliers:
  - 1. Carole, Augusta, GA [www.carolefabrics.com](http://www.carolefabrics.com).
  - 2. Charles Samulsen, New York City, NY [www.csamelson.com](http://www.csamelson.com).
  - 3. Conso / Wright, West Warren, MI [www.conso.com](http://www.conso.com).
  - 4. Coral, Div Charles Samelson, New York City, NY [www.coralofchicago.com](http://www.coralofchicago.com).
  - 5. Fred Krieger & Co. Inc., Jericho, NY [www.fredkriegerfabrics.com](http://www.fredkriegerfabrics.com).
  - 6. Graber Div of Springs Industries, Montgomery, PA [www.graberblinds.com](http://www.graberblinds.com).
  - 7. Hanes Fabric Co, Conover, NC [www.hanesfabric.com](http://www.hanesfabric.com).
  - 8. InterSpec, Allenwood, NJ (800) 526-2800 or (732) 938-4114.
  - 9. Kirsch Co, Freeport, IL [www.kirsch.com](http://www.kirsch.com).
  - 10. Rockland Industries Inc, Baltimore, MD [www.roc-lon.com](http://www.roc-lon.com).
  - 11. Rowley Co, Gastonia, NC. [www.rowleyco.com](http://www.rowleyco.com).
- B. Materials:
  - 1. Fabric:
    - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
      - 1) Casements:
        - a) 5th Avenue or Bourbon Street by Coral: Neutral.
        - b) Fayette, Rosette, or Dixie by Interspec: White.
        - c) Handcart by Fred Krieger: White, Snow.
        - d) Zanzibar by Fred Krieger: White, Cream.
        - e) Snowbird by InterSpec: Ivory, White.
        - f) Layton by InterSpec: White.
      - 2) Blackout Drapery.
        - a) Liteless by Coral: Cream.
        - b) FlameTrol 540 - White by Hanes.
        - c) Roc-Lon Budget Blackout (3-pass) FR, white/white or ivory/white by Rockland Industries.
  - 2. Crinoline / Buckram:
    - a. Heavy or Extra Heavy grade, 4 inches wide, woven permanent goods.
    - b. Type Two Acceptable Products:
      - 1) BW74 by R H Rowley Co.
      - 2) 61421 by Conso.
      - 3) Equal as approved by Architect before use. See Section 01 6200.
  - 3. Drapery Hooks: Stainless steel, standard 1-1/2 inch hook with pointed hook top.
  - 4. Drapery Rods:
    - a. Outside Mount:
      - 1) Rods shall be sufficient width, window width plus 1/3, to allow drape to stack clear of window opening but no wider. This requirement may be modified as follows:
        - a) Where Drawings detail differently.
        - b) Where wall, cabinets, mechanical equipment, or other obstruction requires modification.
        - c) Where symmetry of room would indicate desirability of exception.

- b. Traverse rods shall include wall or floor mounted tension pulleys for endless cord operation.
  - c. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
    - 1) Kirsch:
      - a) 'Super Fine': Less than 15 feet long.
      - b) 'Architrac': 15 feet long and longer.
    - 2) Graber Super Heavy Duty 600 Series by Springs Industries.
- C. Fabrication:
- 1. Double top and bottom hems unless specifically specified otherwise.
  - 2. Provide necessary weights at seam and side hems.
  - 3. Fullness shall be minimum of 2-1/2 times width of space covered by drape.
  - 4. Space pleats 4 inches maximum center of pleat to center of pleat.
  - 5. Drapes shall have:
    - a. Fabric inspected over back-lite table for flaws.
    - b. Straight, even blind-stitched side and bottom hems.
    - c. Seams hidden beside pleats.
    - d. Joined seams serged and overcast with no puckering.
    - e. 4 inch double bottom hems and headings.
    - f. 1-1/2 inches double side hem.
    - g. 2 inch overlap, total of 4 inches on pair.
    - h. Stack-off of 1/3 of window width.
    - i. Specified woven, permanent crinoline / buckram used in heading.
    - j. Seams match up on bottom hems.
    - k. Corners of bottom hems closed with hand stitching.
    - l. Pleats evenly spaced to size.
    - m. Straight edge across top after pleating.
    - n. Straight, even folds.
    - o. Polyester thread matching fabric color for seams and hems.

## PART 3 - GENERAL

### 3.1 FABRICATORS

- A. Acceptable Fabricators:
- 1. Meet Quality Assurance Fabricator / Installer Qualifications as specified in Part 1 of this specification.

### 3.2 INSTALLATION

- A. Install tracks, wall or ceiling mount, with mounting device head no larger than No. 6, to yield direct withdrawal strength of 25 lbs minimum.
- B. Support spacing to be as recommended in Manufacturer's literature.
- C. Install blackout drapery as a separate drape on separate rod behind primary drape.

### 3.3 CLEANING

- A. Tracks to be free of marring, scratches, and foreign material.

## END OF SECTION

**BLANK PAGE**



**SECTION 22 0501****COMMON PLUMBING REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Common requirements and procedures for plumbing systems.
  - 2. Responsibility for proper operation of electrically powered equipment furnished under this Division.
  - 3. Furnish and install sealants relating to installation of systems installed under this Division.
  - 4. Furnish and install Firestop Penetration Systems for plumbing systems penetrations as described in Contract Documents.
- B. Products Furnished But Not Installed Under This Section:
  - 1. Sleeves, inserts, supports, and equipment for plumbing systems installed under other Sections.
- C. Related Requirements:
  - 1. Section 03 3053: 'Miscellaneous Cast-In-Place Concrete' for exterior concrete pads and bases for mechanical equipment.
  - 2. Section 05 0523: 'Metal Fastening' for quality and requirements for welding.
  - 3. Section 07 8400: 'Firestopping' for quality of penetration firestop systems to be used on Project and submittal requirements.
  - 4. Section Section 07 9213: 'Elastomeric Joint Sealant' for quality at building exterior.
  - 5. Sections Under 09 9000 Heading: Painting of plumbing items requiring field painting.
  - 6. Division 26: Raceway and conduit, unless specified otherwise, and line voltage wiring.
  - 7. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.
  - 8. Division 33: Piped utilities.

**1.2 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Manufacturer's catalog data for each manufactured item.
      - 1) Provide section in submittal for each type of item of equipment. Include Manufacturer's catalog data of each manufactured item and enough information to show compliance with Contract Document requirements. Literature shall show capacities and size of equipment used and be marked indicating each specific item with applicable data underlined.
      - 2) Include name, address, and phone number of each supplier.
- B. Informational Submittals:
  - 1. Qualification Statement:
    - a. Plumbing Subcontractor:
      - 1) Provide Qualification documentation if requested by Architect or Owner.
    - b. Installer:
      - 1) Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Operations and Maintenance Data (Modify and add to requirements of Section 01 7800):

- 1) At beginning of PLUMBING section of Operations And Maintenance Manual, provide master index showing items included:
  - a) Provide name, address, and phone number of Architect, Architect's Mechanical Engineer, General Contractor, and Plumbing subcontractor.
  - b) Identify maintenance instructions by using same equipment identification used in Contract Drawings. Maintenance instructions shall include:
    - (1) List of plumbing equipment used indicating name, model, serial number, and nameplate data of each item together with number and name associated with each system item.
    - (2) Manufacturer's maintenance instructions for each piece of plumbing equipment installed in Project. Instructions shall include name of vendor, installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance instructions.
  - c) Provide operating instructions to include:
    - (1) General description of fire protection system.
    - (2) Step by step procedure to follow for shutting down system or putting system into operation.
- b. Warranty Documentation:
  - 1) Include copies of warranties required in individual Sections of Division 22.

### 1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
  1. Perform work in accordance with applicable provisions of Plumbing Codes applicable to Project. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
  2. In case of differences between building codes, laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Notify Architect in writing of such differences before performing work affected by such differences.
  3. Identification:
    - a. Motor and equipment name plates as well as applicable UL / ULC and AGA / CGA labels shall be in place when Project is turned over to Owner.
- B. Qualifications. Requirements of Section 01 4301 applies, but not limited to following:
  1. Plumbing Subcontractor:
    - a. Company specializing in performing work of this section.
      - 1) Minimum five (5) years experience in plumbing installations.
      - 2) Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
    - b. Upon request, submit documentation.
  2. Installer:
    - a. Licensed for area of Project.
    - b. Designate one (1) individual as project foremen who shall be on site at all times during installation and experienced with installation procedures required for this project.
    - c. Upon request, submit documentation.

### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
  1. Accept valves on site in shipping containers with labeling in place.
  2. Provide temporary protective coating on cast iron and steel valves.
  3. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- B. Storage And Handling Requirements:
  1. In addition to requirements specified in Division 01, stored material shall be readily accessible for inspection by Architect until installed.

2. Store items subject to moisture damage in dry, heated spaces.

## 1.5 WARRANTY

- A. Manufacturer Warranty:
  1. Provide certificates of warranty for each piece of equipment made out in favor of Owner.
- B. Special Warranty:
  1. Guarantee plumbing systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.
  2. If plumbing sub-contractor with offices located more than 150 miles from Project site is used, provide service / warranty work agreement for warranty period with local plumbing sub-contractor approved by Architect. Include copy of service / warranty agreement in warranty section of Operation And Maintenance Manual.

## PART 2 - PRODUCTS

### 2.1 COMPONENTS

- A. Components shall bear Manufacturer's name and trade name. Equipment and materials of same general type shall be of same make throughout work to provide uniform appearance, operation, and maintenance.
- B. Pipe And Pipe Fittings:
  1. Weld-O-Let and Screw-O-Let fittings are acceptable.
  2. Use domestic made pipe and pipe fittings on Project, except non-domestic made cast iron pipe and fittings by MATCO-NORCA are acceptable.
- C. Sleeves:
  1. General:
    - a. Two sizes larger than bare pipe or insulation on insulated pipe.
  2. In Concrete And Masonry:
    - a. Sleeves through outside walls, interior shear walls, and footings shall be schedule 80 black steel pipe with welded plate.
  3. In Framing And Suspended Floor Slabs:
    - a. Standard weight galvanized iron pipe, Schedule 40 PVC, or 14 ga galvanized sheet metal.
- D. Valves:
  1. Valves of same type shall be of same manufacturer.

## PART 3 - EXECUTION

### 3.1 INSTALLERS

- A. Acceptable Installers:
  1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

### 3.2 EXAMINATION

- A. Drawings:
  1. Plumbing Drawings show general arrangement of piping, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.

2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over Plumbing Drawings.
3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.

B. Verification Of Conditions:

1. Examine premises to understand conditions that may affect performance of work of this Division before submitting proposals for this work. Examine adjoining work on which plumbing work is dependent for efficiency and report work that requires correction.
2. Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit space available.
3. Check that slots and openings provided under other Divisions through floors, walls, ceilings, and roofs are properly located. Perform cutting and patching caused by neglecting to coordinate with Divisions providing slots and openings at no additional cost to Owner.
4. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

### 3.3 PREPARATION

A. Changes Due To Equipment Selection:

1. Where equipment specified or otherwise approved requires different arrangement or connections from that shown in Contract Documents, submit drawings showing proposed installations.
2. If proposed changes are approved, install equipment to operate properly and in harmony with intent of Contract Documents. Make incidental changes in piping, ductwork, supports, installation, wiring, heaters, panelboards, and as otherwise necessary.
3. Provide additional motors, valves, controllers, fittings, and other equipment required for proper operation of systems resulting from selection of equipment.
4. Be responsible for proper location of rough-in and connections provided under other Divisions.

### 3.4 INSTALLATION

A. Interface With Other Work:

1. Furnish exact location of electrical connections and complete information on motor controls to installer of electrical system.
2. Furnish sleeves, inserts, supports, and equipment that are to be installed by others in sufficient time to be incorporated into construction as work proceeds. Locate these items and confirm that they are properly installed.

B. Cut carefully to minimize necessity for repairs to previously installed or existing work. Do not cut beams, columns, or trusses.

C. Locating Equipment:

1. Arrange pipes and equipment to permit ready access to valves, cocks, unions, traps, and to clear openings of doors and access panels.
2. Adjust locations of pipes, equipment, and fixtures to accommodate work to interferences anticipated and encountered.
3. Install plumbing work to permit removal of equipment and parts of equipment requiring periodic replacement or maintenance without damage to or interference with other parts of equipment or structure.

4. Determine exact route and location of each pipe before fabrication.
  - a. Right-Of-Way:
    - 1) Lines that pitch shall have right-of-way over those that do not pitch. For example, plumbing drains shall normally have right-of-way.
    - 2) Lines whose elevations cannot be changed shall have right-of-way over lines whose elevations can be changed.
  - b. Offsets, Transitions, and Changes in Direction:
    - 1) Make offsets, transitions, and changes in direction in pipes as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.
    - 2) Furnish and install all traps, air vents, sanitary vents, and devices as required to effect these offsets, transitions, and changes in direction.
- D. Penetration Firestops:
  1. Install Penetration Firestop System appropriate for penetration at plumbing systems penetrations through walls, ceilings, roofs, and top plates of walls.
- E. Sealants:
  1. Seal openings through building exterior caused by penetrations of elements of plumbing systems.
  2. Furnish and install acoustical sealant to seal penetrations through acoustically insulated walls and ceilings.
- F. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus:
  1. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Division from responsibility for proper installation of plumbing systems.
  2. Arrange piping to not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings:
    - a. Arrange so as to facilitate removal of tube bundles.
    - b. Provide accessible flanges or ground joint unions, as applicable for type of piping specified, at connections to equipment and on bypasses.
      - 1) Make connections of dissimilar metals with di-electric unions.
      - 2) Install valves and unions ahead of traps and strainers. Provide unions on both sides of traps.
    - c. Do not use reducing bushings, bull head tees, close nipples, or running couplings. Street elbows are allowed only on potable water pipe **3/4 inch** in diameter and smaller.
    - d. Install piping systems so they may be easily drained
    - e. Install piping to insure noiseless circulation.
    - f. Place valves and specialties to permit easy operation and access. Valves shall be regulated, packed, and glands adjusted at completion of work before final acceptance.
  3. Do not install piping in shear walls.
  4. Cut piping accurately to measurements established at site. Remove burr and cutting slag from pipes.
  5. Work piping into place without springing or forcing. Make piping connections to pumps and other equipment without strain at piping connection. Remove bolts in flanged connections or disconnect piping to demonstrate that piping has been so connected, if requested.
  6. Make changes in direction with proper fittings.
  7. Expansion of Thermoplastic Pipe:
    - a. Provide for expansion in every **30 feet** of straight run.
    - b. Provide **12 inch** offset below roof line in each vent line penetrating roof.
  8. Expansion of PEX Pipe: Allow for expansion and contraction of PEX pipe as recommended by Pipe Manufacturer.
- G. Sleeves:
  1. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete slabs on grade.
  2. Provide sleeves around pipes passing through concrete or masonry floors, walls, partitions, or structural members. Seal sleeves with specified sealants. Follow Pipe Manufacturer's recommendations for PEX pipe penetrations through studs and floor slabs.

3. Sleeves through floors shall extend **1/4 inch** above floor finish in mechanical equipment rooms above basement floor. In other rooms, sleeves shall be flush with floor.
4. Sleeves through floors and foundation walls shall be watertight.

H. Escutcheons:

1. Provide spring clamp plates where pipes run through walls, floors, or ceilings and are exposed in finished locations of building. Plates shall be chrome plated heavy brass of plain pattern and shall be set tight on pipe and to building surface.

### 3.5 REPAIR / RESTORATION

- A. Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it:
1. Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown.
  2. Surface finishes shall exactly match existing finishes of same materials.

### 3.6 FIELD QUALITY CONTROL

A. Field Tests:

1. Perform tests on plumbing piping systems. Furnish devices required for testing purposes.

B. Non-Conforming Work:

1. Replace material or workmanship proven defective with sound material at no additional cost to Owner.
2. Repeat tests on new material, if requested.

### 3.7 CLEANING

A. Remove dirt, grease, and other foreign matter from each length of piping before installation:

1. After each section of piping used for movement of water or steam is installed, flush with clean water, except where specified otherwise.
2. Arrange temporary flushing connections for each section of piping and arrange for flushing total piping system.
3. Provide temporary cross connections and water supply for flushing and drainage and remove after completion of work.

B. Clean exposed piping, equipment, and fixtures. Remove stickers from fixtures and adjust flush valves.

### 3.8 CLOSEOUT ACTIVITIES

A. Instruction of Owner:

1. Instruct building maintenance personnel and Stake Physical Facilities Representative in operation and maintenance of plumbing systems utilizing Operation And Maintenance Manual when so doing.
2. Conduct instruction period after Substantial Completion inspection when systems are properly working and before final payment is made.

### 3.9 PROTECTION

- A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system. Cap or plug open ends of pipes and equipment to

keep dirt and other foreign materials out of system. Do not use plugs of rags, wool, cotton waste, or similar materials.

**END OF SECTION**

**SECTION 22 0529****HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Common hanger and support requirements and procedures for plumbing systems.
- B. Products Installed But Not Furnished Under This Section:
  - 1. Paint identification for gas piping used in HVAC equipment.
- C. Related Requirements:
  - 1. Section 05 0523: 'Metal Fastening' for quality and requirements for welding.
  - 2. Section 07 8400: 'Firestopping' for quality of Penetration Firestop Systems to be used on Project and submittal requirements.
  - 3. Sections Under 09 9000 Heading: Painting of mechanical items requiring field painting.
  - 4. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.
  - 5. Section 23 0529: 'Hangers And Supports For HVAC Piping And Equipment' for gas piping used with HVAC equipment.
  - 6. Section 23 0553: 'Identification For HVAC Piping And Equipment' for paint identification of gas piping used with HVAC equipment.

**1.2 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Manufacturer's catalog data for each manufactured item.

**PART 2 - PRODUCTS****2.1 ASSEMBLIES**

- A. Manufacturers:
  - 1. Manufacturer Contact List:
    - a. Anvil International, Portsmouth, NH [www.anvilintl.com](http://www.anvilintl.com).
    - b. Cooper B-Line, Highland, IL [www.b-line.com](http://www.b-line.com).
    - c. Unistrut, Wayne, MI [www.tyco-unistrut.com](http://www.tyco-unistrut.com).
- B. Materials:
  - 1. Hangers, Rods, And Inserts
    - a. Galvanized and UL approved for service intended.
    - b. Support horizontal piping from hangers or on roller assemblies with channel supports, except where trapeze type hangers are explicitly shown on Drawings. Hangers shall have double nuts.
      - 1) Support insulated pipes **2 inches** in diameter and smaller with adjustable swivel ring hanger with insulation protection shield. Gauge and length of shield shall be in accordance with Anvil design data.
        - a) Type Two Acceptable Products:
          - (1) Swivel Ring Hanger: Anvil Fig. 69.



- (2) Insulation Protection Shield: Anvil Fig. 167.
    - (3) Equals by Cooper B-Line.
  - 2) Support insulated pipes **2-1/2 inches** in diameter and larger with clevis hanger or roller assembly with an insulation protection shield. Gauge and length of shield shall be according to Anvil design data.
    - a) Type Two Acceptable Products:
      - (1) Clevis Hanger: Anvil Fig. 260.
      - (2) Roller Assembly: Anvil Fig. 171.
      - (3) Insulation Protection Shield: Anvil Fig. 167.
      - (4) Equals by Cooper B-Line.
  - 3) Support uninsulated copper pipe **2 inches** in diameter and smaller from swivel ring hanger, copper plated and otherwise fully suitable for use with copper tubing. Support non-copper uninsulated pipes from swivel ring hanger.
    - a) Type Two Acceptable Products:
      - (1) Swivel Ring Hanger For Copper Pipe: Anvil Fig. CT-69.
      - (2) Swivel Ring Hanger For Other Pipe: Anvil Fig. 69.
      - (3) Equals by Cooper B-Line.
  - 4) Support uninsulated copper pipe **2-1/2 inches** in diameter and larger from clevis hanger, copper plated hangers and otherwise fully suitable for use with copper tubing. Support non-copper uninsulated pipes from clevis hanger.
    - a) Type Two Acceptable Products:
      - (1) Clevis Hanger For Copper Pipe: Anvil Fig. CT-65.
      - (2) Clevis Hanger For Other Pipe: Anvil Fig. 260.
      - (3) Equals by Cooper B-Line.
- c. Support rods for single pipe shall be in accordance with following table:
 

Rod Diameter	Pipe Size
<b>3/8 inch</b>	<b>2 inches and smaller</b>
<b>1/2 inch</b>	<b>2-1/2 to 3-1/2 inches</b>
<b>5/8 inch</b>	<b>4 to 5 inches</b>
<b>3/4 inch</b>	<b>6 inches</b>
<b>7/8 inch</b>	<b>8 to 12 inches</b>
- d. Support rods for multiple pipe supported on steel angle trapeze hangers shall be in accordance with following table:
 

Rods		Number of Pipes per Hanger for Each Pipe Size						
Number	Diameter	2 Inch	2.5 Inch	3 Inch	4 Inch	5 Inch	6 Inch	8 Inch
<b>2</b>	<b>3/8 Inch</b>	<b>Two</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>2</b>	<b>1/2 Inch</b>	<b>Three</b>	<b>Three</b>	<b>Two</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>2</b>	<b>5/8 Inch</b>	<b>Six</b>	<b>Four</b>	<b>Three</b>	<b>Two</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>2</b>	<b>5/8 Inch</b>	<b>Nine</b>	<b>Seven</b>	<b>Five</b>	<b>Three</b>	<b>Two</b>	<b>Two</b>	<b>0</b>
<b>2</b>	<b>5/8 Inch</b>	<b>Twelve</b>	<b>Nine</b>	<b>Seven</b>	<b>Five</b>	<b>Three</b>	<b>Two</b>	<b>Two</b>
- 1) Size trapeze angles so bending stress is less than **10,000 psi**.
- e. Riser Clamps For Vertical Piping:
  - 1) Type Two Acceptable Products:
    - a) Anvil Fig. 261.
    - b) Equals by Cooper B-Line.
- f. Steel Deck Bracket:
  - 1) Class Two Quality Standard: Equal to Unistrut P1000 with clamp nut, minimum **6 inch** length.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

#### A. Piping:

1. Properly support piping and make adequate provisions for expansion, contraction, slope, and anchorage.
  - a. Except for underground pipe, suspend piping from roof trusses or clamp to vertical walls using Unistrut and clamps. Do not hang pipe from other pipe, equipment, or ductwork. Laying of piping on any building element is not allowed.
  - b. Supports For Horizontal Piping:
    - 1) Support metal piping at **96 inches** on center maximum for pipe **1-1/4 inches** or larger and **72 inches** on center maximum for pipe **1-1/8 inch** or less.
    - 2) Support thermoplastic pipe at **48 inches** on center maximum.
    - 3) Support PEX pipe at **32 inches** minimum on center.
    - 4) Provide support at each elbow. Install additional support as required.
  - c. Supports for Vertical Piping:
    - 1) Place riser clamps at each floor or ceiling level.
    - 2) Securely support clamps by structural members, which in turn are supported directly from building structure.
    - 3) Provide clamps as necessary to brace pipe to wall.
  - d. Attach Unistrut to structural steel roof supporting structure. Spacing and support as described above.
  - e. Insulate hangers for copper pipe from piping by means of at least two layers of Scotch 33 plastic tape.
2. Gas piping Identification:
  - a. Apply paint identification for gas piping used with HVAC equipment as specified in Section 23 0553.

**END OF SECTION**

**BLANK PAGE**

**SECTION 22 0553****IDENTIFICATION FOR PLUMBING PIPES AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install identification of plumbing piping and equipment as described in Contract Documents.

**PART 2 - PRODUCTS****2.1 SYSTEM**

- A. Materials:
  - 1. Labels:
    - a. Equipment Identification:
      - 1) Black formica, with white reveal when engraved.
      - 2) Lettering to be **3/16 inch** high minimum.
  - 2. Paint:
    - a. One Coat Primer:
      - 1) 6-2 Quick Drying Latex Primer Sealer over fabric covers.
      - 2) 6-205 Metal Primer under dark color paint.
      - 3) 6-6 Metal Primer under light color paint.
    - b. Finish Coats: Two coats 53 Line Acrylic Enamel.
    - c. Performance Standard: Paints specified are from Pittsburgh Paint & Glass (PPG), Pittsburgh, PA [www.pittsburghpaints.com](http://www.pittsburghpaints.com) or PPG Canada Inc, Mississauga, ON (800) 263-4350 or (905) 238-6441.
    - d. Type Two Acceptable Products. See Section 01 6200.
      - 1) Paint of equal quality from following Manufacturers may be submitted for Architect's approval before use. Maintain specified colors, shades, and contrasts.
        - a) Benjamin Moore, Montvale, NJ [www.benjaminmoore.com](http://www.benjaminmoore.com) or Toronto, ON (800) 304-0304 or (416) 766-1176.
        - b) ICI Dulux, Cleveland, OH or ICI Paints Canada Inc, Concord, ON [www.dulux.com](http://www.dulux.com).
        - c) Sherwin Williams, Cleveland, OH [www.sherwin-williams.com](http://www.sherwin-williams.com).

**PART 3 - EXECUTION****3.1 APPLICATION**

- A. Painting:
  - 1. Only painted legends, directional arrows, and color bands are acceptable.
  - 2. Locate identifying legends, directional arrows, and color bands at following points on exposed piping of each piping system:
    - a. Adjacent to each item of equipment.
    - b. At point of entry and exit where piping goes through wall.
    - c. On each riser and junction.
    - d. Every **25 feet** on long continuous lines.
    - e. Stenciled symbols shall be one inch high and black.

**3.2 ATTACHMENTS**

## A. Schedules:

## 1. Pipe Identification Schedule:

## a. Apply stenciled symbols as follows:

Pipe Use	Abbreviation
Domestic Cold Water	CW
Domestic Hot Water	HW

**END OF SECTION**

**SECTION 22 0719****PLUMBING PIPING INSULATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install insulation on hot and cold water lines, fittings, valves, and accessories as described in Contract Documents.
  2. Furnish and install insulation on roof drain piping as described in Contract Documents.
- B. Related Requirements:
1. Section 22 1116: 'Domestic Water Piping'.

**PART 2 - PRODUCTS****2.1 COMPONENTS**

- A. Manufacturers:
1. Manufacturer Contact List:
    - a. Armacell, Mebane, NC [www.armacell.com](http://www.armacell.com).
    - b. Childers Products Co, Eastlake, OH [www.fosterproducts.com](http://www.fosterproducts.com).
    - c. IMCOA, Youngsville, NC [www.nomacokflex.com](http://www.nomacokflex.com).
    - d. Johns-Manville, Denver, CO [www.jm.com](http://www.jm.com).
    - e. Knauf, Shelbyville, IN [www.knauffiberglass.com](http://www.knauffiberglass.com).
    - f. Manson, Brossard, PQ, Canada [www.isolationmanson.com](http://www.isolationmanson.com).
    - g. Nomaco Inc, Yopungsville, NC [www.nomacokflex.com](http://www.nomacokflex.com).
    - h. Owens-Corning, Toledo, OH [www.owenscorning.com](http://www.owenscorning.com).
    - i. Speedline Corp, Solon, OH [www.speedlinepvc.com](http://www.speedlinepvc.com).
- B. Materials:
1. Above Grade Metal Piping:
    - a. Insulation For Piping:
      - 1) Snap-on glass fiber or melamine foam pipe insulation, or heavy density pipe insulation with factory vapor jacket.
      - 2) Insulation Thickness:
 

Service Water Temperature	Pipe Sizes		
	Up to 1-1/4 In	1-1/2 to 2 In	Over 2 In
170 - 180 Deg F	One In	1-1/2 In	2 In
140 - 160 Deg F	1/2 In	One In	1-1/2 In
45 - 130 Deg F	1/2 In	1/2 In	One In
      - 3) Performance Standards: Fiberglas ASJ by Owens-Corning.
      - 3) Type One Acceptable Manufacturers:
        - 3) a) Childers Products.
        - 3) b) Knauf.
        - 3) c) Manson.
        - 3) d) Owens-Corning.
        - 3) e) Johns-Manville.
        - 3) f) Equal as approved by Architect before bidding. See Section 01 6200.
    - b. Fitting, Valve, And Accessory Covers:
      - 3) PVC.
      - 2) Performance Standard: Zeston by Johns-Manville.
      - 3)
      - 3)
      - 3)
      - 3)

- 3) Type One Acceptable Manufacturers:
  - a) Knauf.
  - b) Speedline.
  - c) Johns-Manville.
  - d) Equal as approved by Architect before bidding. See Section 01 6200.
2. Below Grade Metal Piping:
  - a. Insulation:
    - 1) **1/2 inch thick.**
    - 2) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
      - a) SS Tubolit by Armacell.
      - b) ImcoLock by Imcoa.
      - c) Nomalock or Therma-Cel by Nomaco.
  - b. Joint Sealant:
    - 1) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
      - a) Armacell 520.
      - b) Nomaco K-Flex R-373.
3. Pex Piping, Above And Below Grade:
  - a. Insulation:
    - 1) **1/2 inch thick.**
    - 2) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
      - a) SS Tubolit by Armacell.
      - b) ImcoLock by Imcoa.
      - c) Nomalock or Therma-Cel by Nomaco.
  - b. Joint Sealant:
    - 1) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
      - a) Armacell 520.
      - b) Nomaco K-Flex R-373.
      - c)
4. PP-R Piping, Above And Below Grade:
  - a. Insulation:
    - 1) **1/2 inch thick.**
    - 2) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
      - a) SS Tubolit by Armacell.
      - b) ImcoLock by Imcoa.
      - c) Nomalock or Therma-Cel by Nomaco.
  - b. Joint Sealant:
    - 1) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
      - a) Armacell 520.
      - b) Nomaco K-Flex R-373.
5. PVC or ABS Piping, Above And Below Grade - Facility Storm Drain:
  - a. Insulation:
    - 1) **1/2 inch thick.**
    - 2) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
      - a) SS Tubolit by Armacell.
      - b) ImcoLock by Imcoa.
      - c) Nomalock or Therma-Cel by Nomaco.
  - b. Joint Sealant:
    - 1) Category Four Acceptable Products. See Section 01 6200 for definition of Categories:
      - a) Armacell 520.
      - b) Nomaco K-Flex R-373.

## PART 3 - EXECUTION

### 3.1 APPLICATION

- A. Above Grade Piping:
  1. Apply insulation to clean, dry piping with joints tightly butted.

2. Install insulation in manner to facilitate removal for repairs. Place sections or blocks so least possible damage to insulation will result from inspection or repairs of piping or equipment.
  3. Piping up to **1-1/4 inch** Diameter:
    - a. Adhere 'factory applied vapor barrier jacket lap' smoothly and securely at longitudinal laps with white vapor barrier adhesive.
    - b. Adhere **3 inch** wide self-sealing butt joint strips over end joints.
  4. Piping **1-1/2 inches** Diameter And Larger:
    - a. Use broken-joint construction in application of two-layer covering.
    - b. Fill cracks and depressions with insulating cement mixed to thick plastic paste.
      - 1) Apply by hand in several layers to make up total specified thickness.
      - 2) Final layer shall have smooth uniform finish before application of covering.
  5. Fittings, Valves, And Accessories:
    - a. Do not apply insulation over flanged joints or victaulic couplings until piping has been brought up to operating temperature and flange bolts have been fully tightened. Insulate valves so wheel, stem, and packing nut are exposed.
    - b. Insulate with same type and thickness of insulation as pipe, with ends of insulation tucked snugly into throat of fitting and edges adjacent to pipe insulation tufted and tucked in.
    - c. Piping Up To **1-1/4 Inch** ( Diameter:
      - 1) Cover insulation with one piece fitting cover secured by stapling or taping ends to adjacent pipe covering.
      - 2) Alternate Method:
        - a) Insulate fittings, valves, and accessories with one inch of insulating cement and vapor seal with two **1/8 inch** wet coats of vapor barrier mastic reinforced with glass fabric extending **2 inches** onto adjacent insulation.
    - d. Piping **1-1/2 inches** To **2 Inches**:
      - 1) Insulate with hydraulic setting insulating cement or equal, to thickness equal to adjoining pipe insulation.
      - 2) Apply final coat of fitting mastic over insulating cement.
    - e. Piping **2-1/2 inch** And Larger:
      - 1) Insulate with segments of molded insulation securely wired in place and coated with skim coat of insulating cement.
      - 2) Apply fitting mastic, fitting tape and finish with final coat of fitting mastic.
  6. Pipe Hangers:
    - a. Do not allow pipes to come in contact with hangers.
    - b. Pipe Shield:
      - 1) Provide schedule 40 PVC by **6 inch** long at each clevis and/or unistrut type hanger.
      - 2) Provide **16 ga** by **6 inch** long galvanized shields at each pipe hanger to protect pipe insulation from crushing by clevis hanger.
      - 3) Provide **22 ga** by **6 inch** long galvanized shield at each pipe hanger to protect insulation from crushing by Unistrut type hanger.
    - c. At Pipe Hangers:
      - 1) Provide rigid calcium silicate insulation (**100 psi** compressive strength) at least **2 inches** beyond shield.
  7. Protect insulation wherever leak from valve stem or other source might drip on insulated surface, with aluminum cover or shield rolled up at edges and sufficiently large in area and of shape that dripping will not splash on surrounding insulation.
- B. Below Grade Piping:
1. Slip underground pipe insulation onto pipe and seal butt joints.
  2. Where slip-on technique is not possible, slit insulation, apply to pipe, and seal seams and joints.

## END OF SECTION



**BLANK PAGE**

**SECTION 22 1116****DOMESTIC WATER PIPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Perform excavating and backfilling required by work of this Section.
  - 2. Furnish and install potable water piping complete with necessary valves, connections, and accessories inside building and connect with outside utility lines **5 feet** from building perimeter as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 22 0501: 'Common Piping Requirements'.
  - 2. Section 22 0719: 'Plumbing Piping Insulation'.
  - 3. Section 31 2316: 'Excavation' for criteria for performance of excavation.
  - 4. Section 31 2323: 'Fill' for criteria for performance of backfill.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. American National Standards Institute / American Society of Sanitary Engineers:
    - a. ANSI/ASSE 1017-2009, 'Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems'.
    - b. ANSI/ASSE 1070-2004, 'Performance Requirements for Water Temperature Limiting Devices'.
  - 2. American Water Works Association:
    - a. AWWA C904-06, 'Cross-Linked Polyethylene (PEX) Pressure Pipe, 1/2 inch (12 mm) Through 3 inch (76 mm) for Water Service'.
  - 3. ASTM International:
    - a. ASTM B88-09, 'Standard Specification for Seamless Copper Water Tube'.
    - b. ASTM E84-13a, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
    - c. ASTM F876-13a, 'Standard Specification for Crosslinked Polyethylene (PEX) Tubing'.
    - d. ASTM F877-11a, 'Standard Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems'.
    - e. ASTM F1807-13a, 'Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing'.
    - f. ASTM F2023-13, "Standard Test Method for Evaluating the Oxidative Resistance of Crosslinked Polyethylene (PEX) Tubing and Systems to Hot Chlorinated Water'.
    - g. ASTM F2389-10, 'Standard Specification for Pressure-rated Polypropylene (PP) Piping Systems'.
  - 4. NSF International Standard:
    - a. NSF P171, 'Protocol for Chlorine Resistance of Plastic Piping Materials' (1999).
  - 5. NSF International Standard / American National Standards Institute:
    - a. NSF/ANSI 14-2013, 'Plastic Piping System Components and Related Materials'.
    - b. NSF/ANSI 61-2012, 'Drinking Water System Components - Health Effects'.
    - c. NSF/ANSI 372-2011, 'Drinking Water System Components - Lead Content'.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Qualifications:

1. Manufacturer Qualifications:
  - a. PP-R pipe:
    - 1) Certified by NSF International.
2. Installers Qualifications:
  - a. PP-R pipe:
    - 1) Certified by Manufacturer.

## 1.4 SUBMITTALS

- A. Action Submittals:
  1. Product Data:
    - a. Manufacturer's Literature:
      - 1) PEX pipe and PEX pipe fittings.
      - 2) PP-R pipe and PP-R pipe fittings.
  2. Shop Drawings:
    - a. Piping Layout:
      - 1) Piping layout redesign showing PEX manifold and distribution piping for optimization of cost.
  3. Samples:
    - a. PEX pipe fitting.
- B. Informational Submittals:
  1. Test And Evaluation Reports:
    - a. Written report of sterilization test.

## 1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
  1. Meet NSF International Standards for materials or products that come into contact with drinking water, drinking water treatment chemicals, or both for chemical contaminants and impurities that are indirectly imparted to drinking water from products, components, and materials used in drinking water systems.
  2. California only: California Assembly Bill 1953 (AB1953) Compliant for Lead Free.

## PART 2 - PRODUCTS

### 2.1 SYSTEMS

- A. Manufacturers:
  1. Manufacturer Contact List:
    - a. Aquatherm, Inc., Lindon, UT [www.aquathermpipe.com](http://www.aquathermpipe.com).
    - b. Cash Acme, Cullman, AL [www.cashacme.com](http://www.cashacme.com)
    - c. Cla-Val Company, Costa Mesa, CA or Cla-Val Canada Ltd, Beamsville, ON [www.cla-val.com](http://www.cla-val.com).
    - d. Conbraco Industries Inc, Matthews, NC [www.conbraco.com](http://www.conbraco.com) or Conbraco (Honeywell Ltd), Scarborough, ON (416) 293-8111.
    - e. Hammond Valve, New Berlin, WI [www.hammondvalve.com](http://www.hammondvalve.com).
    - f. Handy & Harmon Products Div, Fairfield, CT [www.handyharmon.com](http://www.handyharmon.com) or Handy and Harmon of Canada Ltd, Rexdale, ON (800) 463-1465 or (416) 675-1860.
    - g. Harris Products Group, Cincinnati, OH [www.harrisproductsgroup.com](http://www.harrisproductsgroup.com).
    - h. Honeywell Inc, Minneapolis, MN [www.honeywell.com](http://www.honeywell.com).
    - i. Leonard Valve Co, Cranston, RI [www.leonardvalve.com](http://www.leonardvalve.com).
    - j. Milwaukee Valve Co, New Berlin, WI [www.milwaukeevalve.com](http://www.milwaukeevalve.com).
    - k. Nibco Inc, Elkhart, IN [www.nibco.com](http://www.nibco.com).
    - l. Rehau, Leesburg, VA [www.rehau-na.com](http://www.rehau-na.com).

- m. Sloan Valve Co, Franklin Park, IL [www.sloanvalve.com](http://www.sloanvalve.com).
  - n. Spence Engineering Co, Walden, NY [www.spenceengineering.com](http://www.spenceengineering.com).
  - o. Symmons Industries, Braintree, MA [www.symmons.com](http://www.symmons.com).
  - p. Uponor Inc, Apple Valley, MN [www.uponor-usa.com](http://www.uponor-usa.com).
  - q. Viega ProPress, Wichita, KS [www.viega-na.com](http://www.viega-na.com).
  - r. Watts Regulator Co, Andover, MA [www.wattsreg.com](http://www.wattsreg.com).
  - s. Wilkins (Zurn Wilkins), Paso Robles, CA [www.zurn.com](http://www.zurn.com).
  - t. Zurn PEX, Inc., Commerce, TX [www.zurnpex.com](http://www.zurnpex.com).
- B. Materials:
- 1. Design Criteria:
    - a. All drinking water products, components, and materials above and below grade used in drinking water systems must meet NSF International Standards for Lead Free.
    - b. No CPVC allowed.
  - 2. Pipe:
    - a. Copper:
      - 1) Above-Grade:
        - a) Meet requirements of ASTM B88, Type L.
      - 2) Below-Grade:
        - a) Meet requirements of ASTM B88, Type K. **3/4 inch** minimum under slabs.
        - b) **2 inches** And Smaller: Annealed soft drawn.
        - c) **2-1/2 inches** And Larger: Hard Drawn.
    - b. Cross-Linked Polyethylene (PEX):
      - 1) Certified with NSF International against NSF Standards NSF/ANSI 14, NSF/ANSI 61, NSF/ANSI 372, and NSF P171 Protocol.
      - 2) Copper tube size (CTS) outside dimensions and Standard Dimension Ratio (SDR) of 9.
      - 3) Pressure rated for **160 psiat 73 deg F**, **100 psiat 180 deg F**, and **80 psiat 200 deg F**.
      - 4) Marked with Manufacturer's name, design pressure and temperature ratings, and third party certification stamp for NSF-PW.
      - 5) Manufactured by Engel or peroxide method (PEX-A) or by silane method (PEX-B).
      - 6) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
        - a) Raupex by Rehau.
        - b) Wirsbo Aquapex by Uponor.
        - c) ViegaPEX by Viega.
        - d) Zurn PEX by Zurn PEX.
  - 3. Fittings:
    - a. For Copper Pipe: Wrought copper.
    - b. For PEX Pipe:
      - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
        - a) Everloc by Rehau.
        - b) F877 bronze fitting with stainless steel press sleeve by Viega.
        - c) Propex by Uponor including EP flow-through multiport tees.
        - d) Zurn PEX XL, DZR and CR fittings.
  - 4. Connections For Copper Pipe:
    - a. Above-Grade:
      - 1) Sweat copper type with 95/5 or 96/4 Tin-Antimony solder, Bridgit solder, or Silvabrite 100 solder. Use only lead-free solder.
      - 2) Viega ProPress System
    - b. Below Grade:
      - 1) Brazed using following type rods:
        - a) Copper to Copper Connections:
          - (1) AWS Classification BCuP-4 Copper Phosphorus (6 percent silver).
          - (2) AWS Classification BCuP-5 Copper Phosphorus (15 percent silver).
        - 2) Copper to Brass or Copper to Steel Connections: AWS Classification BAg-5 Silver (45 percent silver).
      - 3) Do not use rods containing Cadmium.
      - 4) Brazing Flux:
        - a) Approved Products:
          - (1) Stay-Silv white brazing flux by Harris Product Group.
          - (2) High quality silver solder flux by Handy & Harmon.

- 5) Joints under slabs acceptable only if allowed by local codes.
5. Ball Valves:
  - a. Use ball valves exclusively unless otherwise specified. Ball valves shall be by single manufacturer from approved list below.
  - b. Valves shall be two-piece, full port for 150 psiSWP.
    - 1) Operate with flow in either direction, suitable for throttling and tight shut-off.
    - 2) Body: Bronze, 150 psigwsp at 350 deg F and 400 psigwog.
    - 3) Seat: Bubble tight at 100 psigunder water.
  - c. Class One Quality Standard: Nibco T585 or S585.
    - 1) Equal by Conbraco 'Apollo,' Hammond, Milwaukee, or Watts.
  - d. PP-R piping if used:
    - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - a) PP-R fusion-weld ball valves by Aquatherm.
6. Combination Pressure Reducing Valve / Strainer:
  - a. Integral stainless steel strainer, or separate 'Y' strainer installed upstream of pressure reducing valve.
  - b. Built-in thermal expansion bypass check valve.
  - c. Class One Quality Standard: Watts LFU5B:
    - 1) Equal by Cash Acme, Cla-Val Hi Capacity, Conbraco 36C, Honeywell-Braukmann, Spence Hi Capacity, Watts, or Wilkins. See Section 01 6200.
7. Mixing Valve MV-2:
  - a. Solid brass construction and CSA B125 certified.
  - b. Includes integral check valves and inlet screen. Features advanced paraffin-based actuation technology.
  - c. Flow of 5.7 GPM with maximum 10 psi pressure drop. Perform to minimum flow of 0.5 GPM in accordance with ASSE 1017.
  - d. Set for 110 deg F ( Service.
  - e. Match Construction Drawings for connection sizes.
  - f. Class One Quality Standard: Powers LFLM495. See Section 01 6200.
  - g. Acceptable Manufacturers: Lawler, Leonard, Powers, Sloan, Symmons, and Watts.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Locate cold water lines a minimum of 6 inches from hot water line.

### 3.2 FIELD QUALITY CONTROL

- A. Field Tests:
  1. Before pipes are covered, test systems in presence of Architect/Engineer at 125 psig hydrostatic pressure for four (4) hours and show no leaks.
  2. Disconnect equipment not suitable for 125 psig pressure from piping system during test period.
  3. PP-R Piping:
    - a. Test in accordance with Manufacturer's instructions prior to covering.
      - 1) Provide documentation.

### 3.3 CLEANING

- A. Sterilize potable water system with solution containing 200 parts per million minimum of available chlorine and maintaining pH of 7.5 minimum. Introduce chlorinating materials into system in manner approved by Architect/Engineer. Allow sterilization solution to remain for twenty four (24) hours and open and close valves and faucets several times during that time.

- B. After sterilization, flush solution from system with clean water until residual chlorine content is less than 0.2 parts per million.
- C. Water system will not be accepted until negative bacteriological test is made on water taken from system. Repeat dosing as necessary until such negative test is accomplished.

**END OF SECTION**

**BLANK PAGE**

**SECTION 22 1119****DOMESTIC WATER PIPING SPECIALTIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install miscellaneous potable water piping specialties as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 22 0501: 'Common Plumbing Requirements'.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. NSF International Standard / American National Standards Institute:
    - a. NSF/ANSI 61-2012, 'Drinking Water System Components - Health Effects'.
    - b. NSF/ANSI 372-2011, 'Drinking Water System Components - Lead Content'.

**1.3 QUALITY ASSURANCE**

- A. Regulatory Agency Sustainability Approvals:
  - 1. Meet NSF International Standards for materials or products that come into contact with drinking water, drinking water treatment chemicals, or both for chemical contaminants and impurities that are indirectly imparted to drinking water from products, components, and materials used in drinking water systems.
  - 2. California only: California Assembly Bill 1953 (AB1953) Compliant for Lead Free.

**PART 2 - PRODUCTS****2.1 ACCESSORIES**

- A. Manufacturers:
  - 1. Manufacturer Contact List:
    - a. Ashcroft, Stratford, CT [www.ashcroftinc.com](http://www.ashcroftinc.com).
    - b. H O Trerice, Oak Park, MI [www.hotco.com](http://www.hotco.com).
    - c. IPS Corporation, Compton, CA [www.ipscorp.com](http://www.ipscorp.com).
    - d. Josam Co, Michigan City, IN [www.josam.com](http://www.josam.com).
    - e. Jay R. Smith Manufacturing Co, Montgomery, AL [www.jrsmith.com](http://www.jrsmith.com).
    - f. Prier Products, Inc., Grandview, MD [www.prier.com](http://www.prier.com).
    - g. Proset Systems Inc., Lawrenceville, GA [www.prosetsystems.com](http://www.prosetsystems.com).
    - h. Sioux Chief Manufacturing Co, Peculiar, MO [www.siouxchief.com](http://www.siouxchief.com).
    - i. Sure Seal, Tacoma, WA [www.thesureseal.com](http://www.thesureseal.com).
    - j. Wade (Division of Tyler Pipe), Tyler, TX [www.wadedrains.com](http://www.wadedrains.com).
    - k. Watts Drainage, Spindale, NC [www.watts.com](http://www.watts.com).
    - l. Weiss Instruments, Inc., Holtsville, NY [www.weissinstruments.com](http://www.weissinstruments.com).
    - m. Woodford Manufacturing, Colorado Springs, CO [www.woodfordmfg.com](http://www.woodfordmfg.com).
    - n. Zurn Cast Metals, Erie, PA [www.zurn.com](http://www.zurn.com).
- B. Materials:



1. Trap Guard Trap Seal:
  - a. Design Criteria:
    - 1) Not required to meet NSF International Standards for Lead Free.
  - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - 1) Trap Guard by Proset:
      - a) Install per Manufacturer's recommendations.
    - 2) Sure Seal by Sure Seal:
      - a) Install per Manufacturer's recommendation.
2. Exterior Hydrants:
  - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - 1) Josam: 71050.
    - 2) Jay R. Smith: 5609-QT.
    - 3) Prier: C-634.
    - 4) Wade: W-8600.
    - 5) Watts: HY-725.
    - 6) Woodford: 67.
    - 7) Zurn: Z-1310.
3. Water Hammer Arrestors:
  - a. Design Criteria:
    - 1) Meet NSF International Standards for Lead Free.
    - 2) Nesting type, air pre-charged bellows with casing.
    - 3) Bellows constructed of stabilized 18-8 stainless steel.
  - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - 1) Josam: 75003.
    - 2) Jay R. Smith: 5020.
    - 3) Sioux Chief: 650 Series.
    - 4) Wade: 20.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Gauges: Connect to pipe with **1/4 inch** connections utilizing gauge cocks.

**END OF SECTION**

**SECTION 22 1313****FACILITY SANITARY SEWERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install soil, waste, and vent piping systems within building and connect with outside utility lines **5 feet** out from building where applicable.
  - 2. Perform excavation and backfill required by work of this Section.
- B. Related Requirements:
  - 1. Section 07 8400: 'Firestopping' for quality of firestopping material.
  - 2. Section 22 0501: 'Common Plumbing Requirements'.
  - 3. Section 22 1319: 'Facility Sanitary Sewer Specialties' for furnishing of sewer specialties.
  - 4. Section 31 2316: 'Excavation' for criteria for performance of excavation.
  - 5. Section 31 2323: 'Fill' for criteria for performance of backfill and compaction.
  - 6. Section 33 3313: 'Sanitary Utility Sewerage' for sewage piping from **5 feet** out from building to main.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference: Participate in pre-installation conference specified in Section 03 3111.

**1.3 REFERENCES**

- A. Reference Standards:
  - 1. ASTM International:
    - a. ASTM D2321-14, 'Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications'.
    - b. ASTM D2564-12, 'Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems'.
    - c. ASTM D3034-14, 'Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings'.
    - d. ASTM F656-15, 'Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings'.
    - e. ASTM F891-10, 'Standard Specification for Coextruded Poly(Vinyl Chloride) (PVC) Plastic Pipe With a Cellular Core'.
  - 2. Cast Iron Soil Pipe Institute:
    - a. CISPI Standard 301-09, 'Standard Specification for Hubless Cast Iron Soil Pipe End Fittings for Sanitary & Storm Drain, Waste, and Vent Piping Applications'.
    - b. CISPI 310-11, 'Standard Specification for Couplings for use in connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications'.
    - c. CISPI Handbook. 'Cast Iron Soil Pipe and Fittings Handbook' (2006).
      - 1) CSA B182.2-15, 'PSM Type Polyvinylchloride (PVC) Sewer Pipe Fittings'.
  - 3. International Code Council:
    - a. ICC IPC-2015, 'International Plumbing Code'.

**PART 2 - PRODUCTS****2.1 SYSTEMS****A. Performance:****1. Design Criteria:**

- a. Minimum size of waste piping installed under floor slab on grade shall be **2 inches**.

**B. Materials:**

1. Piping And Fittings: PVC Schedule 40 cellular core plastic pipe and pipe fittings meeting requirements of ASTM F891, joined using cement primer meeting requirements of ASTM F656 and pipe cement meeting requirements of ASTM D2564.

- a. Furnish wall cleanouts with chrome wall cover and screw.

**2. Cleanouts:**

- a. Furnish wall cleanouts with chrome wall cover and screw.

**b. Type Two Acceptable Products:****1) Finish Floors:**

- a) Josam: 56010.
- b) J. R. Smith: 4023.
- c) Mifab: C1100C-R-1.
- d) Wade: W-6000.
- e) Watts: CO-200-R.
- f) Zurn: Z-1402.

**2) Resilient Flooring:**

- a) Josam: 56010-12.
- b) J. R. Smith: 4140.
- c) Mifab: C1100C-T-1.
- d) Wade: W-6000-T.
- e) Watts: CO-200-T.
- f) Zurn: Z-1400.

**3) Finished Wall:**

- a) Josam: 58790.
- b) J. R. Smith: 4530.
- c) Mifab: C1460RD.
- d) Wade: W8560E.
- e) Watts: CO-460-RD.
- f) Zurn: Z-1446.

**4) Exposed Drain Lines:**

- a) Josam: 58910.
- b) J. R. Smith: 4510.
- c) Mifab: C1460.
- d) Wade: W8560B.
- e) Watts: CO-460.
- f) Zurn: Z-1440.

**5) General Purpose:**

- a) Josam: 58900.
- b) J. R. Smith: 4400.
- c) Mifab: C1300-MF
- d) Wade: W8550E.
- e) Watts: CO-380.
- f) Zurn: Z-1440.

- 6) Equal as approved by Architect before installation. See Section 01 6200.

**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Excavate and backfill as specified in Sections 31 2316 and 31 2323 with following additional requirements:
1. Runs shall be as close as possible to those shown on Drawings.
  2. Excavate to required depth and grade to obtain fall required. Grade soil and waste lines within building perimeter **1/4 inch** fall in **one foot** in direction of flow.
  3. Bottom of trenches shall be hard. Tamp as required.
  4. Remove debris from trench before laying of pipe.
  5. Do not cut trenches near footings without consulting Architect.
- B. Thermoplastic Pipe And Fittings:
1. General: Piping and joints shall be clean and installed according to Manufacturer's recommendations. Break down contaminated joints, clean seats and gaskets and reinstall.
  2. Above Grade: Locate pipe hangers every **4 feet** on center maximum and at elbows.
  3. Below Grade:
    - a. Install in accordance with Manufacturer's recommendations and ASTM D2321.
    - b. Stabilize unstable trench bottoms.
    - c. Bed pipe true to line and grade with continuous support from firm base.
      - 1) Bedding depth: **4 to 6 inches**.
      - 2) Material and compaction to meet ASTM standard noted above.
    - d. Excavate bell holes into bedding material so pipe is uniformly supported along its entire length. Blocking to grade pipe is forbidden.
    - e. Trench width at top of pipe:
      - 1) Minimum: **18 inches** or diameter of pipe plus **12 inches**, whichever is greater.
      - 2) Maximum: Outside diameter of pipe plus **24 inches**.
    - f. Do not use backhoe or power equipment to assemble pipe.
    - g. Initial backfill shall be **12 inches** above top of pipe with material specified in referenced ASTM standard.
    - h. Minimum cover over top of pipe not under building slab:
      - 1) **36 inches** before wheel loading.
      - 2) **48 inches** before compaction.
- C. Install piping so cleanouts may be installed as follows:
1. Where shown on Drawings and near bottom of each stack and riser.
  2. At every 135 degrees of accumulative change in direction for horizontal lines.
  3. Every **100 feet** of horizontal run.
  4. Extend piping to accessible surface. Do not install piping so cleanouts must be installed in carpeted floors. In such locations, configure piping so wall type cleanouts may be used.
- D. Each fixture and appliance discharging water into sanitary sewer or building sewer lines shall have seal trap in connection with complete venting system so gasses pass freely to atmosphere with no pressure or siphon condition on water seal.
- E. Vent entire waste system to atmosphere. Join lines together in fewest practicable numbers before projecting above roof. Set back vent lines so they will not pierce roof near edge or valley. Vent line terminations shall be:
1. **6 inches** minimum above roof and **12 inches** minimum from any vertical surface.
  2. Same size as vent pipe.
  3. In areas where minimum design temperature is below **0 deg F** or where frost or snow closure may be possible:
    - a. Vent line terminations shall be same size as vent pipe, except no smaller than **2 inches** in diameter.
    - b. Vents shall terminate **10 inches** minimum above roof or higher if required by local codes.

- F. Furnish and install firestopping at penetrations of fire-rated structures as required under Sections 07 8400 and 22 0501.
- G. If test Tees are used for testing, plug Tees so wall finish can be installed. Do not leave as exposed cleanouts.

### 3.2 FIELD QUALITY CONTROL

- A. Field Tests:
  - 1. Conduct tests for leaks and defective work. Notify Architect before testing.
  - 2. Thermoplastic Pipe System:
    - a. Before backfilling and compacting of trenches, Fill waste and vent system with water to roof level or **10 feet** minimum, and show no leaks for two hours. Correct leaks and defective work.
    - b. After backfilling and compacting of trenches is complete but before placing floor slab, re-test as specified above. Uncover pipe and correct leaks and defective work. Re-backfill and compact and re-test.

**END OF SECTION**

**SECTION 22 1319****FACILITY SANITARY SEWER SPECIALTIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under this Section as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 22 0501: 'Common Plumbing Requirements'.
  - 2. Section 22 1119: 'Domestic Water Piping Specialties'.
  - 3. Section 22 1313: 'Facility Sanitary Sewers' for installation of miscellaneous sanitary sewer specialties.

**PART 2 - PRODUCTS****2.1 SYSTEMS**

- A. Manufacturers:
  - 1. Manufacturer Contact List:
    - a. Josam Co, Michigan City, IN [www.josam.com](http://www.josam.com).
    - b. Jay R. Smith Manufacturing Co, Montgomery, AL [www.jrsmith.com](http://www.jrsmith.com).
    - c. Mifab Manufacturing Inc, Chicago, IL [www.mifab.com](http://www.mifab.com).
    - d. Proset Systems, Lawrenceville, GA [www.prosetsystems.com](http://www.prosetsystems.com).
    - e. Sioux Chief Manufacturing Co, Peculiar, MO [www.sioxchief.com](http://www.sioxchief.com).
    - f. Sureseal Manufacturing, Tacoma WA [www.thesureseal.com](http://www.thesureseal.com).
      - 1) Contact Information:
        - a) All Areas except Idaho and Utah: Rick Ensley (253) 564-0624, [rick@thesureseal.com](mailto:rick@thesureseal.com).
        - b) Idaho and Utah Areas: Mark Evans, phone (801) 748-1222, [mark@franklinjames.com](mailto:mark@franklinjames.com).
    - g. Wade Div Tyler Pipe, Tyler, TX [www.wadedrains.com](http://www.wadedrains.com).
    - h. Watts Drainage, Spindale, NC [www.watts.com](http://www.watts.com) or Watts Industries, Burlington, ON, Canada [www.wattscda.com](http://www.wattscda.com).
    - i. Zurn Industries, LLC, Erie PA [www.zurn.com](http://www.zurn.com). or Zurn Industries Ltd, Mississauga, ON (905) 795-8844.
- B. Performance:
  - 1. Design Criteria:
    - a. All materials NOT required to be low lead compliant.
- C. Components:
  - 1. Drains And Drain Accessories:
    - a. Floor Drain FD-1:
      - 1) Approved types with deep seal trap and chrome plated strainer.
      - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
        - a) Josam: 30000-50-Z-5A.
        - b) J. R. Smith: 2010-A.
        - c) Mifab: F-1100-C.
        - d) Sioux Chief: 832.
        - e) Wade: 1100.
        - f) Watts: FD-200-A.
        - g) Zurn: Z-415.

## D. Accessories:

## 1. Drain Accessories:

## a. Floor Drains:

- 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
  - a) Trap guard by Proset Systems. Provide model number to match floor drain.
  - b) Trap seal by Sureseal. Provide model number to match floor drain.

**PART 3 - EXECUTION: Not Used****END OF SECTION**

**SECTION 22 4213****COMMERCIAL WATER CLOSETS AND URINALS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install plumbing fixtures as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 07 9213: 'Elastomeric Joint Sealants' for sealants used between fixtures and other substrates.
  - 2. Section 22 0501: 'Common Plumbing Requirements'.
  - 3. Section 22 1116: 'Domestic Water Piping'.

**1.2 REFERENCES**

- A. Definitions:
  - 1. High-Efficiency Toilet (HET): Toilets with effective flush volume of **1.28 gallons** or less.
  - 2. Maximum Performance (MaP): Toilet testing that rates toilet efficiency and flush performance by measuring number of grams of solid waste (soybean paste and toilet paper) that a toilet can flush and remove completely from fixture in single flush represented as a scale or score. 1000 grams is highest score possible ([www.map-testing.com](http://www.map-testing.com)).
- B. Reference Standards:
  - 1. American Society of Mechanical Engineers / CSA Group (Canadian Standards Association):
    - a. ASME A112.19.2-2013/CSA B45.1-13, 'Ceramic Plumbing Fixtures'.

**1.3 SUBMITTALS**

- A. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Operation and Maintenance Data:
      - 1) Sensor Operated operation and maintenance manuals.

**PART 2 - PRODUCTS****2.1 ASSEMBLIES**

- A. Manufacturers:
  - 1. Manufacturer Contact List:
    - a. American Standard Brands, Piscataway, NJ [www.americanstandard-us.com](http://www.americanstandard-us.com).
    - b. AMTC - Advanced Modern Technologies Corp, Woodland Hills, CA [www.amtcorporation.com](http://www.amtcorporation.com).
    - c. Bemis Manufacturing Co, Sheboygan Falls, WI [www.bemismfg.com](http://www.bemismfg.com).
    - d. Beneke by Sanderson Plumbing Products, Columbus, MS [www.sppi.com](http://www.sppi.com).
    - e. Church Seat Co, Sheboygan Falls WI [www.churchseats.com](http://www.churchseats.com).
    - f. Delany Flush Valves, Charlottesville, VA [www.delanyproduct.com](http://www.delanyproduct.com).
    - g. Delta Faucet Co, Indianapolis, IN [www.deltafaucet.com](http://www.deltafaucet.com).
    - h. Dearborn Brass, Cleveland, OH [www.dearbornbrass.com](http://www.dearbornbrass.com).
    - i. Gerber Plumbing Fixtures LLC, Woodridge, IL [www.gerberonline.com](http://www.gerberonline.com).



- j. Josam Co, Michigan City, IN [www.josam.com](http://www.josam.com).
- k. Jay R. Smith Mfg. Co, Montgomery, AL [www.jrsmith.com](http://www.jrsmith.com).
- l. Kohler Co Plumbing Div, Kohler, WI [www.us.kohler.com](http://www.us.kohler.com).
- m. McGuire Manufacturing Co, Cheshire, CT [www.mcguiremfg.com](http://www.mcguiremfg.com).
- n. Mifab Manufacturing Inc, Amherst, NY [www.mifab.com](http://www.mifab.com).
- o. Moen Incorporated, North Olmsted, OH, [www.moen.com](http://www.moen.com).
- p. Olsonite Corp, Newnan, GA [www.olsonite.net](http://www.olsonite.net).
- q. Sloan Valve Co, Franklin Park, IL [www.sloanvalve.com](http://www.sloanvalve.com).
- r. South Fork Manufacturing, Coalville, UT (801) 953-3001 [www.dirt-grabber.com](http://www.dirt-grabber.com).
- s. Toto U.S.A., Inc., Morrow, GA [www.totousa.com](http://www.totousa.com)
- t. Wade Div Tyler Pipe, Tyler, TX [www.wadedrains.com](http://www.wadedrains.com).
- u. Watts Drainage, Spindale, NC [www.wattsdrainage.com](http://www.wattsdrainage.com).
- v. Zurn Industries, LLC, Erie PA [www.zurn.com](http://www.zurn.com).

B. Performance:

1. Design Criteria:

- a. Meet or exceed ASME A112.19.2/CSA B45.1 for Vitreous China Plumbing Fixtures.
- b. Interior exposed pipe, valves, and fixture trim, including trim behind custom casework doors, shall be chrome plated.
- c. All materials NOT required to be low lead compliant.

C. Materials:

1. Water Closets:

a. Floor Mounted With Tank:

1) Standard Fixture:

- a) Water usage of 1.6 gallons per flush.
- b) MaP Score of 1000 grams.
- c) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
  - (1) American Standard: Cadet 3 Elongated 215CA.004.
  - (2) Gerber: Avalanche AV-21-812.
  - (3) Kohler: Wellworth K-3978.
  - (4) Sloan: WETS-9003-1.6.
  - (5) Toto: 'Drake' CST744S.

2) Handicap Accessible Fixture:

- a) Water usage of 1.6 gallons per flush.
- b) 18 inch maximum rim height.
- c) MaP Score of 1000 grams.
- d) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
  - (1) American Standard: Cadet 3 Right Height Elongated 215AA.004.
  - (2) Gerber: Avalanche AV-21-818.
  - (3) Kohler: Highline K-3979.
  - (4) Sloan: WETS-9023-1.6.
  - (5) Toto: 'ADA Drake' CST744SL.

2. Water Closet Accessories:

a. Seats:

- 1) Provide split front type with check hinge.
- 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
  - a) Standard And Handicap Accessible Fixtures:
    - (1) American Standard: 5905.100SS.
    - (2) Bemis: 1655SSC.
    - (3) Beneke: 527 SS.
    - (4) Church: 9500SSC.
    - (5) Kohler: K-4731-C.
    - (6) Olsonite: 95SSC.
    - (7) Toto SC534.

b. Supply Pipe And Stop:

- 1) Provide chrome plated quarter-turn brass ball valve, 12 inch ( braided stainless steel riser, and chrome-plated steel flange.

- 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
  - a) McGuire: BV2166CC.
  - b) Zurn: Z8804.
- c. Carrier / Support:
  - 1) Wall mounted.
  - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a) Josam.
    - b) Jay R. Smith.
    - c) Mifab.
    - d) Wade.
    - e) Watts.
    - f) Zurn.
3. Urinals:
  - a. Standard Fixture (wall mounted Flush Valve, mount standard height or ADA mounting height):
    - 1) Water usage of 1.0 gallons per flush.
    - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - a) American Standard: Washbrook FloWise 6590.001.
      - b) Gerber: Monitor 27-780or 27-730.
      - c) Kohler: Bardon K-4904-ET.
      - d) Sloan SU-1006-1.0.
      - e) Toto: UT447E.
4. Urinal Accessories:
  - a. Carrier / Support:
    - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - a) Josam.
      - b) Jay R. Smith.
      - c) Mifab.
      - d) Wade.
      - e) Zurn.
  - b. Flush Valve:
    - 1) 1 gallon per flush.
    - 2) Proximity sensor type with battery.
    - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - a) American Standard 6063.101.
      - b) Delany: PL 1451-1.
      - c) Delta: 81T231BTA.
      - d) Moen: 8312.
      - e) Sloan: 186-1.0.
      - f) Zurn: ZR6003AV with maintenance override button.
  - c. Flush Valve Filter:
    - 1) Required in following flush valves:
      - a) Sloan.
      - b) Zurn.
    - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - a) SFDG1 'Dirt Grabber' by South Fork Manufacturing.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install each fixture with separate vent line. Do not circuit vent.
- B. Ensure provisions are made for proper support of fixtures and that rough-in piping is accurately set and protected from movement and damage.
  1. Seal wall-mounted fixtures around edges to wall with sealant specified in Section 07 9213 'Elastomeric Joint Sealants'.
  2. Attach wall-hung fixtures to carriers.

3. Support fixture hanger or arm free of finished wall.
- C. Adjust flush valves for proper flow.
- D. Provide each individual fixture supply with accessible chrome-plated stop valve with hand wheel.
- E. Mounting:
  1. Urinals:
    - a. Standard: 24 inches from floor to bottom lip.
    - b. Handicap Accessible: 17 inches maximum from floor to bottom lip.
- F. Water Closets:
  1. Floor or Wall Fixtures:
    - a. Make fixture connections with approved brand of cast iron flange, soldered or caulked securely to waste pipe. Make joints between fixtures and flanges tight with approved fixture setting compound or gaskets. Caulk between fixtures with sealant specified in Section 07 9213. Point edges.
- G. Flush Valve Filters:
  1. Install in Sloan and Zurn only flush valves.
  2. Install after water lines have been flushed out, but before turning water into flush valve.

### 3.2 CLEANING

- A. Polish chrome finish at completion of Project.

**END OF SECTION**

**SECTION 22 4216****COMMERCIAL LAVATORIES AND SINKS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install plumbing fixtures as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 07 9213: 'Elastomeric Joint Sealants' for sealants used between fixtures and other substrates.
  - 2. Section 22 0501: 'Common Plumbing Requirements'.
  - 3. Section 22 1116: 'Domestic Water Piping'.

**1.2 REFERENCES**

- A. Reference Standard:
  - 1. American National Standards Institute / International Code Council:
    - a. ANSI/ICC A117.1-2009, 'Standard for Accessible and Usable Buildings and Facilities'.
  - 2. American Society of Mechanical Engineers / Canadian Standards Association (CSA Group):
    - a. ASME A112.18.1-2012/CSA B125.1-12, 'Plumbing Supply Fittings'.
    - b. ASME A112.19.1-2013/CSA B45.2-13, 'Enamelled cast iron and enamelled steel plumbing fixtures'.
    - c. ASME A112.19.3-2008/CSA B45.4-08 (R2013), 'Stainless steel plumbing fixtures'.
  - 3. NSF International Standard / American National Standards Institute:
    - a. NSF/ANSI 61-2014a, 'Drinking Water System Components - Health Effects'.
    - b. NSF/ANSI 372-2011, 'Drinking Water System Components - Lead Content'.

**1.3 QUALITY ASSURANCE**

- A. Regulatory Agency Sustainability Approvals:
  - 1. Meet NSF International Standards for materials or products that come into contact with drinking water, drinking water treatment chemicals, or both for chemical contaminants and impurities that are indirectly imparted to drinking water from products, components, and materials used in drinking water systems.
  - 2. California only: California Assembly Bill 1953 (AB1953) Compliant for Lead Free.

**1.4 SUBMITTALS**

- A. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Warranty Documentation:
      - 1) Final, executed copy of Warranty.

**1.5 WARRANTY**

- A. Manufacturer Warranty:
  - 1. Manufacturer's standard Warranty against material or Manufacturing defects.

**PART 2 - PRODUCTS****2.1 ASSEMBLIES****A. Manufacturers:****1. Manufacturer Contact List:**

- a. American Standard Brands, Piscataway, NJ [www.americanstandard-us.com](http://www.americanstandard-us.com).
- b. Brocar Products Inc, Cincinnati, OH [www.brocar.com](http://www.brocar.com).
- c. CECO, Huntington Park, CA [www.cecossinks.com](http://www.cecossinks.com).
- d. Chicago Faucet Co, Des Plaines, IL [www.chicagofaucets.com](http://www.chicagofaucets.com).
- e. Dearborn Brass, Tyler, TX [www.dearbornbrass.com](http://www.dearbornbrass.com).
- f. Delta Faucet Co, Indianapolis, IN [www.deltafaucet.com](http://www.deltafaucet.com).
- g. Engineered Brass Co. (EBC) (Just Manufacturing Co.), Franklin Park, IL [www.justmfg.com](http://www.justmfg.com).
- h. Elkay Manufacturing Co, Oak Brook, IL [www.elkay.com](http://www.elkay.com).
- i. Gerber Plumbing Fixtures LLC, Woodridge, IL [www.gerberonline.com](http://www.gerberonline.com).
- j. Josam Co, Michigan City, IN [www.josam.com](http://www.josam.com).
- k. Jay R. Smith Manufacturing Co, Montgomery, AL [www.jrsmith.com](http://www.jrsmith.com).
- l. Just Manufacturing Co, Franklin Park, IL [www.justsinks.com](http://www.justsinks.com).
- m. Keeney Manufacturing Co, Newington, CT [www.keeneymfg.com](http://www.keeneymfg.com).
- n. Kindred USA, Midland, ON [www.kindred-sinkware.com](http://www.kindred-sinkware.com).
- o. Kohler Co Plumbing Div, Kohler, WI [www.us.kohler.com](http://www.us.kohler.com).
- p. McGuire Manufacturing Co, Cheshire, CT [www.mcguiremfg.com](http://www.mcguiremfg.com).
- q. Mifab Manufacturing Inc, Amherst, NY [www.mifab.com](http://www.mifab.com).
- r. Moen Incorporated, North Olmsted, OH, [www.moen.com](http://www.moen.com).
- s. Omni Flow Controls, Harbor City, CA [www.chronomite.com](http://www.chronomite.com) or [www.omniflowcontrols.com](http://www.omniflowcontrols.com).
- t. Plumberex Specialty Products, Palm Springs, CA [www.plumberex.com](http://www.plumberex.com).
- u. Sloan Valve Co, Franklin Park, IL [www.sloanvalve.com](http://www.sloanvalve.com).
- v. Speakman Company, New Castle, DE [www.speakmancompany.com](http://www.speakmancompany.com).
- w. Symmons, Braintree, MA [www.symmons.com](http://www.symmons.com).
- x. T & S Brass & Bronze Works Inc, Travelers Rest, SC [www.tsbrass.com](http://www.tsbrass.com).
- y. TrueBro Inc, Collierville, TN [www.truebro.com](http://www.truebro.com).
- z. Wade Div Tyler Pipe, Tyler, TX [www.wadedrains.com](http://www.wadedrains.com).
- aa. Watts Drainage, Spindale, NC [www.wattsdrainage.com](http://www.wattsdrainage.com).
- bb. Zurn Commercial Brass, Sanford, NC [www.zurn.com](http://www.zurn.com).
- cc. Zurn Cast Metal, Erie, PA [www.zurn.com](http://www.zurn.com).

**B. Performance:****1. Design Criteria:**

- a. Interior exposed pipe, valves, and fixture trim, including trim behind custom casework doors, shall be chrome plated.
- b. Faucets and other fixture fittings shall conform to requirements of ASME A112.18.1/CSA B125.1.
- c. Lavatories shall conform to requirements of:
  - 1) Enamelled cast iron and enamelled steel fixtures.
    - a) ASME A112.19.1/CSA B45.2.
  - 2) Stainless steel plumbing fixtures:
    - a) ASME A112.19.3/CSA B45.4.

**C. Components:****1. Lavatories And Fittings:**

- a. Standard and Handicap Accessible Counter Top Lavatories:
  - 1) Size **20 by 17 inches** nominal.
  - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a) American Standard: Aqualyn 0476.028.
    - b) Gerber: Luxoval 12-844.
    - c) Kohler: Pennington K-2196-4N.
- b. Standard and Handicap Accessible Self Supporting Lavatories:
  - 1) Size: **20 by 18 inches** nominal.
  - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:

- a) American Standard: Lucern 0355.012.
- b) Gerber: Monticello II 12-654.
- c) Kohler: Greenwich K-2032.
- 3) Carrier / Support:
  - a) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - (1) Josam: 17100.
    - (2) Jay R. Smith: 0700.
    - (3) Mifab: MC-41.
    - (4) Wade: 520-M36.
- c. Lavatory Fittings:
  - 1) Faucet and Grid Strainer For Standard Sinks:
    - a) Design Criteria:
      - (1) Meet NSF International Standards for Lead Free.
    - b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - (1) American Standard: Monterrey Two-Handle Centerset Lavatory Faucet with Vandal-Resistant Wrist Blade handles and grid strainer drain 5502.140
      - (2) Chicago: 802CP with 327XCP.
      - (3) Delta: 2529HDF.
      - (4) Gerber: C4-44-412.
      - (5) Kohler: K-7404-5A with K-7715 strainer.
      - (6) Moen: 8215 with 14750 grid strainer.
      - (7) Speakman: SC 3072.
      - (8) T & S: B-0890 with B-0899 Grid Strainer.
      - (9) Zurn: Z81104 with McGuire 155A Grid Strainer.
  - 2) Faucet and Grid Strainer For Handicap Accessible Sinks:
    - a) Design Criteria:
      - (1) Meet NSF International Standards for Lead Free.
    - b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - (1) American Standard: Monterrey Two-Handle Centerset Lavatory Faucet with Vandal-Resistant Wrist Blade handles and grid strainer drain 5502.170.
      - (2) Chicago: 802-317CP with K7715 strainer.
      - (3) Delta: 2529HDF.
      - (4) Gerber: CO-44-412.
      - (5) Kohler: K-7404-5A with K-13885 strainer.
      - (6) Moen: 8215 with 14750 grid strainer.
      - (7) Speakman: SC 3074.
      - (8) T & S: B-0890 with B-0899 Grid Strainer.
      - (9) Zurn: Z-81104 with McGuire 155A grid strainer.
  - 3) Flow Control Fitting:
    - a) Design Criteria:
      - (1) Meet NSF International Standards for Lead Free.
    - b) Accessories:
      - (1) Provide vandal-proof type in place of aerator. Flow shall be 0.5 gpm.
    - c) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
      - (1) Omni L-200 Series by Chronomite Laboratories.
  - 4) Supply pipes with stops:
    - a) Design Criteria:
      - (1) Meet NSF International Standards for Lead Free.
    - b) Accessories:
      - (1) Provide chrome plated quarter-turn brass ball valve, 12 inches long braided stainless steel riser, and chrome-plated steel flange.
    - c) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - (1) McGuire: BV2165CC.
      - (2) Zurn: Z8804 LRQ-PC.
  - 5) Trap:

- a) Description:
    - (1) 17 gauge tube 'P' trap, chrome plated.
  - b) Design Criteria:
    - (1) Not required to meet NSF International Standards for Lead Free.
  - c) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - (1) Dearborn.
    - (2) Engineered Brass Company (EBC).
    - (3) Keeney Manufacturing.
    - (4) McGuire.
    - (5) Zurn.
- 6) Safety Covers for Handicap Accessible Lavatories:
- a) Description:
    - (1) Provide protection on water supply pipes and on trap.
  - b) Design Criteria:
    - (1) Not required to meet NSF International Standards for Lead Free.
  - c) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - (1) Trapwrap by Brocar Products Inc.
    - (2) Pro Wrap by McGuire Products.
    - (3) Lav Guard 2 by TrueBro.
    - (4) Pro Extreme by Plumberex.
2. Stainless Steel Sinks And Fittings:
- a. Design Criteria:
    - 1) Not required to meet NSF International Standards for Lead Free.
    - 2) Self-rimming, 18 gauge stainless steel, satin finish.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install each fixture with separate vent line. Do not circuit vent.
- B. Ensure provisions are made for proper support of fixtures and that rough-in piping is accurately set and protected from movement and damage.
- C. Seal wall-mounted fixtures around edges to wall and counter top fixtures to countertop with sealant specified in Section 07 9213.
- D. Unless otherwise noted, provide each individual fixture supply with chrome-plated stop valve with hand wheel.
- E. Install fixtures with accessible stop or control valve in each hot and cold water branch supply line.
- F. Self-Supporting Lavatories: Install using carriers. Support carrier free of finished wall.
- G. Install Safety Covers on all under sink / lavatories with exposed water supply pipes and traps.
- H. Install Handicap Accessible Lavatories as per ADA height mounting requirements.

### 3.2 CLEANING

- A. Polish chrome finish at completion of Project.

## END OF SECTION

**SECTION 23 0501****COMMON HVAC REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Common requirements and procedures for HVAC systems.
  - 2. Responsibility for proper operation of electrically powered equipment furnished under this Division.
  - 3. Interface with Testing And Balancing Agency.
  - 4. Furnish and install sealants relating to installation of systems installed under this Division.
  - 5. Furnish and install Firestop Penetration Systems for HVAC system penetrations as described in Contract Documents.
  - 6. Furnish and install sound, vibration, and seismic control elements.
- B. Products Furnished But Not Installed Under This Section:
  - 1. Sleeves, inserts, and equipment for mechanical systems installed under other Sections.
- C. Related Requirements:
  - 1. Section 03 3053: 'Miscellaneous Cast-In-Place Concrete' for exterior concrete pads and bases for mechanical equipment.
  - 2. Section 05 0523: 'Metal Fastening' for quality and requirements for welding.
  - 3. Section 07 8400: 'Firestopping' for quality of Penetration Firestop Systems to be used on Project and submittal requirements.
  - 4. Section 07 9213: 'Elastometric Joint Sealant' for quality of sealants used at building exterior.
  - 5. Section 07 9219: 'Acoustical Joint Sealants' for quality of acoustical sealants.
  - 6. Sections Under 09 9000 Heading: Painting of mechanical items requiring field painting.
  - 7. Division 26: Raceway and conduit, unless specified otherwise, line voltage wiring, outlets, and disconnect switches.
  - 8. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.
  - 9. Sections Under 33 5000 Heading: Fuel Distribution Utilities.

**1.2 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Manufacturer's catalog data for each manufactured item.
      - 1) Provide section in submittal for each type of item of equipment. Include Manufacturer's catalog data of each manufactured item and enough information to show compliance with Contract Document requirements. Literature shall show capacities and size of equipment used and be marked indicating each specific item with applicable data underlined.
      - 2) Include name, address, and phone number of each supplier.
  - 2. Shop Drawings:
    - a. Schematic control diagrams for each separate fan system, heating system, control panel, etc. Each diagram shall show locations of all control and operational components and devices. Mark correct operating settings for each control device on these diagrams.
    - b. Diagram for electrical control system showing wiring of related electrical control items such as firestats, fuses, interlocks, electrical switches, and relays. Include drawings showing electrical power requirements and connection locations.
    - c. Drawing of each temperature control panel identifying components in panels and their function.



- d. Other shop drawings required by Division 23 trade Sections.
- B. Informational Submittals:
  - 1. Qualification Statement:
    - a. HVAC Firm:
      - 1) Provide Qualification documentation if requested by Architect or Owner.
    - b. Installer:
      - 1) Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Operations and Maintenance Data (Modify and add to requirements of Section 01 7800):
      - 1) At beginning of HVAC section of Operations And Maintenance Manual, provide master index showing items included.
        - a) Provide name, address, and phone number of Architect, Architect's Mechanical Engineer, General Contractor, and HVAC, Sheet Metal, Refrigeration, and Temperature Control subcontractors.
        - b) Identify maintenance instructions by using same equipment identification used in Contract Drawings. Maintenance instructions shall include:
          - (1) List of HVAC equipment used indicating name, model, serial number, and nameplate data of each item together with number and name associated with each system item.
          - (2) Manufacturer's maintenance instructions for each piece of HVAC equipment installed in Project. Instructions shall include name of vendor, installation instructions, parts numbers and lists, operation instructions of equipment, and maintenance and lubrication instructions.
          - (3) Summary list of mechanical equipment requiring lubrication showing name of equipment, location, and type and frequency of lubrication.
          - (4) Manual for Honeywell T7350 thermostat published by Honeywell.
        - c) Provide operating instructions to include:
          - (1) General description of each HVAC system.
          - (2) Step by step procedure to follow in putting each piece of HVAC equipment into operation.
          - (3) Provide diagrams for electrical control system showing wiring of items such as smoke detectors, fuses, interlocks, electrical switches, and relays.
    - b. Warranty Documentation:
      - 1) Include copies of warranties required in individual Sections of Division 23.
    - c. Record Documentation:
      - 1) Manufacturers documentation:
        - a) Copies of approved shop drawings.

### 1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
  - 1. Perform work in accordance with applicable provisions of Gas Ordinances applicable to Project. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
  - 2. In case of differences between building codes, laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Notify Architect in writing of such differences before performing work affected by such differences.
  - 3. Identification:
    - a. Motor and equipment name plates as well as applicable UL / ULC and AGA / CGA labels shall be in place when Project is turned over to Owner.
- B. Qualifications: Requirements of Section 01 4301 applies, but not limited to following:
  - 1. Company:
    - a. Company specializing in performing work of this section.
      - 1) Minimum five (5) years experience in HVAC installations.
      - 2) Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.

- b. Upon request, submit documentation.
2. Installer:
  - a. Licensed for area of Project.
  - b. Designate one (1) individual as project foremen who shall be on site at all times during installation and experienced with installation procedures required for this project.
  - c. Upon request, submit documentation.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
  1. Accept valves on site in shipping containers with labeling in place.
- B. Storage And Handling Requirements:
  1. In addition to requirements specified in Division 01:
    - a. Stored material shall be readily accessible for inspection by Architect until installed.
    - b. Store items subject to moisture damage, such as controls, in dry, heated spaces.
    - c. Provide temporary protective coating on cast iron and steel valves.
    - d. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
  2. Protect bearings during installation. Thoroughly grease steel shafts to prevent corrosion.

#### 1.5 WARRANTY

- A. Manufacturer Warranty:
  1. Provide certificates of warranty for each piece of equipment made out in favor of Owner. Clearly record 'start-up' date of each piece of equipment on certificate.
- B. Special Warranty:
  1. Guarantee HVAC systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.
  2. If HVAC sub-contractor with offices located more than **150 miles** from Project site is used, provide service / warranty work agreement for warranty period with local HVAC sub-contractor approved by Architect. Include copy of service / warranty agreement in warranty section of Operation And Maintenance Manual.

### PART 2 - PRODUCTS

#### 2.1 COMPONENTS

- A. Components shall bear Manufacturer's name and trade name. Equipment and materials of same general type shall be of same make throughout work to provide uniform appearance, operation, and maintenance.
- B. Pipe And Pipe Fittings:
  1. Use domestic made pipe and pipe fittings on Project.
  2. Weld-O-Let and Screw-O-Let fittings are acceptable.
- C. Sleeves:
  1. In Framing: Standard weight galvanized iron pipe, Schedule 40 PVC, or **14 ga** galvanized sheet metal two sizes larger than bare pipe or insulation on insulated pipe.
  2. In Concrete And Masonry: Sleeves through outside walls, interior shear walls, and footings shall be schedule 80 black steel pipe with welded plate.
- D. Valves:
  1. Valves of same type shall be of same manufacturer.

**PART 3 - EXECUTION****3.1 INSTALLERS**

- A. Acceptable Installers:
1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

**3.2 EXAMINATION**

- A. Drawings:
1. HVAC Drawings show general arrangement of piping, ductwork, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.
  2. Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over HVAC Drawings.
  3. Because of small scale of Drawings, it is not possible to indicate all offsets, fittings, and accessories that may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves, and accessories required to meet conditions.
- B. Verification Of Conditions:
1. Examine premises to understand conditions that may affect performance of work of this Division before submitting proposals for this work. Examine adjoining work on which mechanical work is dependent for efficiency and report work that requires correction.
  2. No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.
  3. Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit space available.
  4. Check that slots and openings provided under other Divisions through floors, walls, ceilings, and roofs are properly located. Perform cutting and patching caused by neglecting to coordinate with Divisions providing slots and openings at no additional cost to Owner.

**3.3 PREPARATION**

- A. Changes Due To Equipment Selection:
1. Where equipment specified or otherwise approved requires different arrangement or connections from that shown in Contract Documents, submit drawings, if requested by Architect, showing proposed installations.
  2. If proposed changes are approved, install equipment to operate properly and in harmony with intent of Contract Documents. Make incidental changes in piping, ductwork, supports, installation, wiring, heaters, panelboards, and as otherwise necessary.
  3. Provide any additional motors, valves, controllers, fittings, and other additional equipment required for proper operation of system resulting from selection of equipment.
  4. Be responsible for the proper location of roughing-in and connections provided under other Divisions.

**3.4 INSTALLATION**

- A. Interface With Other Work:

1. Furnish sleeves, inserts, supports, and equipment that are to be installed by others in sufficient time to be incorporated into construction as work proceeds. Locate these items and see they are properly installed.
  2. Electrical: Furnish exact location of electrical connections and complete information on motor controls to installer of electrical system.
  3. Testing And Balancing:
    - a. Put HVAC systems into full operation and continue their operation during each working day of testing and balancing.
    - b. Make changes in pulleys, belts, fan speeds, and dampers or add dampers as required for correct balance as recommended by Testing And Balancing Agency and at no additional cost to Owner.
- B. Cut carefully to minimize necessity for repairs to previously installed or existing work. Do not cut beams, columns, or trusses.
- C. Locating Equipment:
1. Arrange pipes, ducts, and equipment to permit ready access to valves, cocks, unions, traps, filters, starters, motors, control components, and to clear openings of doors and access panels.
  2. Adjust locations of pipes, ducts, switches, panels, and equipment to accommodate work to interferences anticipated and encountered.
  3. Install HVAC work to permit removal of equipment and parts of equipment requiring periodic replacement or maintenance without damage to or interference with other parts of equipment or structure.
  4. Determine exact route and location of each pipe and duct before fabrication.
    - a. Right-Of-Way:
      - 1) Lines that pitch shall have right-of-way over those that do not pitch. For example, steam, steam condensate, and drains shall normally have right-of-way.
      - 2) Lines whose elevations cannot be changed shall have right-of-way over lines whose elevations can be changed.
    - b. Offsets, Transitions, and Changes in Direction:
      - 1) Make offsets, transitions, and changes in direction in pipes and ducts as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.
      - 2) Furnish and install all traps, air vents, sanitary vents, and devices as required to effect these offsets, transitions, and changes in direction.
- D. Piping:
1. Furnish and install complete system of piping, valved as indicated or as necessary to completely control entire apparatus.
    - a. Pipe drawings are diagrammatic and indicate general location and connections. Piping may have to be offset, lowered, or raised as required or directed at site. This does not relieve this Division from responsibility for proper erection of systems of piping in every respect.
    - b. Arrange piping to not interfere with removal of other equipment, ducts, or devices, or block access to doors, windows, or access openings.
      - 1) Arrange so as to facilitate removal of tube bundles.
      - 2) Provide accessible flanges or ground joint unions, as applicable for type of piping specified, at connections to equipment and on bypasses.
        - a) Make connections of dissimilar metals with di-electric unions.
        - b) Install valves and unions ahead of traps and strainers. Provide unions on both sides of traps.
      - 3) Do not use reducing bushings, street elbows, bull head tees, close nipples, or running couplings.
      - 4) Install piping systems so they may be easily drained. Provide drain valves at low points and manual air vents at high points in hot water heating and cooling water piping.
      - 5) Install piping to insure noiseless circulation.
      - 6) Place valves and specialties to permit easy operation and access. Valves shall be regulated, packed, and glands adjusted at completion of work before final acceptance.
    - c. Do not install piping in shear walls.
  2. Properly make adequate provisions for expansion, contraction, slope, and anchorage.

- a. Cut piping accurately for fabrication to measurements established at site. Remove burr and cutting slag from pipes.
  - b. Work piping into place without springing or forcing. Make piping connections to pumps and other equipment without strain at piping connection. Remove bolts in flanged connections or disconnect piping to demonstrate that piping has been so connected, if requested.
  - c. Make changes in direction with proper fittings.
  - d. Expansion of Thermoplastic Pipe:
    - 1) Provide for expansion in every 30 feet of straight run.
    - 2) Provide 12 inch offset below roof line in each vent line penetrating roof.
  3. Provide sleeves around pipes passing through concrete or masonry floors, walls, partitions, or structural members. Do not place sleeves around soil, waste, vent, or roof drain lines passing through concrete floors on grade. Seal sleeves with specified sealants.
    - a. Sleeves through floors shall extend 1/4 inch above floor finish in mechanical equipment rooms above basement floor. In other rooms, sleeves shall be flush with floor.
    - b. Sleeves through floors and foundation walls shall be watertight.
  4. Provide spring clamp plates (escutcheons) where pipes run through walls, floors, or ceilings and are exposed in finished locations of building. Plates shall be chrome plated heavy brass of plain pattern and shall be set tight on pipe and to building surface.
  5. Remove dirt, grease, and other foreign matter from each length of piping before installation.
    - a. After each section of piping used for movement of water or steam is installed, flush with clean water, except where specified otherwise.
    - b. Arrange temporary flushing connections for each section of piping and arrange for flushing total piping system.
    - c. Provide temporary cross connections and water supply for flushing and drainage and remove after completion of work.
- E. Penetration Firestops: Install Penetration Firestop System appropriate for penetration at HVAC system penetrations through walls, ceilings, roofs, and top plates of walls.
- F. Sealants:
1. Seal openings through building exterior caused by penetrations of elements of HVAC systems.
  2. Furnish and install acoustical sealant to seal penetrations through acoustically insulated walls and ceilings.

### 3.5 REPAIR / RESTORATION

- A. Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.
1. Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown.
  2. Surface finishes shall exactly match existing finishes of same materials.

### 3.6 FIELD QUALITY CONTROL

- A. Field Tests:
1. Perform tests on HVAC piping systems. Furnish devices required for testing purposes.
- B. Non-Conforming Work:
1. Replace material or workmanship proven defective with sound material at no additional cost to Owner.
  2. Repeat tests on new material, if requested.

### 3.7 SYSTEM START-UP

- A. Off-Season Start-up:

1. If Substantial Completion inspection occurs during heating season, schedule spring start-up of cooling systems. If inspection occurs during cooling season, schedule autumn start-up for heating systems.
  2. Notify Owner seven days minimum before scheduled start-up.
  3. Time will be allowed to completely service, test, check, and off-season start systems. During allowed time, train Owner's representatives in operation and maintenance of system.
  4. At end of off-season start-up, furnish Owner with letter confirming that above work has been satisfactorily completed.
- B. Preparations that are to be completed before start up and operation include, but are not limited to, following:
1. Dry out electric motors and other equipment to develop and properly maintain constant insulation resistance.
  2. Make adjustments to insure that:
    - a. Equipment alignments and clearances are adjusted to allowable tolerances.
    - b. Nuts and bolts and other types of anchors and fasteners are properly and securely fastened.
    - c. Packed, gasketed, and other types of joints are properly made up and are tight and free from leakage.
    - d. Miscellaneous alignments, tightenings, and adjustments are completed so systems are tight and free from leakage and equipment performs as intended.
  3. Motors and accessories are completely operable.
  4. Inspect and test electrical circuitry, connections, and voltages to be properly connected and free from shorts.
  5. Adjust drives for proper alignment and tension.
  6. Make certain filters in equipment for moving air are new and of specified type.
  7. Properly lubricate and run-in bearings in accordance with Manufacturer's directions and recommendations.

### **3.8 CLEANING**

- A. Clean exposed piping, ductwork, and equipment.
- B. No more than one week before Final Inspection, flush out bearings and clean other lubricated surfaces with flushing oil. Provide best quality and grade of lubricant specified by Equipment Manufacturer.
- C. Replace filters in equipment for moving air with new filters of specified type no more than one week before Final Inspection.

### **3.9 CLOSEOUT ACTIVITIES**

- A. Instruction Of Owner:
1. Instruct building maintenance personnel and Stake Physical Facilities Representative in operation and maintenance of mechanical systems utilizing Operation And Maintenance Manual when so doing:
    - a. Minimum Instruction Periods:
      - 1) HVAC and Refrigeration: Four (4) hours.
      - 2) Temperature Control: Four (4) hours.
    - b. Conduct instruction periods after Substantial Completion inspection when systems are properly working and before final payment is made. None of these instructional periods shall overlap another.

### **3.10 PROTECTION**

- A. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system. Cap or plug open ends of pipes and equipment to

keep dirt and other foreign materials out of system. Do not use plugs of rags, wool, cotton waste, or similar materials.

- B. Do not operate pieces of equipment used for moving supply air without proper air filters installed properly in system.
- C. After start-up, continue necessary lubrication and be responsible for damage to bearings while equipment is being operated up to Substantial Completion.

**END OF SECTION**

**SECTION 23 0513****COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Quality of motors used in designated mechanical equipment.
- B. Related Requirements:
  - 1. Section 23 0501: 'Common HVAC Requirements'.

**1.2 REFERENCE**

- A. Reference Standards:
  - 1. Institute of Electrical and Electronics Engineers:
    - a. IEEE Std C50.13-2005, 'Standard for Cylindrical-Rotor 50 Hz and 60 Hz Synchronous Generators Rated 10 MVA and Above'.

**PART 2 - PRODUCTS****2.1 MANUFACTURED UNITS**

- A. Manufacturers:
  - 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
    - a. General Electric Industrial Systems, Fort Wayne, IN [www.geindustrial.com](http://www.geindustrial.com).
    - b. Marathon Electric Co, Cleveland, OH [www.marathonelectric.com](http://www.marathonelectric.com).
    - c. Reliance Electric, Cleveland, OH [www.reliance.com](http://www.reliance.com).
    - d. Siemens Energy & Automation, Alphrata, GA [www.sea.siemens.com](http://www.sea.siemens.com).
    - e. Toshiba International Corp, Houston, TX [www.tic.toshiba.com](http://www.tic.toshiba.com).
- B. Performance:
  - 1. Design Criteria:
    - a. Construct for use at altitude where Project is located.
    - b. Guaranteed to operate continuously at 115 percent of full load with temperature rise in any part not to exceed **40 deg F**.
    - c. Premium efficiency type motor, unless noted otherwise.
    - d. Inverter rated if for variable frequency drive application.
- C. Motors:
  - 1. Comply with requirements of IEEE Std C50 (ANSI C50), and all NEMA Standards.
  - 2. Drip-proof, unless otherwise noted.
  - 3. Ball, sleeve, or roller bearings with dustproof and leakproof rings.
  - 4. Adequately braced and air-cooled windings.
  - 5. Provide motors for V-belt drives with cast-iron or steel base, with slide rail and adjustable screw device and isolate by rubber-in-shear devices.
  - 6. Commercially dynamically balanced and tested at factory before shipment.
    - a. Selected for quiet operation.
    - b. Sound power levels within NEMA MG1-12.49.
  - 7. Motors 3/4 HP and larger: Squirrel-cage type and designed for 3 phase 60 cycle 460V power, unless otherwise specified.
  - 8. Motors smaller than 3/4 HP: 120V 60-cycle single phase, unless otherwise specified.



9. Provide each motor with nameplate for electrical characteristics.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Line up motors and drives and place motors and equipment on foundations ready for operation.

**END OF SECTION**

**SECTION 23 0529****HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Common hanger and support requirements and procedures for HVAC systems.
- B. Related Requirements:
  - 1. Section 05 0523: 'Metal Fastening' for quality and requirements for welding.
  - 2. Section 07 8400: 'Firestopping' for quality of Penetration Firestop Systems to be used on Project and submittal requirements.
  - 3. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.
- C. Products Installed But Not Furnished Under This Section:
  - 1. Stencils and band colors of gas piping used in HVAC equipment.
- D. Related Requirements:
  - 1. Section 09 9124: 'Interior Painted Metal' for providing field painting of identification of piping used with HVAC equipment.
  - 2. Section 23 0553: 'Identification For HVAC Piping And Equipment' for HVAC piping and equipment identification signage requirements.
  - 3. Sections Under 09 9000 Heading: Painting of mechanical items requiring field painting.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Section 09 9124 to coordinate with Section 23 0529 for location of identification of HVAC piping and equipment to be field painted and Section 23 0553 for painting requirements of HVAC piping and equipment.
  - 2. Section 23 0529 to coordinate with Section 23 0553 for stencil and band color locations and identification requirements of HVAC piping and equipment for field application.

**1.3 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Manufacturer's catalog data for each manufactured item.

**PART 2 - PRODUCTS****2.1 ASSEMBLIES**

- A. Manufacturers:
  - 1. Class Two Quality Standard Approved Manufacturers. See Section 01 6200:
    - a. Anvil International, Portsmouth, NH [www.anvilintl.com](http://www.anvilintl.com).
    - b. Cooper B-Line, Highland, IL [www.cooperbline.com](http://www.cooperbline.com).
    - c. Erico International, Solon, OH [www.erico.com](http://www.erico.com).
    - d. Hilti Inc, Tulsa, OK [www.hilti.com](http://www.hilti.com).

- e. Minerallac, Hampshire, IL [www.minerallac.com](http://www.minerallac.com).
- f. Thomas & Betts, Memphis, TN [www.superstrut.com](http://www.superstrut.com).
- g. Unistrut, Wayne, MI [www.unistrut.com](http://www.unistrut.com).

## B. Performance:

## 1. Design Criteria:

- a. Support rods for single pipe shall be in accordance with following table:

Rod Diameter	Pipe Size
3/8 inch	2 inches and smaller
1/2 inch	2-1/2 to 3-1/2 inches
5/8 inch	4 to 5 inches
3/4 inch	6 inches
7/8 inch	8 to 12 inches

- b. Support rods for multiple pipes supported on steel angle trapeze hangers shall be in accordance with following table:

Rods		Number of Pipes per Hanger for Each Pipe Size						
No.	Diameter	2 Inch	2.5 Inch	3 Inch	4 Inch	5 Inch	6 Inch	8 Inch
2	3/8 Inch	Two	0	0	0	0	0	0
2	1/2 Inch	Three	Three	Two	0	0	0	0
2	5/8 Inch	Six	Four	Three	Two	0	0	0
2	5/8 Inch	Nine	Seven	Five	Three	Two	Two	0
2	5/8 Inch	Twelve	Nine	Seven	Five	Three	Two	Two

- 1) Size trapeze angles so bending stress is less than 10,000 psi.

1)

## C. Materials:1)

## 1. Hangers, Rods, Channels, Attachments, And Inserts:

- a. Galvanized and UL approved for service intended.
- b. Support horizontal piping from clevis hangers or on roller assemblies with channel supports, except where trapeze type hangers are explicitly shown on Drawings. Hangers shall have double nuts.
- c. Class Two Quality Standards:
  - 1) Support insulated pipes with clevis hanger equal to Anvil Fig 260 or roller assembly equal to Anvil Fig 171 with an insulation protection shield equal to Anvil Fig 167. Gauge and length of shield shall be in accordance with Anvil design data.
  - 2) Except uninsulated copper pipes, support uninsulated pipes from clevis hanger equal to Anvil Fig 260. Support uninsulated copper pipe from hanger equal to Anvil Fig CT-65
  - 1) copper plated hangers and otherwise fully suitable for use with copper tubing.
- d. Riser Clamps For Vertical Piping:
  - 1) Class Two Quality Standard: Anvil Figure 261.

1)

1)

## PART 3 - EXECUTION

1)

1)

## 3.1 INSTALLATION

1)

## A. Piping:

- 1. Properly support piping and make adequate provisions for expansion, contraction, slope, and anchorage.
  - a. Except for underground pipe, suspend piping from roof trusses or clamp to vertical walls using support channels and clamps. Do not hang pipe from other pipe, equipment, or ductwork. Laying of piping on any building element is not allowed.
  - b. Supports For Horizontal Piping:
    - 1) Support metal piping at 96 inches mm on center maximum for pipe 1-1/4 inches or larger and 72 inches on center maximum for pipe 1-1/8 inch or less.
    - 2) Support thermoplastic pipe at 48 inches on center maximum.
    - 3) Provide support at each elbow. Install additional support as required.
  - c. Supports for Vertical Piping:
    - 1)

- 1) Place riser clamps at each floor or ceiling level.
- 2) Securely support clamps by structural members, which in turn are supported directly from building structure.
- 3) Provide clamps as necessary to brace pipe to wall.
- d. Insulate hangers for copper pipe from piping by means of at least two layers of Scotch 33 plastic tape.
- e. Expansion of Thermoplastic Pipe:
  - 1) Provide for expansion in every 30 feet of straight run.
  - 2) Provide 12 inch offset below roof line in each vent line penetrating roof.

**END OF SECTION**

**BLANK PAGE**

**SECTION 23 0548****VIBRATION AND SEISMIC CONTROL FOR HVAC PIPING AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Quality of and requirements for anchorage and seismic restraint systems and vibration isolation systems for HVAC piping and equipment.
- B. Related Requirements:
  - 1. Section 03 3053: 'Miscellaneous Exterior Cast-In-Place Concrete'.
  - 2. Furnishing and installing of seismic restraint and vibration isolation systems is by installer of equipment requiring such systems. Manufacturers of equipment specified for seismic restraint shall provide product data needed for calculation of seismic restraint needs. This information shall include, but not be limited to, equipment dimensions, dimensioned anchor points, operating weight, and center of gravity dimension.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. Federal Emergency Management Agency (FEMA) / Vibration Isolation and Seismic Control Manufacturers Association (VISCMA) / American Society of Civil Engineers (ASCE):
    - a. FEMA 412, 'Installing Seismic Restraints For Mechanical Equipment' (December 2002).
  - 2. Vibration Isolation and Seismic Control Manufacturers Association (VISCMA):
    - a. VISCMA 101-12, 'Seismic Restraint Specification Guidelines for Mechanical, Electrical, and Plumbing Systems'.
    - b. VISCMA 102-12, 'Vibration Isolation Specification Guidelines for Mechanical, Electrical, and Plumbing Systems'.
- B. Definitions:
  - 1. Vibration Isolation: Vibration reduction in which an isolation system is placed between the source of unwanted vibration and an item which needs to be shielded from the vibration.
- C. Reference Standards:
  - 1. American National Standards Institute / Sheet Metal And Air Conditioning Contractors' National Association:
    - a. ANSI/SMACNA 001-2008, 'Seismic Restraint Manual: Guidelines For Mechanical Systems' (3rd Edition).
  - 2. American Society of Civil Engineers / Structural Engineering Institute:
    - a. ASCE/SEI 7-10, 'Minimum Design Loads for Buildings and Other Structures'.
      - 1) Chapter 13, 'Seismic Design Requirements For Nonstructural Components'.
  - 3. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
    - a. 2011 ASHRAE Handbook - HVAC Applications.
      - 1) Chapter 48, 'Noise and Vibration Control'.
      - 2) Chapter 55, 'Seismic- and Wind-Resistant Design'.
  - 4. ASTM International:
    - a. ASTM A615/A615M-12, 'Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement'.

**1.3 SUBMITTALS**

- A. Action Submittals:

1. Product Data:
  - a. Restraint system and anchorage method to be used for each piece of equipment.
  - b. Seismic restraints and calculations for all flexible mounted equipment.
  - c. Vibration isolators and flexible couplings.
  - d. Clearly outlined procedures for installing and adjusting isolators, seismic bracing anchors, and snubbers.
2. Shop Drawings:
  - a. Show size, hanger length, and location of seismic restraints for piping and ductwork.
  - b. Show details for each isolator and seismic brace with snubbers proposed for specified equipment.
  - c. Show details for proposed structural steel frames and rails and for anchors to be used in conjunction with isolation of equipment.
  - d. Show locations of piping and ductwork restraints on installation and fabrication floor plans (not bid set of documents of floor plans), noting size and type of restraint to be used.
  - e. Show details of supports, hangers, anchorage, and bracing for isolated equipment as designed or proposed by professional engineer employed by Restraint Manufacturer and qualified with seismic experience in bracing for mechanical equipment. Shop drawings submitted for seismic bracing and anchors shall bear engineer's signed professional seal.
  - f. Include anchor bolt calculations, signed and stamped by registered engineer, showing adequacy of bolt sizing and type.
    - 1) Calculations shall include anchor embedment, minimum edge distance and minimum center distance.
    - 2) Design lateral forces shall be distributed in proportion to mass distribution of equipment.
    - 3) Furnish calculations for anchors on restraint devices, cable, isolators, and on rigidly mounted equipment.

## 1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
  1. System design and installation shall meet seismic requirements as defined in ASCE/SEI 7-10, 'Minimum Design Loads for Buildings and Other Structures' and applicable state and local codes in accordance with minimum restraint capability of 1.0 g.

## PART 2 - PRODUCTS

### 2.1 ASSEMBLIES

- A. Manufacturers:
  1. Type One Acceptable Manufacturers:
    - a. Amber / Booth Company, Houston, TX [www.amberbooth.com](http://www.amberbooth.com).
    - b. Mason Industries Inc, Hauppauge, NY [www.mason-ind.com](http://www.mason-ind.com).
    - c. Vibration Mountings and Control Inc, Bloomington, NJ (201) 838-1780.
    - d. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Performance:
  - a. Vibration Isolation Requirements:
    - 1) Isolate equipment from structure by means of resilient vibration and noise isolators.
    - 2) Unless otherwise noted, isolate HVAC equipment one horsepower and over from structure by means of resilient vibration and noise isolators in accordance with ASHRAE 'Handbook - HVAC Applications', Chapter 48, Table 1, 'Design Guidelines for HVAC-Related Background Sound in Rooms'.
    - 3) Design and install isolation equipment, hangers, connections, and other isolating devices to prevent transmission of vibration to structure from equipment and associated piping and ductwork.

- 4) For floor-mounted equipment, use recommendations with ASHRAE 'Handbook - HVAC Applications', Chapter 48, Table 1, 'Design Guidelines for HVAC-Related Background Sound in Rooms'.
- 5) For roofs and floors constructed with open web joints, thin long span slabs, wooden construction and unusual light weight construction, evaluate equipment weighing more than 300 pounds to determine additional deflection of structure caused by equipment weight. Isolator deflection shall be 15 times additional deflection or deflection shown in ASHRAE 'Handbook - HVAC Applications', Chapter 48, Table 1, 'Design Guidelines for HVAC-Related Background Sound in Rooms', whichever is greater.
- 6) Under-Equipment Spring Isolators:
  - a) Equal to Mason SSLFH earthquake motion restrained spring mounts with freestanding stable steel springs, leveling bolts, corrosion resistant finish, motion limiting design, uplift restraining bolts, and **1/4 inch** ribbed neoprene noise stop pad.
  - b) Isolators shall accept force in any direction up to 1.0 g without failure, and shall limit movement to **3/4 inch** in any direction.
  - c) Springs shall have 50 percent overload capacity.
  - d) Size as required to achieve specified static deflection.
  - e) Outer diameter of spring proper shall not be less than 0.8 of spring height when in loaded position.
- 7) Overhead Support Spring And Rubber Hangers:
  - a) Combination spring and neoprene hangers.
  - b) Hanger bracket shall have 500 percent overload capability and shall allow up to 15 degree hanger rod misalignment without short-circuiting.
  - c) Springs shall have 50 percent overload capacity.
  - d) Provide seismic bracing as required.
- 8) Isolate piping and ductwork in mechanical equipment room and piping and ductwork three supports away or **50 feet from** other mechanical equipment, whichever is greater, from structure by means of vibration and noise isolators.
  - a) Isolate suspended piping with combination spring and fiberglass hangers in supporting rods.
  - b) Support floor-mounted piping directly on spring mounts.
- 9) Isolate vertical pipe risers from structure using vibration and noise isolating expansion hangers having minimum rated deflection of four times anticipated pipe movement. Enclose in housing for fail-safe equipment.
- 10) Incorporate flexible connectors in piping adjacent to reciprocating equipment.
- 11) Incorporate flexible connections in ductwork adjacent to air-moving units.
- 12) Elastomeric Isolator: Neoprene or high quality synthetic rubber with anti-ozone and anti-oxidant additives.
- 13) Nuts, Bolts, And Washers: Electroplated zinc.
- 14) Isolators Exposed To Weather: Cadmium plated and neoprene coated springs.
- b. Seismic Requirements:
  - 1) Mechanical equipment, piping, and ductwork shall be braced, snubbed, or supported to withstand seismic disturbances and remain operational.
  - 2) Seismic restraint equipment and resilient isolation devices shall be designed and furnished by single Manufacturer:

C. Finishes:

1. Clean and paint steel components. Thoroughly clean structural steel bases of welding slag and prime with zinc-chromate or metal etching primer. Etch and paint hot dipped galvanized steel components.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Isolation Equipment:



1. Mount vibration isolated equipment on rigid steel frames or concrete bases unless Equipment Manufacturer certifies direct attachment capability.
  2. Install snubbers with factory set clearances.
  3. Piping:
    - a. Protect isolated and non-isolated piping **2-1/2 inches** inside diameter and larger in all planes by restraints to accommodate thermal movement as well as restrain seismic motions.
    - b. Locations shall be as scheduled and include, but not be limited to:
      - 1) At drops to equipment and at flexible connections.
      - 2) At 45 degree or greater changes in direction of pipe.
      - 3) At horizontal runs of pipe **30 feet** maximum on center spacing.
      - 4) Gas piping shall have additional restraints as scheduled.
  4. Ductwork:
    - a. Protect isolated and non-isolated rectangular ductwork **4 feet square** in cross-sectional area and larger in all planes by restraints to accommodate thermal movement as well as restrain seismic motion.
    - b. Locations shall be determined by Seismic Restraint Manufacturer and include, but not be limited to:
      - 1) Horizontal runs of ductwork **30 feet** maximum on center spacing.
      - 2) 45 degree or greater changes in direction of ductwork.
      - 3) Each end of duct runs and drops of equipment.
      - 4) Each flexible connection.
- B. Vibration Isolation: Install piping and ductwork to prevent transmission of noise and vibration into structure.

**END OF SECTION**

**SECTION 23 0553****IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But not Installed Under This Section:
  - 1. Identification of HVAC piping and equipment as described in Contract Documents including:
    - a. Paint identification for gas piping used in HVAC equipment.
    - b. Stencils and band colors for gas piping used in HVAC equipment.
- B. Related Requirements:
  - 1. Section 09 9124: 'Interior Painted Metal' for providing field painting of identification of piping used with HVAC equipment.
  - 2. Section 22 0529: 'Hangers And Supports For Plumbing' for field installation of pipe stencils and band colors for identification for piping used with HVAC equipment.

**PART 2 - PRODUCTS****2.1 SYSTEMS**

- A. Description:
  - 1. Abbreviations for Pipe Stencils and Equipment Identification and Band Colors for Pipe Identification:
    - a. Apply stenciled symbols and continuous painting as follows:
 

Pipe Type	Pipe Color	Symbol
Gas	Yellow	GAS
    - b. Apply stenciled symbols and color banding as follows. Extend color band **2 inches** minimum beyond each side of stenciled symbols.
 

Pipe Type	Band Color	Symbol
Steam Lines	Orange	STM
Steam Condensate Return	Lt Orange	COND
Hot Water Heating	Green	HWH
Chilled Water	Blue	CHW
- B. Materials:
  - 1. Category Four Approved Products and Manufacturers. See Section 01 6200 for definitions of Categories:
    - a. Products listed in edition of MPI Approved Product List current at time of bidding and later are approved, providing they meet VOC requirements in force where Project is located.
  - 2. Description:
    - a. Ferrous Metal:
      - 1) New Surfaces: Use MPI(a) INT 5.1B Waterborne Light Industrial Finish system.
      - 2) Previously Finished Surfaces: Use MPI(r) RIN 5.1B Waterborne Light Industrial Finish system.
  - 3. Performance Requirements:
    - a. New Surfaces: MPI Premium Grade finish requirements.
    - b. Deteriorated Existing Surfaces: MPI Premium Grade finish requirements.
    - c. Sound Existing Surfaces: MPI Custom Grade finish requirements.
    - d. Maintain specified colors, shades, and contrasts.
  - 4. Paint (one coat):
    - a. Primer:
      - 1) Ferrous Metal:
        - a) MPI 107, 'Primer, Rust-Inhibitive, Water Based'.
        - (1) Color: white.
    - b. Finish Coat (two coats):
      - 1) Ferrous Metal:

- a) MPI 153, 'Light Industrial Coating, Interior, Water Based, Semi-Gloss (MPI Gloss Level 5)'.

5. Labels:

a. Equipment Identification:

- 1) Black formica, with white reveal when engraved.
- 2) Lettering to be **3/16 inch** high minimum.

## PART 3 - EXECUTION

### 3.1 APPLICATION

A. Labels:

1. Identify following items with specified labels fastened to equipment with screws (unless noted otherwise):
  - a. Thermostats and control panels in mechanical spaces (attach label to wall directly above or below thermostats).
  - b. Furnaces.
  - c. Condensing units.
2. Engrave following data from Equipment Schedules on Drawings onto labels:
  - a. Equipment mark.
  - b. Area served.
  - c. Thermostat zone number, when different from equipment mark.
  - d. Panel and breaker from which unit is powered.

B. Painting:

1. New Surfaces:
  - a. Remove rust spots by sanding and immediately spot prime. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying full primer coat.
2. Existing Surfaces:
  - a. Remove deteriorated existing paint down to sound substrate by scraping and sanding. Feather edges of existing paint by sanding to be smooth with adjacent surfaces. Spot prime bare metal surfaces immediately.
  - b. Remove rust spots by sanding and immediately spot prime. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying full primer coat.
  - c. Clean existing sound painted surfaces as well as scraped and sanded existing painted surfaces as recommended by Paint Manufacturer.
  - d. Apply prime coat over entire surface to be painted.
  - e. Lightly sand entire surface.
  - f. Clean surface as recommended by Paint Manufacturer.
  - g. Apply finish coats.
3. Leave equipment in like-new appearance.
4. Only painted legends, directional arrows, and color bands are acceptable.
5. Locate identifying legends, directional arrows, and color bands at following points on exposed piping of each piping system:
  - a. Adjacent to each item of equipment.
  - b. At point of entry and exit where piping goes through wall.
  - c. On each riser and junction.
  - d. Every **25 feet** on long continuous lines.
  - e. Stenciled symbols shall be **one inch** high and black.

**END OF SECTION**

**SECTION 23 0713****DUCT INSULATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install thermal wrap duct insulation as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 23 3114: 'Low-Pressure Metal Ducts'.
  - 2. Section 23 3300: 'Acoustic Duct Accessories' for duct liner.

**PART 2 - PRODUCTS****2.1 MANUFACTURERS**

- A. Manufacturer Contact List:
  - 1. Certainteed St Gobain, Valley Forge, PA [www.certainteed.com](http://www.certainteed.com).
  - 2. Johns-Manville, Denver, CO [www.jm.com](http://www.jm.com).
  - 3. Knauf Fiber Glass, Shelbyville, IN [www.knauffiberglass.com](http://www.knauffiberglass.com) or Toronto, ON (416) 593-4322.
  - 4. Manson Insulation Inc, Brossard, QB [www.isolationmanson.com](http://www.isolationmanson.com).
  - 5. Owens-Corning, Toledo, OH or Owens-Corning Canada Inc, Willowdale, ON [www.owenscorning.com](http://www.owenscorning.com).

**2.2 MATERIALS**

- A. Thermal Wrap Duct Insulation:
  - 1. **1-1/2 inch** or **3 inch** thick fiberglass with factory-laminated, reinforced aluminum foil scrim kraft facing and density of **0.75 lb / per cu ft** Thermal Conductivity: 0.27 BTU in/HR SF deg F at **75 deg F** maximum.
  - 2. Type One Acceptable Products:
    - a. Type 75 standard duct insulation by Certainteed St Gobain.
    - b. Microlite FSK by Johns-Manville.
    - c. Duct Wrap FSK by Knauf Fiber Glass.
    - d. Alley Wrap FSK by Manson Insulation Inc.
    - e. FRK by Owens-Corning.
    - f. Equal as approved by Architect before bidding. See Section 01 6200.

**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Thermal Wrap Duct Insulation:
  - 1. Install insulation as follows:
    - a. Within Building Insulation Envelope:
      - 1) **1-1/2 inches** thick on rectangular outside air ducts and combustion air ducts.
      - 2) **1-1/2 inches** thick on all round ducts.
    - b. Outside Building Insulation Envelope:
      - 1) **3 inch** thick on round supply and return air ducts.

- 2) 1-1/2 inch thick on rectangular, acoustically lined, supply and return air ducts.
2. Wrap insulation tightly on ductwork with circumferential joints butted and longitudinal joints overlapped minimum 2 inches.
  - a. Do not compress insulation except in areas of structural interference. Minimum thickness at corners shall be one inch thick.
  - b. Remove insulation from lap before stapling.
  - c. Staple seams at approximately 16 inches on center with outward clenching staples.
  - d. Seal seams with foil vapor barrier tape or vapor barrier mastic. Seal penetrations of facing to provide vapor tight system.
- B. Insulate outside of ceiling diffusers, diffuser drops, and duct silencers same as ductwork.

**END OF SECTION**

**SECTION 23 0933****ELECTRIC AND ELECTRONIC CONTROL SYSTEM FOR HVAC****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install automatic temperature control system as described in Contract Documents.
  - 2. Furnish and install conductors and make connections to control devices, motors, and associated equipment.
  - 3. Assist in air test and balance procedure.
- B. Related Requirements:
  - 1. Section 01 4546: Duct testing, adjusting, and balancing of ductwork.
  - 2. Section 23 0501: Common HVAC Requirements.
  - 3. Section 23 3300: Furnishing and installing of temperature control dampers.
  - 4. Division 26:
    - a. Furnishing and installing of raceway, conduit, and junction boxes, including pull wires, for temperature control system except as noted above.
    - b. Power wiring to magnetic starters, disconnect switches, and motors.
    - c. Motor starters and disconnect switches, unless integral with packaged equipment.

**1.2 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Installer to provide product literature or cut sheets for all products specified in Project.
    - b. Installer to provide questions of control equipment locations to Mechanical Engineer prior to installation.
- B. Informational Submittals:
  - 1. Certificates:
    - a. Installer must provide 'Certificate of Sponsorship' signed from Approved Distributor with bid confirming Installer sponsorship.
- C. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Operations and Maintenance Data:
      - 1) Leave with O&M Manual specified in Section 23 0501.
      - 2) Installer's 'Certificate of Sponsorship'.

**1.3 QUALITY ASSURANCE**

- A. Qualifications: Requirements of Section 01 4301 applies, but is not limited to the following:
  - 1. Installer:
    - a. Before bidding, obtain sponsorship from a local, Approved Distributor specified under PART 2 PRODUCTS of this specification. Initial requirements for sponsorship are:
      - 1) Be one of following Honeywell supported partners:
        - a) Honeywell Authorized Control Integrator (ACI).
        - b) Honeywell Building Controls Specialist (ACS).
        - c) Honeywell Building Controls Associate (BCS).
      - 2) Receive product training from Approved Distributor.
      - 3) Exhibit Webstat system skills to sponsoring Approved Distributor.

- 4) Installer to provide Distributor sponsorship by submitting 'Certificate of Sponsorship' as Informational Submittal with bid. Certificate available as Attachment in this Specification.

## PART 2 - PRODUCTS

### 2.1 SYSTEMS

#### A. Manufacturers:

##### 1. Manufacturer Contact List:

- a. Air Products & Controls Ltd, Pontiac, MI [www.ap-c.com](http://www.ap-c.com).
- b. Fire-Lite Alarms, Northford, CT [www.firelite.com](http://www.firelite.com).
- c. Honeywell Inc, Minneapolis, MN [www.honeywell.com](http://www.honeywell.com).
  - 1) Primary Contact: Chris Brinkerhoff, (801) 550-3344, [chris.brinkerhoff@honeywell.com](mailto:chris.brinkerhoff@honeywell.com).
- d. ICCA Firex, Carol Stream, IL [www.icca.invensys.com](http://www.icca.invensys.com).
- e. Insul\_Guard, Salt Lake City, UT:
  - 1) Primary Contact: Dan Craner, (801) 518-3733, [insul\\_guard@comcast.net](mailto:insul_guard@comcast.net).
- f. System Sensor, St Charles, IL [www.systemsensor.com](http://www.systemsensor.com).
- g. Zimmerman Technologies, Renton, WA:
  - 1) Primary Contact: Tracy Zimmerman, (425) 255-1906, [zimmtech@yahoo.com](mailto:zimmtech@yahoo.com).

#### B. Distributors: Obtain thermostats and other control equipment from following Approved Distributors. See Section 01 4301:

1. Arkansas:
  - a. Quality Controls Inc.: (205) 324-1775 [charris@shopqci.com](mailto:charris@shopqci.com) Chris Harris.
2. Kansas:
  - a. O'Connor Co: (888) 800-3540 [pbeach@oconnor-hvac.com](mailto:pbeach@oconnor-hvac.com) Phil Beach.
  - b. Superior Controls Concepts: (316) 282-0870 [vern@sccl.biz](mailto:vern@sccl.biz) Vern Miller.
3. Missouri:
  - a. Crescent Parts & Equipment: (314) 647-5511 [sgorla@crescentparts.com](mailto:sgorla@crescentparts.com) Steve Gorla.
  - b. O'Connor Co: (888) 800-3540 [pbeach@oconnor-hvac.com](mailto:pbeach@oconnor-hvac.com) Phil Beach.
4. Oklahoma:
  - a. O'Connor Co: (918) 459-2000 [pbeach@oconnor-hvac.com](mailto:pbeach@oconnor-hvac.com) Phil Beach.
  - b. Temperature Control Systems: (405) 557-1986 [t.giles@tempconsys.com](mailto:t.giles@tempconsys.com) Trevor Giles.

#### C. Performance:

##### 1. Design Criteria:

- a. Automatic Temperature Control System design concept utilizes communicating thermostats located near furnace, with electronic sensors and electric / electronic actuation of dampers and with thermostats connected with Echelon approved communication cable. A WebStat Building Manager will interface with the thermostats to provide access via internet browser.
- b. Network communications and control devices will be LonWorks compliant. System shall include HVAC control, WebStat Building Manager to provide maintenance management functions related to normal building operations.

#### D. Components:

##### 1. Thermostats And Sensors:

##### a. Thermostat and Sensor Kit:

- 1) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
  - a) Part Number Y7335H1009 consisting of following:
    - (1) Communicating Thermostat: Low voltage type provided with automatic change-over feature for both heating and cooling stages, seven-day / 365 day program with two starts and stops per day, and provisions for damper operators. Honeywell T7350H1009.
    - (2) Push-Button Remote Room Sensor: Honeywell T7771A1005 with three push buttons, OVERRIDE, WARMER, COOLER, and with selectable ohm resistance, 10k or 20k.
    - (3) Discharge Air Sensor: Honeywell C7041B2005, 6 inch.

- b. Plain Face Remote Room Sensor:
    - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - a) Honeywell TR21-A, plain face, 10k ohms.
      - b) Honeywell TR21, plain face, 20k ohms.
  - 2. Transformer:
    - a. 120 / 24 V, 50VA Honeywell AT150F.
    - b. 120 / 24 V, 75VA Honeywell AT175F.
  - 3. Damper Actuators:
    - a. Electric type equipped for Class I wiring.
    - b. Shall not consume power during UNOCCUPIED cycle or use chemicals or expandable media.
    - c. Have built in spring return.
    - d. Category Four Approved Product. See Section 01 6200 for definitions of Categories:
      - 1) Honeywell MS8105A1030/U.
      - 2) Honeywell MS8105A1130 w/ End switch.
  - 4. Conductors:
    - a. Color-coded and No. 16 and No. 12 AWG Type TWN, TFN, or THHN, stranded.
    - b. Thermostat Cable: 12, 8, or 4 conductor, 18AWG solid copper wire, insulated with high-density polyethylene. Conductors parallel enclosed in brown PVC jacket (22 AWG cable not allowed).
    - c. Communicating Cable:
      - 1) Class Two Quality Standard. See Section 01 6200:
        - a) CAT 4, 22 gauge (0.025 in) (0.645 mm), twisted pair, non-plenum and non-shielded cable.
  - 5. Web based building manager:
    - a. Category Four Approved Product. See Section 01 6200 for definitions of Categories:
      - 1) Honeywell Webstat: Model W7350A1000.
- E. Operation Sequences:
- 1. Programmable thermostat shall control unoccupied and occupied status of fan system based on adjustable seven day program and remote room sensor / push button. Fan shall run continuously in occupied mode and cycle in unoccupied mode.
  - 2. Adjustable heating and cooling set points shall control space temperature by activating either heating or cooling equipment. Programmable thermostat provides automatic change over between heating and cooling.
  - 3. Remote room sensor provides optional override of thermostat program by allowing three hour timed override of thermostat program at any time by pushing ON / OFF button on remote room sensor cover. This shall activate thermostat to occupied mode and system shall control to occupied set point.
  - 4. Minimum outside air damper, spring return type, shall open in occupied mode and remain closed in unoccupied mode in zones using outside air.
  - 5. Two Sensor Averaging, Stake Suite: One sensor has OVERRIDE, WARMER, COOLER buttons. Set jumper to appropriate setting necessary to average with another sensor.

## PART 3 - EXECUTION

### 3.1 INSTALLERS

- A. Acceptable Installers. See Section 01 4301:
  - 1. Approved HVAC Sub-Contractors shall be pre-approved and included in Construction Documents by Addendum.

### 3.2 INSTALLATION

- A. Interface With Other Work:
  - 1. Calibrate room thermostats as required during air test and balance. Insulate sensor J-box with fiberglass insulation; expandable/ foam insulation is NOT acceptable



2. Instruct air test and balance personnel in proper use and setting of control system components.
3. Install low voltage electrical wiring in accordance with Division 26 of these Specifications.

B. Communication Cable:

1. Network communicating thermostats and WebStat Building Manager together with specified communicating cable.
2. Do not bundle communication cables with cables of other systems. Maintain 12 inches minimum distance from wires of other systems, except communication cable may cross other low-voltage wiring if done perpendicularly.

C. Safety Controls:

1. Interlock main return air duct smoke detectors to keep heating, cooling, and system fan from operating when detector is energized. Interlock smoke detector for combination fire / smoke dampers so fire / smoke damper closes on detection of smoke.
2. Interlock gas valves with cooling compressors and supply air fan.
3. Gas valves shall obtain their electrical control power from same circuit as supply fan motor.
4. Check high limit thermostats furnished with heating equipment for correct operation. Gas valves shall close when duct temperature exceeds high limit setting. Perform this work immediately after wiring burner controls.
5. Wire bonnet thermostatic switches to dissipate all heat in combustion chambers.
6. Fresh air dampers shall close on fan shut-down, power failure, open fan motor disconnect switch, and when thermostat is in UNOCCUPIED mode.
7. Gas burner safety controls furnished with furnace units shall be incorporated in control circuits for all modes of operation.
8. Control twinned furnace systems, where two furnaces serve common supply and return plenums, as one unit with twinning kit. Motors shall start and stop together and gas valves operate together.

D. Mount damper actuators and actuator linkages external of airflow. Make certain dampers operate freely without binding or with actuator housing moving.

E. Paste copy of record control wiring diagram on back of relay panel door cover for each multiple furnace system.

### 3.3 FIELD QUALITY CONTROL

A. Field Tests:

1. Calibrate, adjust, and set controls for proper operation, operate systems, and be prepared to prove operation of any part of control system. This work is to be completed before pre-substantial completion inspection.
2. Test each individual heating, cooling, and damper control for proper operation using control system.

### 3.4 SYSTEM STARTUP

A. For systems with WebStat Building Manager.

1. Contractor is responsible for a fully functioning control system accessible via internet web browser. Contractor is responsible to coordinate Network start up with assistance from local IT technician. Local IT technician shall provide Static, IP address, Network Mask, Default Gateway, Primary DNS Server, Local Host Name, Local Domain Name.
2. Contractor is responsible configuring all thermostats with proper zone names, zone scheduling, proper Church conference / holiday scheduling, all to be coordinated with local FM manager. Set proper clock setting including day/month/year. Use WebStat as network time master from "System" tab in WebStat.
3. Set remote sensor to T7771.
4. Set remote humidity to none unless using remote humidity sensor on DH systems.
5. Set Occupancy sensor to None.
6. Set Discharge Air Temp sensor to Remote.

7. Set Heating / Cooling to proper stages
8. Set heat cycle rates to 9 cph and cooling to 4 cph. Set discharge high limit to 110 degrees but do not activate (check) the high limit option. This is only to be used later by Owner if equipment experiences issues with system overshoot.
9. Set Aux relay to "Time of Day".
10. Set fan switch operation to "ON".
11. Set minimum UnOcc start time for all days. No days shall be scheduled Unconfigured.
12. Set occupied start times to match meeting start times; provided by local FM manager.
13. Place all zone over-ride durations to one (1) hour except for Bishop and Stake area which shall be set to two (2) hours.
14. Set Occupied default heating setpoints to 70 degrees, cooling setpoints to 74 degrees.
15. Set UnOccupied default heating setpoint to 60 degrees, cooling setpoints to 90 degrees.
16. Set each zone to applicable Holiday scheduling for General & Stake Conferences.

B. WebStat settings

1. Obtain from IT a LAN / WAN SMTP email server name for system alarming; where applicable.
2. Create alarm setpoint of 55 degrees low limit / 92 degrees high limit for all zones.
3. Create separate Administrative User level for Local FM Manager.

### 3.5 ADJUSTING

- A. Program minimum of one (1) day's operation into thermostat memory function.

### 3.6 CLOSEOUT ACTIVITIES

A. Instruction Of Owner:

1. Include as part of training required in Section 23 0501, following training:
  - a. Training shall be by personnel of installing company and utilize operator's manuals and as-built documentation.
  - b. Provide training in (2) two sessions including WebStat for up to four (4) hours total.
    - 1) First session will occur between system completion and Substantial Completion.
    - 2) Second session will occur within forty five (45) days of Substantial Completion when agreed upon by Owner.
  - c. Training shall include sequence of operation review, selection of displays, modification of schedules and setpoints, troubleshooting of sensors, etc, as follows:
    - 1) Control System Overview:
      - a) Show access to system through both individual thermostats and Internet browser via WebStat and how network works. Demonstrate scheduling for Stake and General Conferences.
    - 2) Thermostat Programming From Keypad: Instructions on developing setpoints and schedules and adjusting local zone temperatures.
    - 3) Thermostat Operation:
      - a) Identify and explain use of buttons on thermostat face, I.E. 'i' or information button, warmer button, and cooler button.
      - b) Identify and explain buttons under thermostat cover.
      - c) Provide training for Thermostat Palm Program.
    - 4) WebStat training with local Facilities Manager during two (2) sessions.
      - a) Review all features accessible from the Overview tab including individual zone details, setpoints and fan, show schedule, edit configuration.
      - b) Review all features accessible from schedules including multiple schedules, zone assignments, holiday scheduling/ conference scheduling.
      - c) Review alarm configurations, alarm assignments, alarm priority.
      - d) Review user levels and creating users.
      - e) Review thermostat editing and configuration. Explain each thermostat programming option. Explain download pending, download, & commissioning.
      - f) Review System backup configuration, restore configuration, reboot WebStat, Network Time Master, time and date setting and Local Weather option. No OAT is associated.

- g) Review system User Log in and User Log Out process.

### END OF SECTION

### ATTACHMENTS

**INFORMATION:** Following Attachment 'Certificate of Sponsorship' to be given by Installer to Approved Distributor. Installer must fill out Project Information and Installer Information before giving to Approved Distributor. Installer must submit Certificate as specified in the Informational Submittal with Installer's bid.

# **CERTIFICATE OF SPONSORSHIP**

## **Electric and Electronic Control System for HVAC Installer**

### **PROJECT INFORMATION** (To be filled out by Installer - available from project specification):

Project Name: \_\_\_\_\_

Project Number: \_\_\_\_\_

Project Address: \_\_\_\_\_

### **INSTALLER INFORMATION** (To be filled out by Installer):

Installer Name: \_\_\_\_\_

Installer Firm: \_\_\_\_\_

Installer Address: \_\_\_\_\_

I acknowledge and confirm the above listed Installer has received training and exhibit Webstat System skills and is qualified to install the automation control system as specified for Project identified above. Our company will stand behind the Installer meeting the legal specified performance requirements.

Sponsoring Approved Honeywell Distributor Name: \_\_\_\_\_

Signature: \_\_\_\_\_ Printed Signature: \_\_\_\_\_

Date: \_\_\_\_\_

BLANK PAGE

**SECTION 23 1123****FACILITY NATURAL-GAS PIPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Perform excavation and backfill required for work of this Section.
  - 2. Furnish and install gas piping and fittings within building and from building to meter including connection to meter as described in Contract Documents.
- B. Related Requirements:
  - 1. Sections Under 09 9000 Heading: Painting of exterior piping.
  - 2. Section 23 0501: 'Common HVAC Requirements'.
  - 3. Section 31 2316: 'Excavation' for procedure and quality of excavation.
  - 4. Section 31 2323: 'Fill' for procedure and quality of backfill and compaction.
  - 5. Section 33 5100: 'Natural-Gas Distribution' for gas line from meter to main.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. ASTM International:
    - a. ASTM A53/A53M-12, 'Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless'.
    - b. ASTM A234/A234M-11a, 'Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service'.
    - c. ASTM D2513-12ae1, 'Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings'.

**1.3 QUALITY ASSURANCE**

- A. Qualifications:
  - 1. Welders:
    - a. Welders shall be certified and bear evidence of certification thirty (30) days before commencing work on project.
    - b. If there is doubt as to proficiency of welder, Owner's Representative may require welder to take another test. This shall be done at no cost to Owner. Certification shall be by Pittsburgh Testing Laboratories or other approved authority.
  - 2. Pipe Installers:
    - a. Polyethylene pipe installers shall be properly trained and certified in procedure for joining polyethylene pipe.

**1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Storage And Handling Requirements:
  - 1. Do not store polyethylene pipe so it is exposed to sunlight.

**PART 2 - PRODUCTS****2.1 SYSTEM****A. Manufacturers:**

1. Manufacturer Contact List:
  - a. BrassCraft, Novi, MI [www.brasscraft.com](http://www.brasscraft.com).
  - b. Cimberio Valve Co Inc, Malvern, PA [www.cimberio.com](http://www.cimberio.com).
  - c. ConBraCo Industries, Inc, Matthews, NC [www.conbraco.com](http://www.conbraco.com) or ConBraCo / Honeywell Ltd, Scarborough, ON (416) 293-8111.
  - d. Dormont Manufacturing Company, Export, PA [www.dormont.com](http://www.dormont.com).
  - e. Jenkins-NH-Canada, Brantford, ON [www.jenkins-nh-canada.com](http://www.jenkins-nh-canada.com).
  - f. Jomar International, Madison Heights, MI [www.jomar.com](http://www.jomar.com).
  - g. California Valves (formally KOSO) by Pacific Seismic Products Inc, Lancaster, CA, Distributed by Strand Earthquake Consultants [www.strandearthquake.net](http://www.strandearthquake.net).
  - h. Watts Regulator Co, North Andover, MA [www.wattsreg.com](http://www.wattsreg.com) or Watts Industries (Canada) Inc, Burlington, ON (888) 208-8927.

**B. Materials:**

1. Above-Ground Pipe And Fittings:
  - a. Black carbon steel, butt welded, Schedule 40 pipe meeting requirements of A53/A53M.
  - b. Welded forged steel fittings meeting requirements of ASTM A234/A234M or standard weight malleable iron screwed.
2. Below-Ground Pipe And Fittings: Polyethylene pipe and fittings meeting requirements of ASTM D2513 with No. 14 coated copper trace wire.
3. Valves:
  - a. **125 psi** bronze body ball valve, UL listed.
  - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - 1) CIM 102.1 by Cimbrío Valve.
    - 2) Apollo Series 80-100 by ConBraCo.
    - 3) 'Red Cap' R602 by Jenkins NH Canada.
    - 4) Model T-204 by Jomar International.
    - 5) Model B-6000-UL by Watts Regulator.
4. Cocks:
  - a. Gauge Cocks: Conbraco Series 50-56 bronze gauge cock.
5. Flexible Connector:
  - a. Type 304 stainless steel corrugated tube coated for corrosion protection.
  - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - 1) Dormont Supr-Safe.
    - 2) BrassCraft Procoat.

**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Steel pipe installed through air plenums, in walls, and pipes **2-1/2 inches** and larger shall have welded fittings and joints. Other steel pipe may have screwed or welded fittings.
- B. Lay underground pipe in accordance with Manufacturer's recommendations and local gas utility company regulations and specifications.
  1. Provide **24 inch** minimum steel pipe between vertical rise of riser and end of polyethylene line if anode-less riser is not used. Use plastic-to-steel transition or compression fitting between end of polyethylene line and steel meter riser. Provide cathodic protection for steel riser or use anode-less riser.
  2. Place tracer wire along side of polyethylene pipe from meter to point where pipe rises inside building.

3. Place **4 inches** of sand around gas line buried underground.
  4. Do not install gas piping under building floor slabs-on-grade.
- C. On lines serving gas-fired equipment, install gas cocks adjacent to equipment outside of equipment cabinet and easily accessible.
- D. Install **6 inch** long minimum dirt leg, with pipe cap, on vertical gas drop serving each gas-fired equipment unit.
- E. Use fittings for changes of direction in pipe and for branch runouts.

### 3.2 FIELD QUALITY CONTROL

- A. Field tests:
1. Subject all portions of gas piping system, in sections or in entirety, to air pressure of **75 psig** and prove airtight for 4 hours.
  2. Disconnect equipment not suitable for **75 psig** pressure from piping system during test period.

**END OF SECTION**



**BLANK PAGE**

**SECTION 23 2300****REFRIGERANT PIPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install piping and specialties for refrigeration systems as described in Contract Documents.
- B. Products Installed But Not Furnished Under This Section:
- C. Related Requirements:
  - 1. Section 23 0501: 'Common HVAC Requirements'.
  - 2. Section 23 0719: 'Refrigerant Piping Insulation'.
  - 3. Section 23 6213: 'Packaged Air-Cooled Refrigerant Compressor And Condenser Units'.
  - 4. Section 23 8216.01: 'Air Coils: DX'.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. Federal Emergency Management Agency (FEMA) / Vibration Isolation and Seismic Control Manufacturers Association (VISCMA) / American Society of Civil Engineers (ASCE):
    - a. FEMA 412, 'Installing Seismic Restraints For Mechanical Equipment' (December 2002).
  - 2. Vibration Isolation and Seismic Control Manufacturers Association (VISCMA):
    - a. VISCMA 101-15, 'Seismic Restraint Specification Guidelines for Mechanical, Electrical, and Plumbing Systems'.
    - b. VISCMA 102-12, 'Vibration Isolation Specification Guidelines for Mechanical, Electrical, and Plumbing Systems'.
- B. Definitions:
  - 1. Refrigerant: Absorbs heat by a change of state (evaporation) from liquid to a gas, and releases heat by a change of state (condenses) from gas back to a liquid.
  - 2. Vibration Isolation: Vibration reduction in which an isolation system is placed between the source of unwanted vibration and an item which needs to be shielded from the vibration.
- C. Reference Standards:
  - 1. American National Standards Institute (ANSI) / American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
    - a. ANSI/ASHRAE 5-2013 (packaged w/ 34-2013, 'Safety Standard and Designation and Classification of Refrigerants'.
  - 2. American National Standards Institute / American Welding Society:
    - a. ANSI/AWS A5.8M/A5.8-2011, 'Specification for Filler Metals for Brazing and Braze Welding'.
  - 3. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
    - a. 2011 ASHRAE Handbook - HVAC Applications.
      - 1) Chapter 48, 'Noise and Vibration Control'.
  - 4. ASTM International:
    - a. ASTM A36/A36M-14, 'Standard Specification for Carbon Structural Steel'.
    - b. ASTM B280-13, 'Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service'.
  - 5. National Fire Protection Association / American National Standards Institute:
    - a. NFPA 90A-2015, 'Installation of Air Conditioning and Ventilating Systems'.
  - 6. Underwriters Laboratories:
    - a. UL 2182, 'Refrigerants' (April 2006).

### 1.3 SUBMITTALS

- A. Action Submittals:
  - 1. Shop Drawings: Show each individual equipment and piping support.
- B. Informational Submittals:
  - 1. Qualification Statements: Technician certificate for use of HFC and HCFC refrigerants.

### 1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
  - 1. Refrigerants:
    - a. Underwriters Laboratories / Underwriters Laboratories of Canada:
      - 1) Comply with requirements of UL 2182.
- B. Qualifications. Section 01 4301 applies, but is not limited to the following:
  - 1. Installer: Refrigerant piping shall be installed by refrigeration contractor licensed by State and by technicians certified in use of HFC and HCFC refrigerants.

## PART 2 - PRODUCTS

### 2.1 COMPONENTS

- A. Manufacturers:
  - 1. Manufacturer Contact List:
    - a. Airtec, Fall River, MA, [www.noventcaps.com](http://www.noventcaps.com).
    - b. Cooper Industries, Houston, TX [www.cooperindustries.com](http://www.cooperindustries.com).
    - c. Cush-A-Clamp by ZSI Manufacturing, Canton, MI [www.cushaclamp.com](http://www.cushaclamp.com).
    - d. Elkhart Products Corp, Elkhart, IN [www.elkhartproducts.com](http://www.elkhartproducts.com).
    - e. Emerson Climate Technologies, St Louis, MO [www.emersonflowcontrols.com](http://www.emersonflowcontrols.com).
    - f. Handy & Harman Products Division, Fairfield, CT [www.handy-1.com](http://www.handy-1.com).
    - g. Harris Products Group, Cincinnati, OH [www.harrisproductsgroup.com](http://www.harrisproductsgroup.com).
    - h. Henry Valve Co, Melrose Park, IL [www.henrytech.com](http://www.henrytech.com).
    - i. Hilti Inc, Tulsa, OK [www.hilti.com](http://www.hilti.com).
    - j. Hydra-Zorb Co, Auburn Hills, MI [www.hydra-zorb.com](http://www.hydra-zorb.com).
    - k. JB Industries, Aurora, IL [www.jbind.com](http://www.jbind.com).
    - l. Mueller Steam Specialty, St Pauls, NC [www.muellersteam.com](http://www.muellersteam.com).
    - m. Nibco Inc, Elkhart, IN [www.nibco.com](http://www.nibco.com).
    - n. Packless Industries, Waco, TX [www.packless.com](http://www.packless.com).
    - o. Parker Corp, Cleveland, OH [www.parker.com](http://www.parker.com).
    - p. Sporlan Valve Co, Washington, MO [www.sporlan.com](http://www.sporlan.com).
    - q. Sherwood Valves, Washington, PA [www.sherwoodvalve.com](http://www.sherwoodvalve.com).
    - r. Thomas & Betts, Memphis, TN [www.superstrut.com](http://www.superstrut.com).
    - s. Unistrut, Div of Atkore International, Inc., Harvey, IL [www.unistrut.com](http://www.unistrut.com).
    - t. Universal Metal Hose, Chicago, IL [www.universalmetalhose.com](http://www.universalmetalhose.com).
    - u. Vibration Mountings & Controls, Bloomington, NJ [www.vmc-kdc.com](http://www.vmc-kdc.com).
    - v. Virginia KMP Corp, Dallas, TX [www.virginiakmp.com](http://www.virginiakmp.com).
- B. Materials:
  - 1. Refrigerant Piping:
    - a. Meet requirements of ASTM B280, hard drawn straight lengths. Soft copper tubing not permitted.
    - b. Do not use pre-charged refrigerant lines.
  - 2. Refrigerant Fittings:
    - a. Wrought copper with long radius elbows.
    - b. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:

- 1) Mueller Streamline.
- 2) Nibco Inc.
- 3) Elkhart.
3. Suction Line Traps:
  - a. Manufactured standard one-piece traps.
  - b. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
    - 1) Mueller Streamline.
    - 2) Nibco Inc.
    - 3) Elkhart.
4. Tee Access:
  - a. Brass:
    - 1) Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
      - a) JB Industries: Part #A3 Series with Factory Cap and Valve Core.
5. Connection Material:
  - a. Brazing Rods in accordance with ANSI/AWS A5.8M/A5.8:
    - 1) Copper to Copper Connections:
      - a) Classification BCuP-4 Copper Phosphorus (6 percent silver).
      - b) Classification BCuP-5 Copper Phosphorus (15 percent silver).
    - 2) Copper to Brass or Copper to Steel Connections: Classification BAg-5 Silver (45 percent silver).
    - 3) Do not use rods containing Cadmium.
  - b. Flux:
    - 1) Type Two Acceptable Products:
      - a) Stay-Silv White Brazing Flux by Harris Products Group.
      - b) High quality silver solder flux by Handy & Harmon.
      - c) Equal as approved by Architect before use. See Section 01 6200.
6. Valves:
  - a. Expansion Valves:
    - 1) For pressure type distributors, externally equalized with stainless steel diaphragm, and same refrigerant in thermostatic elements as in system.
    - 2) Size valves to provide full rated capacity of cooling coil served. Coordinate selection with evaporator coil and condensing unit.
    - 3) Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
      - a) Emerson Climate Technologies.
      - b) Henry.
      - c) Mueller.
      - d) Parker.
      - e) Sporlan.
  - b. Manual Refrigerant Shut-Off Valves:
    - 1) Ball valves designed for refrigeration service and full line size.
    - 2) Valve shall have cap seals.
    - 3) Valves with hand wheels are not acceptable.
    - 4) Provide service valve on each liquid and suction line at compressor.
    - 5) If service valves come as integral part of condensing unit, additional service valves shall not be required.
    - 6) Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
      - a) Henry.
      - b) Mueller.
      - c) Sherwood.
      - d) Virginia.
7. Filter-Drier:
  - a. On lines **3/4 inch** outside diameter and larger, filter-drier shall be replaceable core type with Schraeder type valve.
  - b. On lines smaller than **3/4 inch** outside diameter, filter-drier shall be sealed type with brazed end connections.
  - c. Size shall be full line size.
  - d. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:

- 1) Emerson Climate Technologies.
  - 2) Mueller.
  - 3) Parker.
  - 4) Sporlan.
  - 5) Virginia.
8. Sight Glass:
- a. Combination moisture and liquid indicator with protection cap.
  - b. Sight glass shall be full line size.
  - c. Sight glass connections and sight glass body shall be solid copper or brass, no copper-coated steel sight glasses allowed.
  - d. Category Four Approved Product. See Section 01 6200 for definitions of Categories:
    - 1) HMI by Emerson Climate Technologies.
9. Flexible Connectors:
- a. Designed for refrigerant service with bronze seamless corrugated hose and bronze braiding.
  - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - 1) Vibration Absorber Model VAF by Packless Industries.
    - 2) Vibration Absorbers by Virginia KMP Corp.
    - 3) Anaconda 'Vibration Eliminators' by Universal Metal Hose.
    - 4) Style 'BF' Spring-flex freon connectors by Vibration Mountings.
10. Refrigerant Piping Supports:
- a. Base, Angles, And Uprights: Steel meeting requirements of ASTM A36.
  - b. Securing Channels:
    - 1) At Free-Standing Pipe Support:
      - a) Class One Quality Standard: P-1000 channels by Unistrut.
      - b) Acceptable Manufacturers: Hilti, Thomas & Betts.
      - c) Equal as approved by Architect before installation. See Section 01 6200.
    - 2) At Wall Support:
      - a) Class One Quality Standard: P-3300 channels by Unistrut.
      - b) Acceptable Manufacturers: Hilti, Thomas & Betts.
      - c) Equal as approved by Architect before installation. See Section 01 6200.
    - 3) At Suspended Support:
      - a) Class One Quality Standard: P-1001 channels by Unistrut.
      - b) Acceptable Manufacturers: Hilti, Thomas & Betts.
      - c) Equal as approved by Architect before installation. See Section 01 6200.
    - 4) Angle Fittings:
      - a) Class One Quality Standard: P-2626 90 degree angle by Unistrut.
      - b) Acceptable Manufacturers: Hilti, Thomas & Betts.
      - c) Equal as approved by Architect before installation. See Section 01 6200.
  - c. Pipe Clamps:
    - 1) Type Two Acceptable Manufacturers:
      - a) Hydra-Zorb.
      - b) ZSI Cush-A-Clamp.
      - c) Hilti Cush-A-Clamp.
      - d) Equal as approved by Architect before installation. See Section 01 6200.
  - d. Protective Cover: 18 ga steel, hot-dipped galvanized.
11. Locking Refrigerant Cap:
- a. Provide and install on charging valves:
    - 1) Class One Quality Standard: 'No Vent' locking refrigerant cap.
    - 2) Acceptable Manufacturers: Airtec.
    - 3) Equal as approved by Architect before installation. See Section 01 6200.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

#### A. Refrigerant Lines:

1. Install as high in upper mechanical areas as possible. Do not install underground or in tunnels.

2. Slope suction lines down toward compressor **one inch/10 feet**. Locate traps at vertical rises against flow in suction lines.

B. Connections:

1. Refrigeration system connections shall be copper-to-copper, copper-to-brass, or copper-to-steel type properly cleaned and brazed with specified rods. Use flux only where necessary. No soft solder (tin, lead, antimony) connections will be allowed in system.
2. Braze manual refrigerant shut-off valve, sight glass, and flexible connections.
3. Circulate dry nitrogen through tubes being brazed to eliminate formation of copper oxide during brazing operation.

C. Specialties:

1. Install valves and specialties in accessible locations. Install refrigeration distributors and suction outlet at same end of coil.
2. Install thermostatic bulb as close to cooling coil as possible. Do not install on vertical lines.
3. Install equalizing line in straight section of suction line, downstream of and reasonably close to thermostatic bulb. Do not install on vertical lines.
4. Provide flexible connectors in each liquid line and suction line at both condensing unit and evaporator on systems larger than five tons. Anchor pipe near each flexible connector.

D. Refrigerant Supports:

1. Support Spacing:
  - a. Piping **1-1/4 inch** And Larger: **8 feet** on center maximum.
  - b. Piping **1-1/8 inch** And Smaller: **6 feet** on center maximum.
  - c. Support each elbow.
2. Isolate pipe from supports and clamps with Hydrozorb or Cush-A-Clamp systems.
3. Run protective cover continuous from condensing units to risers or penetrations at building wall.

### 3.2 FIELD QUALITY CONTROL

A. Field Tests:

1. Make evacuation and leak tests in presence of Architect's Engineer after completing refrigeration piping systems. Positive pressure test will not suffice for procedure outlined below.
  - a. Draw vacuum on each entire system with two stage vacuum pump. Draw vacuum to 300 microns using micron vacuum gauge capable of reading from atmosphere to 10 microns. Do not use cooling compressor to evacuate system nor operate it while system is under high vacuum.
  - b. Break vacuum with nitrogen and re-establish vacuum test. Vacuum shall hold for 30 minutes at 300 microns without vacuum pump running.
  - c. Conduct tests at **70 deg F** ambient temperature minimum.
  - d. Do not run systems until above tests have been made and systems started up as specified. Inform Owner's Representative of status of systems at time of final inspection and schedule start-up and testing if prevented by outdoor conditions before this time.
  - e. After testing, fully charge system with refrigerant and conduct test with Halide Leak Detector.
  - f. Recover all refrigerant in accordance with applicable codes. Do not allow any refrigerant to escape to atmosphere.

B. Non-Conforming Work:

1. If it is observed that refrigerant lines are being or have been brazed without proper circulation of nitrogen through lines, all refrigerant lines installed up to that point in time shall be removed and replaced at no additional cost to Owner.

**END OF SECTION**

**BLANK PAGE**

**SECTION 23 2600****CONDENSATE DRAIN PIPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Coordinate installation of condensate drain piping with Section 22 0501 as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 22 0501: 'Common Plumbing Requirements'.
  - 2. Section 23 0501: 'Common HVAC Requirements'.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. ASTM International:
    - a. ASTM B88-09, 'Standard Specification for Seamless Copper Water Tube'.
    - b. ASTM D1785-12, 'Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120'.

**PART 2 - PRODUCTS****2.1 SYSTEMS**

- A. Materials:
  - 1. Condensate Drains:
    - a. Schedule 40 PVC for condensate drains from furnace combustion chambers and furnace cooling coils.
- B. Condensate Pump:
  - 1. Rated at 225 gph at **15 feet** total head. Complete with **one gallon** polystyrene tank with pump and automatic float control. 1/5 hp, 120 V, one phase, 60 Hertz.
  - 2. Condensate piping shall be Type M copper or Schedule 40 PVC.
  - 3. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a. No. CB501UL by Beckett Corp, Irving, TX [www.beckettumps.com](http://www.beckettumps.com).
    - b. No. VCL45ULS by Little Giant Pump Co, Oklahoma City, OK [www.lgpc.com](http://www.lgpc.com) or Little Giant Pump Co/Albany Pump Co Ltd, Downsview, ON (888) 334-3348.

**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Condensate Drains:
  - 1. Support piping and protect from damage.
  - 2. Do not combine PVC condensate drain piping from furnace combustion chamber with copper condensate drain piping from cooling coil.

**END OF SECTION**



**BLANK PAGE**

**SECTION 23 3001****COMMON DUCT REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. General procedures and requirements for ductwork.
  - 2. Repair leaks in ductwork, as identified by duct testing, at no additional cost to Owner.
- B. Related Requirements:
  - 1. Section 01 4546: 'Duct Testing, Adjusting, and Balancing' for ductwork.
  - 2. Section 07 9219: 'Acoustical Joint Sealants' for quality of acoustic sealant.
  - 3. Section 23 0501: 'Common HVAC Requirements'.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. Sheet Metal And Air Conditioning Contractors' National Association / American National Standards Institute:
    - a. SMACNA, 'HVAC Duct Construction Standards - Metal and Flexible' (Third Edition).

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference: Schedule conference immediately before installation of ductwork.

**1.4 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data: Specification data on sealer and gauze proposed for sealing ductwork.
  - 2. Samples: Sealer and gauze proposed for sealing ductwork.
- B. Informational Submittals:
  - 1. Manufacturer Instructions:
    - a. Installation manuals providing detailed instructions on assembly, joint sealing, and system pressure testing for leaks.

**PART 2 - PRODUCTS****2.1 ASSEMBLIES**

- A. Performance:
  - 1. Design Criteria:
    - a. Standard Ducts: Construction details not specifically called out in Contract Documents shall conform to applicable requirements of SMACNA, 'HVAC Duct Construction Standards Metal and Flexible'.
- B. Materials:
  - 1. Duct Hangers:

- a. **One inch** by **18 ga** galvanized steel straps or steel rods as shown on Drawings, and spaced not more than **96 inches** apart. Do not use wire hangers.
- b. Attaching screws at trusses shall be **2 inch** No. 10 round head wood screws. Nails not allowed.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. During installation, protect open ends of ducts by covering with plastic sheet tied in place to prevent entrance of debris and dirt.
- B. Make necessary allowances and provisions in installation of sheet metal ducts for structural conditions of building. Revisions in layout and configuration may be allowed, with prior written approval of Architect. Maintain required airflows in suggesting revisions.
- C. Hangers And Supports:
  1. Install pair of hangers as required by spacing indicated in table on Drawings.
  2. Install upper ends of hanger securely to floor or roof construction above by method shown on Drawings.
  3. Attach strap hangers to ducts with cadmium-plated screws. Use of pop rivets or other means will not be accepted.
  4. Where hangers are secured to forms before concrete slabs are poured, cut off flush all nails, strap ends, and other projections after forms are removed.
  5. Secure vertical ducts passing through floors by extending bracing angles to rest firmly on floors without loose blocking or shimming. Support vertical ducts, which do not pass through floors, by using bands bolted to walls, columns, etc. Size, spacing, and method of attachment to vertical ducts shall be same as specified for hanger bands on horizontal ducts.

### **3.2 CLEANING**

- A. Clean interior of duct systems before final completion.

**END OF SECTION**

**SECTION 23 3114****LOW-PRESSURE METAL DUCTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install above-grade low-pressure steel ducts and related items as described in Contract Documents.
- B. Products Installed But Not Furnished Under This Section:
  - 1. Duct smoke detectors.
  - 2. Air Coils: 'Water'.
- C. Related Requirements:
  - 1. Section 01 4546: 'Duct Testing, Adjusting, And Balancing' for duct test, balance, and adjust air duct systems services provided by Owner.
  - 2. Section 23 0713: 'Duct Insulation' for thermal Insulation for ducts, plenum chambers, and casings.
  - 3. Section 23 3001: 'Common Duct Requirements'.
  - 4. Section 23 0933: 'Electric And Electronic Control System For HVAC':
    - a. Temperature control damper actuators and actuator linkages.
    - b. Furnishing of duct smoke detectors.
  - 5. Section 23 8216.02: 'Air Coils: Water'.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. Sheet Metal And Air Conditioning Contractors' National Association / American National Standards Institute:
  - 2. SMACNA, 'HVAC Duct Construction Standards - Metal and Flexible' (Third Edition).
- B. Reference Standards:
  - 1. ASTM International:
    - a. ASTM A653/A653M-13, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
    - b. ASTM E84-14, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
  - 2. Underwriters Laboratories, Inc.:
    - a. UL 723: 'Standard for Safety Test for Surface Burning Characteristics of Building Materials'; (2010 - Tenth Edition).

**1.3 QUALITY ASSURANCE**

- A. Regulatory Agency Sustainability Approvals:
  - 1. Duct Sealer:
    - a. Meet Class A flame spread rating in accordance with ASTM E84 or UL 723.
    - b. Handle, store, and apply materials in compliance with applicable regulations and material safety data sheets (MSDS).

**1.4 DELIVERY, STORAGE, AND HANDLING**

- A. Storage and Handling Requirements:
  - 1. Duct Sealer:

- a. Handle, store, and apply materials in compliance with applicable regulations and material safety data sheets (MSDS).
- b. Handle to prevent inclusion of foreign matter, damage by water, or breakage.
- c. Store in a cool dry location, but never under 35 deg F or subjected to sustained temperatures exceeding 110 deg F as per Manufacturer's written recommendations.
- d. Do use sealants that have exceeded shelf life of product.

## 1.5 FIELD CONDITIONS

### A. Ambient Conditions:

1. Duct Sealer:
  - a. Do not apply under 35 deg F or subjected to sustained temperatures exceeding 110 deg F as per Manufacturer's written recommendations.
  - b. Do not apply when rain or freezing temperatures will occur within seventy two (72) hours.

## PART 2 - PRODUCTS

### 2.1 SYSTEM

#### A. Materials:

1. Sheet Metal:
  - a. Fabricate ducts, plenum chambers and casings of zinc-coated, lock-forming quality steel sheets meeting requirements A653/A653M, with G 60 coating.
2. Duct Sealer For Interior Ducts:
  - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - 1) Duct Butter or ButterTak by Cain Manufacturing Co Inc, Pelham, AL [www.cainmfg.com](http://www.cainmfg.com).
    - 2) DP 1010 by Design Polymerics, Fountain Valley, CA [www.designpoly.com](http://www.designpoly.com).
    - 3) PROseal, FIBERseal, EVERseal, or EZ-seal by Ductmate Industries, Inc., Charleroi, PA [www.ductmate.com](http://www.ductmate.com).
    - 4) SAS by Duro Dyne, Bay Shore, NY or Duro Dyne Canada, Lachine, QB [www.durodyne.com](http://www.durodyne.com).
    - 5) Iron Grip 601 by Hardcast Inc, Wylie, TX [www.hardcast.com](http://www.hardcast.com).
    - 6) MTS100 or MTS 200 by Hercules Mighty Tough, Denver CO, [www.herculesindustries.com](http://www.herculesindustries.com).
    - 7) 15-325 by Miracle / Kingco, Div ITW TACC, Rockland, MA [www.taccint.com](http://www.taccint.com).
    - 8) 44-39 by Mon-Eco Industries Inc, East Brunswick, NJ [www.mon-ecoindustries.com](http://www.mon-ecoindustries.com).
    - 9) Airseal Zero by Polymer Adhesive Sealant Systems Inc, Weatherford, TX [www.polymeradhesives.com](http://www.polymeradhesives.com).
    - 10) Airseal #22 Water Base Duct Sealer by Polymer Adhesive Sealant Systems Inc, Weatherford, TX [www.polymeradhesives.com](http://www.polymeradhesives.com).
3. Duct Sealer For Exterior Ducts:
  - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - 1) Two Part II Sealing System including RTA-50 liquid adhesive and DT-5300 for 3 inch and DT 5400 for 4 inch tape by Hardcast Inc, Wylie, TX [www.carlislehvac.com](http://www.carlislehvac.com).

#### B. Fabrication:

1. General:
  - a. Straight and smooth on inside with joints neatly finished.
  - b. Duct drops to diffusers shall be round, square, or rectangular to accommodate diffuser neck. Drops shall be same gauge as branch duct. Seal joints air tight.
2. Standard Ducts:
  - a. General:
    - 1) Ducts shall be large enough to accommodate inside acoustic duct liner. Dimensions shown on Drawings are net clear inside dimensions after duct liner has been installed.
  - b. Rectangular Duct:
    - 1) Duct panels through 48 inch dimension having acoustic duct liner need not be cross-broken or beaded. Cross-break unlined ducts, duct panels larger than 48 inch vertical

- and horizontal sheet metal barriers, duct offsets, and elbows, or bead **12 inches** on center.
- a) Apply cross-breaking to sheet metal between standing seams or reinforcing angles.
  - b) Center of cross-break shall be of required height to assure surfaces being rigid.
  - c) Internally line square and rectangular drops. Externally insulate round drops.
- c. Round Duct:
- 1) Longitudinal Seam:
    - a) **28 ga** minimum for ducts up to and including **8 inches** in diameter.
    - b) **26 ga** minimum for ducts over **8 inches** and up to **14 inches** in diameter.
    - c) **24 ga** minimum for ducts over **14 inches** up to and including **26 inches** in diameter.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Metal duct surface must be clean and free of moisture, contamination and foreign matter before applying duct sealer for interior and exterior ducts.

### 3.2 INSTALLATION

- A. Install internal ends of slip joints in direction of flow. Seal transverse and longitudinal joints air tight using specified duct sealer as per Manufacturer's written instructions. Cover horizontal and longitudinal joints on exterior ducts with two layers of specified tape installed with specified adhesive.
- B. Securely anchor ducts and plenums to building structure with specified duct hangers attached with screws. Do not hang more than one duct from a duct hanger. Brace and install ducts so they shall be free of vibration under all conditions of operation.
- C. Ducts shall not bear on top of structural members.
- D. Paint ductwork visible through registers, grilles, and diffusers flat black.
- E. Properly flash where ducts protrude above roof.
- F. Under no conditions will pipes, rods, or wires be allowed to penetrate ducts.
- G. Where ducts are shown connecting to concrete or masonry openings and along edges of plenums at floors and walls, provide continuous **2 by 2 by 1/4 inches** galvanized angle iron.
  - 1. Bolt angle iron to structure and make airtight by applying sealant between angle and structure.
  - 2. Bolt or weld sheet metal at these locations to angle and caulk airtight.
  - 3. Apply two coats of aluminum paint to angles after installation.

### 3.3 FIELD QUALITY CONTROL

- A. Field Tests:
  - 1. Air Test and Balance Testing as specified in Section 01 4546: 'Duct Testing, Adjusting, and Balancing'.
- B. Non-Conforming Work:
  - 1. Reseal transverse joint duct leaks and seal longitudinal duct joint leaks discovered during air test and balance procedures at no additional cost to Owner.

## END OF SECTION

**BLANK PAGE**

**SECTION 23 3300****AIR DUCT ACCESSORIES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install duct accessories in specified ductwork as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 23 0933: 'Electric And Electronic Control System For HVAC' for temperature control damper actuators and actuator linkages.
  - 2. Section 23 3001: 'Common Duct Requirements'.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. ASTM International:
    - a. ASTM A653/A653M-15, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
    - b. ASTM C1071-12, 'Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)'.
    - c. ASTM C1338-14, 'Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings'.

**PART 2 - PRODUCTS****2.1 ACCESSORIES**

- A. Manufacturers:
  - 1. Manufacturer Contact List:
    - a. AGM Industries, Brockton, MA [www.agmind.com](http://www.agmind.com).
    - b. Air Balance Inc, Holland, OH [www.airbalance.com](http://www.airbalance.com).
    - c. Air Filters Inc, Baltimore, MD [www.afinc.com](http://www.afinc.com).
    - d. Air-Rite Manufacturing, Bountiful, UT (801) 295-2529.
    - e. American Warming & Ventilating, Holland, OH [www.american-warming.com](http://www.american-warming.com).
    - f. Arrow United Industries, Wyalusing, PA [www.arrowunited.com](http://www.arrowunited.com).
    - g. Cain Manufacturing Company Inc, Pelham, AL [www.cainmfg.com](http://www.cainmfg.com).
    - h. C & S Air Products, Fort Worth, TX [www.csairproducts.com](http://www.csairproducts.com).
    - i. CertainTeed Corp, Valley Forge, PA [www.certainteed.com](http://www.certainteed.com).
    - j. Cesco Products, Florence, KY [www.cescoproducts.com](http://www.cescoproducts.com).
    - k. Daniel Manufacturing, Ogden, UT (801) 622-5924.
    - l. Design Polymerics, Fountain Valley, CA [www.designpoly.com](http://www.designpoly.com).
    - m. Ductmate Industries Inc, East Charleroi, PA [www.ductmate.com](http://www.ductmate.com).
    - n. Duro Dyne, Bay Shore, NY [www.durodyne.com](http://www.durodyne.com).
    - o. Dyn Air Inc. Lachine, QB [www.dynair.ca](http://www.dynair.ca)
    - p. Elgen Manufacturing Company, Inc. East Rutherford, NJ [www.elgenmfg.com](http://www.elgenmfg.com)
    - q. Flexmaster USA Inc, Houston, TX [www.flexmasterusa.com](http://www.flexmasterusa.com).
    - r. Greenheck Corp, Schofield, WI [www.greenheck.com](http://www.greenheck.com).
    - s. Gripnail Corp, East Providence, RI [www.gripnail.com](http://www.gripnail.com).
    - t. Hardcast Inc, Wylie, TX [www.hardcast.com](http://www.hardcast.com).
    - u. Hercules Industries, Denver, CO, [www.herculesindustries.com](http://www.herculesindustries.com).



- v. Honeywell Inc, Minneapolis, MN [www.honeywell.com](http://www.honeywell.com).
- w. Industrial Acoustics Co, Bronx, NY [www.industrialacoustics.com](http://www.industrialacoustics.com).
- x. Johns-Manville, Denver, CO [www.jm.com](http://www.jm.com).
- y. Kees Inc, Elkhart Lake, WI [www.kees.com](http://www.kees.com).
- z. Knauf Fiber Glass, Shelbyville, IN [www.knauffiberglass.com](http://www.knauffiberglass.com).
- aa. Manson Insulation Inc, Brossard, QB [www.isolationmanson.com](http://www.isolationmanson.com).
- bb. Metco Inc, Salt Lake City, UT (801) 467-1572 [www.metcospiral.com](http://www.metcospiral.com).
- cc. Miracle / Kingco, Rockland, MA [www.taccint.com](http://www.taccint.com).
- dd. Mon-Eco Industries Inc, East Brunswick, NJ [www.mon-ecoindustries.com](http://www.mon-ecoindustries.com).
- ee. Nailor Industries Inc, Houston, TX [www.nailor.com](http://www.nailor.com).
- ff. Owens Corning, Toledo, OH [www.owenscorning.com](http://www.owenscorning.com).
- gg. Polymer Adhesive Sealant Systems Inc, Irving, TX [www.polymeradhesives.com](http://www.polymeradhesives.com).
- hh. Pottorff Company, Fort Worth, TX [www.pottorff.com](http://www.pottorff.com).
- ii. Ruskin Manufacturing, Kansas City, MO [www.ruskin.com](http://www.ruskin.com).
- jj. Sheet Metal Connectors Inc, Minneapolis, MN [www.smconnectors.com](http://www.smconnectors.com).
- kk. Tamco, Stittsville, ON [www.tamco.ca](http://www.tamco.ca).
- ll. Techno Adhesive, Cincinnati, OH [www.technoadhesives.com](http://www.technoadhesives.com).
- mm. Titus, Richardson, TX (972) 699-1030. [www.titus-hvac.com](http://www.titus-hvac.com)
- nn. McGill AirSeal, Columbus, OH [www.mcgillairseal.com](http://www.mcgillairseal.com).
- oo. United Enertech Corp, Chattanooga, TN [www.unitedenertech.com](http://www.unitedenertech.com).
- pp. Utemp Inc, Salt Lake City, UT (801) 978-9265.
- qq. Ventfabrics Inc, Chicago, IL [www.ventfabrics.com](http://www.ventfabrics.com).
- rr. Ward Industries, Grand Rapids MI [www.wardind.com](http://www.wardind.com).
- ss. Young Regulator Co, Cleveland, OH [www.youngregulator.com](http://www.youngregulator.com).

B. Materials:

1. Acoustical Liner System:

a. Duct Liner:

- 1) **One inch** thick, **1-1/2 lb** density fiberglass conforming to requirements of ASTM C1071. Liner will not support microbial growth when tested in accordance with ASTM C1338.
- 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
  - a) ToughGard by CertainTeed.
  - b) Duct Liner E-M by Knauf Fiber Glass.
  - c) Akousti-Liner by Manson Insulation.
  - d) Quiet R by Owens Corning.
  - e) Linacoustic RC by Johns-Manville.

b. Adhesive:

- 1) Category Four Approved Water-Based Products. See Section 01 6200 for definitions of Categories:
  - a) Cain: Hydrotak.
  - b) Design Polymerics: DP2501 or DP2502 (CMCL-2501).
  - c) Duro Dyne: WSA.
  - d) Elgen: A-410-WB.
  - e) Hardcast: Coil-Tack.
  - f) Hercules: Mighty Tough Adhesives MTA500 or MTA600.
  - g) Miracle / Kingco: PF-101.
  - h) Mon-Eco: 22-67 or 22-76.
  - i) Polymer Adhesive: Glasstack #35.
  - j) Techno Adhesive: 133.
  - k) McGill AirSeal: Uni-tack.
- 2) Category Four Approved Solvent-Based (non-flammable) Products. See Section 01 6200 for definitions of Categories:
  - a) Cain: Safetak.
  - b) Duro Dyne: FPG.
  - c) Hardcast: Glas-Grip 648-NFSE.
  - d) Miracle / Kingco: PF-91.
  - e) Mon-Eco: 22-24.
  - f) Polymer Adhesive: Q-Tack.
  - g) Techno Adhesive: 'Non-Flam' 106.

- 3) Category Four Approved Solvent-Based (flammable) Products. See Section 01 6200 for definitions of Categories:
  - a) Cain: HV200.
  - b) Duro Dyne: MPG.
  - c) Hardcast: Glas-Grip 636-SE.
  - d) Miracle / Kingco: PF-96.
  - e) Mon-Eco: 22-22.
  - f) Polymer Adhesive: R-Tack.
  - g) Techno Adhesive: 'Flammable' 106.
- c. Fasteners:
  - 1) Adhesively secured fasteners not allowed.
  - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a) AGM Industries: 'DynaPoint' Series RP-9 pin.
    - b) Cain.
    - c) Duro Dyne.
    - d) Gripnail: May be used if each nail is installed by 'Grip Nail Air Hammer' or by 'Automatic Fastener Equipment' in accordance with Manufacturer's recommendations.
2. Flexible Equipment Connections:
  - a. 30 oz closely woven UL approved glass fabric, double coated with neoprene.
  - b. Fire retardant, waterproof, air-tight, resistant to acids and grease, and withstand constant temperatures of **200 deg F**.
  - c. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - 1) Cain: N-100.
    - 2) Duro Dyne: MFN.
    - 3) Dyn Air: CPN with G-90 galvanized off-set seam.
    - 4) Elgen: ZLN / SDN.
    - 5) Ventfabrics: Ventglas.
    - 6) Ductmate: ProFlex.
3. Duct Access Doors:
  - a. General:
    - 1) Factory built insulated access door with hinges and sash locks, as necessary. Construction shall be galvanized sheet metal, **24 ga** minimum.
    - 2) Fire and smoke damper access doors shall have minimum clear opening of **12 inches** square or larger as shown on Drawings.
  - b. Rectangular Ducts:
    - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - a) Air Balance: Fire/Seal FSA 100.
      - b) Air-Rite: Model HAD-2.
      - c) Cesco: HDD.
      - d) Elgen: TAB Type / Hinge and Cam.
      - e) Flexmaster: Spin Door.
      - f) Kees: ADH-D.
      - g) Nailor: 08SH.
      - h) Pottorff: 60-HAD.
      - i) Ruskin: ADH-24.
      - j) United Enertech: L-95.
  - c. Round Ducts:
    - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - a) Ductmate: 'Sandwich' Access Door.
      - b) Elgen: Sandwich Access Door.
      - c) Kees: ADL-R.
      - d) Nailor: 0809.
      - e) Pottorff: RAD.
      - f) Ruskin: ADR.
      - g) Ward: DSA.
4. Dampers And Damper Accessories:
  - a. Locking Quadrant Damper Regulators:
    - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - a) Duro Dyne: KS-385.

- b) Dyn Air: QPS-385.
- c) Elgen: EQR-4.
- d) Ventfabrics: Ventline 555.
- e) Young: No. 1.
- b. Concealed Ceiling Damper Regulators:
  - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a) Cain.
    - b) Duro Dyne.
    - c) Elgen.
    - d) Metco Inc.
    - e) Ventfabrics: 666 Ventlok.
    - f) Young: 301.
- c. Volume Dampers:
  - 1) Rectangular Duct:
    - a) Factory-manufactured 16 ga galvanized steel, single blade and opposed blade type with 3/8 inch axles and end bearings. Blade width 8 inches maximum. Blades shall have 1/8 inch clearance all around.
    - b) Damper shall operate within acoustical duct liner.
    - c) Provide channel spacer equal to thickness of duct liner.
    - d) Dampers above removable ceiling and in Mechanical Rooms shall have locking quadrant on bottom or side of duct. Otherwise, furnish with concealed ceiling damper regulator and cover plate.
    - e) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - (1) Air-Rite: Model CD-2.
      - (2) American Warming: VC-2-AA.
      - (3) Arrow: OBDAF-207.
      - (4) C & S: AC40.
      - (5) Cesco: AGO.
      - (6) Daniel: CD-OB.
      - (7) Greenheck: VCD-20.
      - (8) Nailor: 1810 or 1820.
      - (9) Pottorff: CD-42.
      - (10) Ruskin: MD-35.
      - (11) United Enertech: MD-115.
      - (12) Utemp: CD-OB.
  - 2) Round Duct:
    - a) Factory-manufactured 20 ga galvanized steel, single blade with 3/8 inch axles and end bearings.
    - b) For use in outside air ducts.
    - c) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - (1) Air Balance: Model AC-22.
      - (2) Air-Rite: Model CD-5.
      - (3) American Warming: V-22.
      - (4) Arrow: Type-70.
      - (5) C & S: AC21R.
      - (6) Cesco: MGG.
      - (7) Nailor: 1890.
      - (8) Pottorff: CD-21R.
      - (9) Ruskin: MDRS-25.
      - (10) United Enertech: RD.
- d. Motorized Outside Air Dampers:
  - 1) General:
    - a) Low leakage type. AMCA certified.
    - b) Make provision for damper actuators and actuator linkages to be mounted external of air flow.
  - 2) Rectangular Ducts:
    - a) Damper Blades:

- (1) Steel or aluminum airfoil type with mechanically locked blade seals, 8 inch blade width maximum measured perpendicular to axis of damper.
    - (2) Jamb seals shall be flexible metal compression type.
    - (3) Opposed or single blade type.
  - b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - (1) Air Balance: AC 526.
    - (2) American Warming: AC526.
    - (3) Arrow: AFD-20.
    - (4) C & S: AC50.
    - (5) Cesco: AGO3.
    - (6) Nailor: 2020.
    - (7) Pottorff: CD-52.
    - (8) Ruskin: CD-60.
    - (9) Tamco: Series 1000.
    - (10) United Enertech: CD-150 or CD-160.
- 3) Round Ducts:
  - a) Damper Blades:
    - (1) Steel with mechanically locked blade seals.
    - (2) Blade seals shall be neoprene or polyethylene.
    - (3) Single blade type.
  - b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - (1) Air Balance: AC 25.
    - (2) American Warming: VC25.
    - (3) Arrow: Type 70 or 75.
    - (4) C & S: AC25R.
    - (5) Cesco: AGG.
    - (6) Nailor: 1090.
    - (7) Pottorff: CD-25R.
    - (8) Ruskin: CD25.
    - (9) Tamco: Square-to-Round Series 1000.
    - (10) United Enertech: RI.
- e. Backdraft Dampers:
  - 1) Backdraft blades shall be nonmetallic neoprene coated fiberglass type.
  - 2) Stop shall be galvanized steel screen or expanded metal, 1/2 inch mesh.
  - 3) Frame shall be galvanized steel or extruded aluminum alloy.
  - 4) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a) Air-Rite: Model BDD-3.
    - b) American Warming: BD-15.
    - c) C & S: BD30.
    - d) Pottorff: BD-51.
    - e) Ruskin: NMS2.
    - f) Utemp: BFEA.
5. Air Turns:
  - a. Single thickness vanes. Double thickness vanes not acceptable.
  - b. 4-1/2 inch wide vane rail. Junior vane rail not acceptable.
6. Branch Tap for Flexible Ductwork:
  - a. Factory-manufactured rectangular-to-round 45 degree leading tap fabricated of 24 ga zinc-coated lock-forming quality steel sheets meeting requirements of ASTM A653, with G-90 coating.
  - b. One inch wide mounting flange with die formed corner clips, pre-punched mounting holes, and adhesive coated gasket.
  - c. Manual Volume Damper:
    - 1) Single blade, 22 ga minimum
    - 2) 3/8 inch minimum square rod with brass damper bearings at each end.
    - 3) Heavy-duty locking quadrant on 1-1/2 inch high stand-off mounting bracket attached to side of round duct.
  - d. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - 1) ST-1HD by Air-Rite.

- 2) STO by Flexmaster.
- 3) HET by Sheet Metal Connectors.

C. Fabrication:

1. Duct Liner:
  - a. Install mat finish surface on airstream side. Secure insulation to cleaned sheet metal duct with continuous 100 percent coat of adhesive and with **3/4 inch** long mechanical fasteners **12 inches** on center maximum unless detailed otherwise on Drawings. Pin all duct liner.
  - b. Accurately cut liner and thoroughly coat ends with adhesive. Butt joints tightly. Top and bottom sections of insulation shall overlap sides. If liner is all one piece, folded corners shall be tight against metal. Ends shall butt tightly together.
  - c. Coat longitudinal and transverse edges of liner with adhesive.
2. Air Turns:
  - a. Permanently install vanes arranged to permit air to make abrupt turn without appreciable turbulence, in 90 degree elbows of above ground supply and return ductwork.
  - b. Quiet and free from vibration when system is in operation.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Duct Liner:

1. Furnish and install acoustic lining in following types of rectangular ducts unless noted otherwise on Contract Documents:
  - a. Supply air.
  - b. Return air.
  - c. Mixed air.
  - d. Transfer air.
  - e. Relief air.
  - f. Exhaust air.
  - g. Elbows, fittings, and diffuser drops greater than **12 inches** in length.
  - h. Concrete underfloor boxes.
2. Do not install acoustic lining in round ducts.

B. Flexible Connections: Install flexible inlet and outlet duct connections to each furnace.

C. Access Doors In Ducts:

1. Install at each manual outside air damper and at each motorized damper. Locate doors within **6 inches** of installed dampers.
2. Install within **6 inches** of fire dampers and in Mechanical Room if possible. Install on side of duct that allows easiest access to damper.

D. Dampers And Damper Accessories:

1. Install concealed ceiling damper regulators.
  - a. Paint cover plates to match ceiling tile.
  - b. Do not install damper regulators for dampers located directly above removable ceilings or in Mechanical Rooms.
2. Provide each take-off with an adjustable volume damper to balance that branch.
  - a. Anchor dampers securely to duct.
  - b. Install dampers in main ducts within insulation.
  - c. Dampers in branch ducts shall fit against sheet metal walls, bottom and top of duct, and be securely fastened. Cut duct liner to allow damper to fit against sheet metal.
  - d. Where concealed ceiling damper regulators are installed, provide cover plate.
3. Install motorized dampers.

## END OF SECTION

**SECTION 23 3713****DIFFUSERS, REGISTERS, AND GRILLES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install diffusers, registers, and grilles connected to ductwork as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 23 3001: 'General Duct Requirements'.

**1.2 SUBMITTALS**

- A. Maintenance Material Submittals:
  - 1. Tools: Leave tool for removing core of each different type of grille for building custodian.

**PART 2 - PRODUCTS****2.1 MANUFACTURERS**

- A. Manufacturer Contact List:
  - 1. Carnes Co, Verona, MI [www.carnes.com](http://www.carnes.com).
  - 2. J & J Register, Grand Rapids, MI [www.jandjreg.com](http://www.jandjreg.com).
  - 3. Krueger Air System Components, Richardson, TX [www.krueger-hvac.com](http://www.krueger-hvac.com).
  - 4. Metal\*Aire by Metal Industries Inc, Clearwater, FL [www.metalaire.com](http://www.metalaire.com).
  - 5. Nailor Industries Inc, Houston, TX or Weston, ON [www.nailor.com](http://www.nailor.com).
  - 6. Price Industries Inc, Suwanee, GA [www.price-hvac.com](http://www.price-hvac.com) or E H Price Ltd, Winnipeg, MB (204) 669-4220.
  - 7. Titus, Richardson, TX [www.titus-hvac.com](http://www.titus-hvac.com).
  - 8. Tuttle & Bailey, Richardson, TX [www.tuttleandbailey.com](http://www.tuttleandbailey.com).

**2.2 MANUFACTURED UNITS**

- A. Ceiling Return And Transfer Grilles:
  - 1. Finish: Off-white baked enamel.
  - 2. **1/2 inch** spacing.
  - 3. See Contract Documents for location of filter grilles.
  - 4. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a. Carnes: RSLA.
    - b. J & J: S90H.
    - c. Krueger: S85H.
    - d. Metal\*Aire: SRH.
    - e. Nailor: 6155H.
    - f. Price: 535.
    - g. Titus: 355RL or 355 RS.
    - h. Tuttle & Bailey: T75D.
- B. Ceiling Diffusers:
  - 1. Finish: Off-white baked enamel.

2. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
  - a. Carnes: SKSA.
  - b. J & J: R-1400.
  - c. Krueger: SH.
  - d. Metal\*Aire: 5500S.
  - e. Nailor: 65OOB.
  - f. Price: SMD-6.
  - g. Titus: TDC-6.
  - h. Tuttle & Bailey: M.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Anchor securely into openings. Secure frames to ductwork by using four sheet metal screws, one per side. Level floor registers and anchor securely into floor.

### **3.2 ADJUSTING**

- A. Set sidewall supply register blades at 15 degrees upward deflection.

**END OF SECTION**

**SECTION 23 3714****LOUVERS AND VENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install louvers connected to ductwork as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 23 3001: 'General Duct Requirements'.

**PART 2 - PRODUCTS****2.1 MANUFACTURERS**

- A. Manufacturer Contact List:
  - 1. Airolite Co, Marietta, OH [www.airolite.com](http://www.airolite.com).
  - 2. Air-Rite Manufacturing, Bountiful, UT [www.air-ritemfg.com](http://www.air-ritemfg.com).
  - 3. American Warming & Ventilating, Holland, OH [www.awv.com](http://www.awv.com).
  - 4. Arrow United Industries, Wyalusing, PA [www.arrowunited.com](http://www.arrowunited.com).
  - 5. Carnes Co, Verona, WI [www.carnes.com](http://www.carnes.com).
  - 6. Industrial Louvers Inc, Delano, MN [www.industriallouvers.com](http://www.industriallouvers.com).
  - 7. Pottorff, Fort Worth, TX [www.pottorff.com](http://www.pottorff.com).
  - 8. Ruskin Manufacturing, Kansas City, MO [www.ruskin.com](http://www.ruskin.com).
  - 9. United Enertech Corporation, Chattanooga, TN [www.unitedenertech.com](http://www.unitedenertech.com).
  - 10. Vent Products Co Inc, Chicago, IL [www.ventprod.com](http://www.ventprod.com).
  - 11. SF435 by Western Ventilation Products Ltd, Calgary, AB [www.westvent.com](http://www.westvent.com).
  - 12. Wonder Metals Corp, Redding, CA [www.wondermetals.com](http://www.wondermetals.com).

**2.2 MANUFACTURED UNITS**

- A. Louvers:
  - 1. General:
    - a. Extruded aluminum, with blades welded or screwed into frames.
    - b. Frames shall have mitered corners.
    - c. Louvers shall be recessed, flanged, stationary, or removable as noted on Contract Documents.
    - d. Finish:
      - 1) Polyvinylidene Fluoride (PVF<sub>2</sub>) Resin-base finish (Kynar 500 or Hylar 5000) containing 70 percent minimum PVF<sub>2</sub> in resin portion of formula. Thermo-cured two coat system consisting of corrosion inhibiting epoxy primer and top coat factory applied over properly pre-treated metal.
      - 2) Color as selected by Architect from Manufacturer's standard colors.
- 2. Louvers Connected To Ductwork:
  - a. **1/2 inch** mesh **16 ga** aluminum bird screen.
  - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - 1) K638 by Airolite.
    - 2) LE-1 by Air-Rite Manufacturing.
    - 3) LE48 by American Warming & Ventilating.
    - 4) EA-405 by Arrow United Industries.
    - 5) FKDA by Carnes.



- 6) 455-XP by Industrial Louvers.
- 7) EFK-445 by Pottorff.
- 8) ELF81S30 by Ruskin.
- 9) EL-4 by United Enertech.
- 10) 2740-31 by Vent Products.
- 11) EX by Wonder Metals.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Anchor securely into openings.
- B. Where louvers touch masonry or dissimilar metals, protect with heavy coat of asphaltum paint.

**END OF SECTION**

**SECTION 23 3723****HVAC GRAVITY VENTILATORS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install roof vents as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 23 3001: 'Common Duct Requirements'.

**PART 2 - PRODUCTS****2.1 MANUFACTURERS**

- A. Manufacturer List:
  - 1. Air-Rite Manufacturing, Bountiful, UT (801) 295-2529.
  - 2. Breidert Air Products, Jacksonville, FL [www.breidert.com](http://www.breidert.com).
  - 3. Carnes Company, Verona, WI [www.carnes.com](http://www.carnes.com).
  - 4. Greenheck Fan Corporation, Schofield, WI [www.greenheck.com](http://www.greenheck.com).
  - 5. Loren Cook Co, Springfield, MO [www.lorencook.com](http://www.lorencook.com).
  - 6. United Enertech Corporation, Chattanooga, TN [www.unitedenertech.com](http://www.unitedenertech.com).
  - 7. Vent Products Co, Inc, Chicago, IL [www.ventprod.com](http://www.ventprod.com).

**2.2 MANUFACTURED UNITS**

- A. Louvered Penthouses:
  - 1. Fabricated from (0.081 inch) extruded aluminum.
    - a. All welded construction.
    - b. Screws or rivets will not be allowed.
  - 2. Blades:
    - a. Horizontal at 45 degree angle with return bends at upper edges.
    - b. Welded, mitered corners for continuous blade effect.
  - 3. Bird Screens: 1/2 inch square mesh 16 ga aluminum in extruded aluminum, rewirable frames on interior of louvers.
  - 4. Penthouse Finish: Clear anodized aluminum.
  - 5. Curbs:
    - a. Extruded aluminum, insulated, factory-fabricated curb.
    - b. Insulation: Minimum 1-1/2 inches thick, 3 lb density fiber glass.
    - c. Curb Extension: 8 inches above finished roof level.
  - 6. Provide automatic back draft damper on Relief Air Penthouses. Provide motorized damper where indicated on Drawings.
  - 7. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a. Air-Rite Manufacturing: Model LPE-1.
    - b. Breidert: Model RLX.
    - c. Carnes: GLAB.
    - d. Cook: Type TRE.
    - e. Greenheck: WIH/WRH.
    - f. United Enertech: Model PEL-4.
    - g. Vent Products: Model 7100.

**PART 3 - EXECUTION: Not Used****END OF SECTION**

**BLANK PAGE**

**SECTION 23 4100****AIR FILTERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install filters used in mechanical equipment.
- B. Related Requirements:
  - 1. Section 23 3001: 'Common Duct Requirements'.

**1.2 REFERENCES**

- A. Reference Standard:
  - 1. American National Standards Institute (ANSI) / American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
    - a. ANSI/ASHRAE 52.2-2012, 'Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size'.

**PART 2 - PRODUCTS****2.1 MANUFACTURED UNITS**

- A. Furnace Filters: **One inch** thick throw-away type as recommended by Furnace Manufacturer.

**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Provide ample access for filter removal.

**3.2 FIELD QUALITY CONTROL**

- A. Inspection: At date of Substantial Completion, air filters shall be new, clean, and approved by Owner's representative.

**END OF SECTION**

**BLANK PAGE**

**SECTION 23 5135****AIR PIPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install heating equipment exhaust piping and combustion air intake piping as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 07 6310: 'Steep Slope Roof Flashing: Asphalt Tile' for pipe flashing used on steep slope asphalt tile roofs only.
  - 2. Sections Under 09 9000 Heading: Painting.
  - 3. Section 22 3413: 'Instantaneous, Tankless, Gas Domestic Water Heaters'.
  - 4. Section 23 0501: 'Common HVAC Requirements'.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. ASTM International:
    - a. ASTM D1785-12, 'Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120'.
    - b. ASTM D2564-12, 'Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems'.
    - c. ASTM D2661-11, 'Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings'.
    - d. ASTM D2665-14, 'Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings'.

**PART 2 - PRODUCTS****2.1 ASSEMBLIES**

- A. Manufacturers:
  - 1. Manufacturer Contact List:
    - a. Armaflex by Armacell, Mebane, NC [www.armacell.com](http://www.armacell.com).
    - b. Nomaco, Youngsville, NC [www.nomacokflex.com](http://www.nomacokflex.com).
- B. Materials:
  - 1. Air Piping: Schedule 40 pipe and fittings meeting requirements of ASTM D1785, ASTM D2661, or ASTM D2665.
  - 2. Piping Primer And Cement:
    - a. Meet requirements of ASTM D2564.
  - 3. Flexible Foamed Pipe Insulation:
    - a. Thickness:
      - 1) **1/2 inch** for **2 through 3 inch** outside diameter pipe.
      - 2) **1/2 inch** sheet for fittings as recommended by Manufacturer.
    - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - 1) Tubolit by Armaflex.
      - 2) ImcoLock or Therma-Cel by Nomaco K-Flex.
  - 4. Insulation Joint Sealer:

- a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
  - 1) 520 by Armaflex.
  - 2) R-320 by Nomaco K-Flex.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Installation For Condensing Furnaces:
  - 1. Run individual vent and individual combustion intake piping from each furnace to concentric roof termination kit provided by Furnace Manufacturer. Slope lines downward toward furnace.
  - 2. Slope combustion chamber drain downward to funnel drain. Anchor to wall with wall clamps, allowing free movement through clamp for expansion.
  - 3. Use concentric roof termination kit provided by Furnace Manufacturer. Install vent and combustion air intake piping at clearance and distances required by Furnace Manufacturer.
  - 4. Attach factory-supplied neoprene coupling to combustion-air inlet connection and secure with clamp.
  - 5. Ensure that factory-supplied perforated metal disc is installed in flexible coupling, unless its removal is required.
  - 6. York Furnaces: Install air piping on side of furnace in horizontal or vertical installation.
- B. Installation For Condensing Water Heaters:
  - 1. Run individual vent and individual combustion intake piping from each water heater to roof termination as recommended by Water Heater Manufacturer. Concentric roof termination kit may be used if approved by and provided by Water Heater Manufacturer. Slope lines downward toward water heater.
  - 2. Slope combustion chamber exhaust drain downward to floor drain.
- C. Support:
  - 1. Support concentric roof termination kit at ceiling or roof line with 20 ga sheet metal straps as detailed on Drawings.
  - 2. Support horizontal and sloping sections of pipe with 1 inch wide 20 ga galvanized steel straps. Anchor securely to structure, not allowing pipe to sway.
- D. Insulation:
  - 1. General:
    - a. Install insulation in snug contact with pipe and in accordance with Manufacturer's recommendations.
    - b. Slip insulation on piping before piping sections and fittings are assembled keeping slitting of insulation to a minimum.
    - c. Joints:
      - 1) Place 'slit' joint seams of insulation exposed outside building on bottom of pipe.
      - 2) Stagger joints on layered insulation.
      - 3) Seal joints in insulation.
    - d. Paint exterior exposed insulation with two coats of finish recommended by Insulation Manufacturer, color selected by Architect.
  - 2. Install specified insulation on PVC air piping serving mechanical equipment as follows
    - a. Combustion air PVC piping in truss space and in attic.
    - b. Combustion vent PVC piping in attic, in truss space, and above roof.
    - c. Insulate fittings with sheet insulation and as recommended by Manufacturer.

**END OF SECTION**

**SECTION 23 5417****GAS-FIRED FURNACES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install horizontal/vertical gas-fired condensing furnaces as described in Contract Documents.
- B. Related Sections:
  - 1. Section 23 0501: 'Common HVAC Requirements'.
  - 2. Section 23 1123: 'Facility Natural Gas Piping'.
  - 3. Section 23 2300: 'Refrigerant Piping'.
  - 4. Section 23 4100: 'Air Filters'.
  - 5. Section 23 5135: 'Air Piping'.

**1.2 SUBMITTALS**

- A. Informational Submittals:
  - 1. Manufacturer Reports: Equipment check-out sheets.
- B. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Warranty Documentation:
      - 1) Final, executed copy of Warranty.
    - b. Record Documentation:
      - 1) Manufacturers Documentation:
        - a) Equipment checkout sheet: Complete and sign all items for each unit.

**1.3 WARRANTY**

- A. Manufacturer's Warranty:
  - 1. Provide Manufacturer's Special LDS Warranty for the following:
    - a. Provide fifteen (15) year minimum limited warranty of heat exchanger and five (5) year limited warranty on parts.

**PART 2 - PRODUCTS****2.1 ASSEMBLIES**

- A. Manufacturer:
  - 1. Manufacturer Contact List:
    - a. Carrier Corporation:
      - 1) Carrier National: Doug Masch (317) 370-2727 [Doug.Masch@carrier.utc.com](mailto:Doug.Masch@carrier.utc.com).
      - 2) Carrier Utah: Rich Carpenter (Contractors HVAC Supply) (801) 410-6077 e-mail [rcarpent@mtncom.net](mailto:rcarpent@mtncom.net).
    - b. Lennox Industries:
      - 1) For pricing and information contact Lennox National Account @ 1-800-367-6285.
      - 2) Lennox National Contact : Cory Hickens (951) 332-3658 [cory.hicken@LennoxInd.com](mailto:cory.hicken@LennoxInd.com).
    - c. Trane Company:



- 1) Salt Lake Trane, attention: Jason Bradford (801) 486-0500  
[www.Jason.Bradford@trane.com](mailto:www.Jason.Bradford@trane.com).
  - d. York International:
    - 1) Brian Michael (405) 419-6230 [brian.k.michael@jci.com](mailto:brian.k.michael@jci.com).
- B. Performance:
1. Design Criteria:
    - a. Rated at 92 percent minimum AFUE (Annual Fuel Utilization Efficiency) calculated in accordance with DOE test procedures.
- C. Manufactured Units:
1. Furnaces:
    - a. Factory assembled units certified by CSA complete with blower section, furnace section, steel casing, piped, and wired.
    - b. Blower section shall consist of cabinet, blower, and motor.
      - 1) Cabinet shall be of 22 ga minimum cold rolled steel and have finish coat of baked-on enamel.
      - 2) Blower shall be Class 1, full DIDW, statically and dynamically balanced.
    - c. Automatic controls shall consist of:
      - 1) Manual gas shut-off valve.
      - 2) Operating automatic gas valve.
      - 3) Solid-state type fan and thermal limit controls.
      - 4) 24-volt transformer.
      - 5) Hot surface ignition system.
    - d. Blower shall be driven by multi-speed direct driven motor.
    - e. Furnace section shall be enclosed in 22 ga minimum enameled steel casing lined with foil covered insulation.
    - f. Heat Exchanger: Aluminized steel.
    - g. Gas Burners: Aluminized steel.
    - h. PVC intake of outside air and PVC combustion product exhaust, with sealed combustion, direct vent system.
    - i. Concentric roof termination kit for roof mounting.
    - j. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - 1) Standard Furnaces:
        - a) Carrier: 59SC5A.
        - b) Lennox: ML195.
        - c) Trane: TUX1/TDX1 or TUH1/TDH1.
        - d) York: TG9S.
  2. Cooling Coil:
    - a. Cooling coil shall consist of heavy gauge steel cabinet with baked-on enamel finish to match furnace:
      - 1) Coil shall have aluminum fins bonded to seamless copper or aluminum tubing.
      - 2) Coil shall be ARI rated. Provide drain pans with connections at one end.
      - 3) Use thermal expansion valve.
    - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - 1) Horizontal:
        - a) Carrier: CNPHP.
        - b) Lennox: CH33.
        - c) Trane: 4TXC.
        - d) York: MC.
      - 2) Vertical:
        - a) Carrier: CNPVP.
        - b) Lennox: CX34.
        - c) Trane: 4TXC.
        - d) York: FC.

## 2.2 ACCESSORIES

- A. Filter Frame:

1. Build filter frame external to furnace as detailed on Drawings.

B. Vibration Isolators:

1. Horizontal Installation:
  - a. Neoprene hanger type with load of **75 lbs** maximum.
  - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - 1) RH by Kinetics Noise Control, Dublin, OH [www.kineticsnoise.com](http://www.kineticsnoise.com).
    - 2) Mason Industries, Hauppauge, NY [www.mason-ind.com](http://www.mason-ind.com).
    - 3) RH by Vibration Mounting & Controls, Bloomingdale, NJ [www.vmc-kdc.com](http://www.vmc-kdc.com).
2. Vertical Installation: **4 inches** square by **1/2 inch** thick minimum neoprene type vibration isolation pads.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Vibration Isolators:

1. Install vibration isolator on each hanger rod supporting horizontal furnace and under each corner of vertical furnace.

### 3.2 FIELD QUALITY CONTROL

A. Field Tests And Inspections:

1. Manufacturer Services:
  - a. Furnace installer shall:
    - 1) Verify proper gas orifice size.
    - 2) Clock gas meter for rated input.
    - 3) Verify and set gas pressure at furnace.
    - 4) Check and measure temperature rise.
    - 5) Check safety controls for proper operation.
    - 6) Check combustion vent sizes and combustion air sizes.
  - b. In addition, furnace installer shall start up, check out, and adjust furnaces using equipment check-out sheet provided by Manufacturer. Complete and sign all items on sheet.

**END OF SECTION**

**BLANK PAGE**

**SECTION 23 6213****PACKAGED AIR-COOLED REFRIGERANT COMPRESSOR  
AND CONDENSER UNITS: Air Conditioning****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install compressor units as described in contract documents.
- B. Related Sections:
  - 1. Sections under Heading 07 5000 Membrane Roofing.
  - 2. Section 23 0501: 'Common HVAC Requirements'.
  - 3. Section 23 2300: 'Refrigerant Piping'.
  - 4. Section 23 5417: 'Gas-Fired Furnaces'.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Compressor: Pump that increases vapor (refrigerant or air) pressure from one level to a higher level of pressure.
  - 2. Compressor Unit: Outside section of an air conditioning system which pumps vaporized refrigerant from the evaporator, compresses it, liquefies it in the condenser and returns it to the evaporator coil. The outdoor portion of a split system air conditioner contains the compressor and outdoor coil.
  - 3. Condenser: Device used to condense refrigerant in a cooling system.
  - 4. Condenser Coils: In a compressor unit, the coil dissipates heat from the refrigerant, changing the refrigerant from vapor to liquid.
  - 5. Refrigerant: Absorbs heat by a change of state (evaporation) from liquid to a gas, and releases heat by a change of state (condenses) from gas back to a liquid.
  - 6. SEER (Seasonal Energy Efficiency Ratio): Measure of cooling efficiency for air conditioners and heat pumps. A ratio of total cooling in comparison to electrical energy input in watts per hour. Higher the seer, the more energy efficient the unit. Since 2006, the minimum SEER required by the Department of Energy is 13.00 and 15.00+ SEER is considered high efficiency.
  - 7. Split System: Combination of an outdoor unit (air conditioner or heat pump) with an indoor unit (furnace or air handler). Split systems must be matched for optimum efficiency.
- B. Reference Standards:
  - 1. American National Standards Institute / Air-Conditioning, Heating, and Refrigeration Institute:
    - a. ANSI/AHRI Standard 210/240-2008, 'Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment' (formerly ARI Standard 210/240).

**1.3 SUBMITTALS**

- A. Informational Submittals:
  - 1. Tests and Evaluation Reports:
    - a. Manufacturer Reports: Equipment check-out sheets.
  - 2. Qualification Statements:
    - a. Technician certificate for use in HFC and HCFC refrigerants.
- B. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Warranty Documentation:

- 1) Final, executed copy of Warranty.
- b. Record Documentation:
  - 1) Manufacturers Documentation:
    - a) Equipment checkout sheet: Complete and sign all items for each unit.

## 1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
  1. Each unit shall be UL / ULC or ETL labeled.
  2. Comply with ANSI/AHRI Standard 210/240.
  3. Refrigeration compressor, coils, and specialties shall be designed to operate with CFC-free refrigerants.
- B. Qualifications. Section 01 4301 applies, but is not limited to the following:
  1. Installer: Refrigerant piping shall be installed by refrigeration contractor licensed by State and by technicians certified in use of HFC and HCFC refrigerants.

## 1.5 WARRANTY

- A. Manufacturer's Warranty:
  1. Provide Manufacturer's Special LDS Warranty for the following:
    - a. Provide ten (10) year limited warranty on compressor and five (5) year limited warranty on parts from date of 'start-up'.
    - b. Record 'start-up' date on warranty certificate for each unit.

## PART 2 - PRODUCTS

### 2.1 ASSEMBLIES

- A. Manufacturers:
  1. Manufacturer Contact List:
    - a. Air-Rite Manufacturing, Bountiful, UT [www.air-ritemfg.com](http://www.air-ritemfg.com).
      - 1) Blair Halverson (801) 295-2529.
    - b. Carrier Corporation:
      - 1) Carrier National: Bradley Brunner (270) 282-1241 [Bradley.M.Brunner@Carrier.utc.com](mailto:Bradley.M.Brunner@Carrier.utc.com).
      - 2) Carrier Utah: Rich Carpenter (Contractors HVAC Supply) (801) 410-6077 [rcarpent@mtncor.net](mailto:rcarpent@mtncor.net).
    - c. Lennox Industries:
      - 1) For pricing and information call Lennox National Account at (800) 367-6285.
      - 2) Lennox National Contact : Cody Jackson (801) 736-8904 [Cody.Jackson@LennoxInd.com](mailto:Cody.Jackson@LennoxInd.com).
    - d. York International:
      - 1) Brian Michael (405) 419-6230 [brian.k.michael@jci.com](mailto:brian.k.michael@jci.com).
- B. Performance:
  1. Capacities: SEER rating as defined by AHRI shall be 13.0 or greater.
- C. Manufactured Units:
  1. Compressor Units (5 Tons or Less):
    - a. General:
      - 1) Units shall be operable down to 0 deg F outdoor temperature.
      - 2) Use R-410a refrigerant.
      - 3) Only one liquid line, one suction line, and one power connection shall be made to each compressor. Provide charging valves.
    - b. Condenser Coils:

- 1) Aluminum plate fins mechanically bonded to seamless copper tubes or 'Spine Fin' trade mark system which has aluminum fins epoxy bonded to aluminum tubes or micro-channel.
- 2) Provide stamped louver coil guard for unit.
- c. Fans:
  - 1) Direct driven propeller type.
  - 2) Fan motor shall be single or two speed, thermostatically controlled, permanently lubricated, and designed with permanent protection.
  - 3) Motors shall be resiliently mounted.
  - 4) Each fan shall have a safety guard.
- d. Compressor:
  - 1) Each condenser unit shall have only one compressor.
  - 2) Design with following features:
    - a) Externally mounted brass service valves with charging connections.
    - b) Crankcase heater.
    - c) Resilient rubber mounts.
    - d) Compressor motor-overload protection.
    - e) Single speed.
- e. Controls:
  - 1) Factory wired and located in separate enclosure.
  - 2) Following three paragraphs may not be factory installed and will therefore have to be field installed.
  - 3) Safety devices:
    - a) High and low pressure cutout.
    - b) Condenser fan motor-overload devices.
  - 4) Anti-cycle timers to prevent units from starting up again for five minutes after any power interruption.
  - 5) Head pressure type low ambient kit.
- f. Casing:
  - 1) Fully weatherproof for outdoor installation. Finish shall be weather resistant.
- g. Openings shall be provided for power and refrigerant connections.
- h. Panels shall be removable for servicing.
- i. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
  - 1) North Region:
    - a) Carrier: 24ABB3.
    - b) Lennox: 13ACXN.
    - c) York: YCD.
  - 2) Southeast Region:
    - a) Carrier: 24ACC4.
    - b) Lennox: 14ACX.
    - c) York: YCE.
  - 3) Southwest Region:
    - a) Carrier: 24AAA5.
    - b) Lennox: 14ACX.
    - c) York: YCS.

## 2.2 ACCESSORIES

### A. Vibration Isolators:

1. 4 inches square by 3/4 inch thick minimum neoprene type vibration isolation pads.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

#### A. Verification Of Conditions:

1. Verify blocking installed under roof decking is in correct location to attach 'compressor unit curb'.
2. Notify Architect of unsuitable conditions in writing
3. Commencement of Work by Installer is considered acceptance of substrate.

### **3.2 INSTALLATION**

#### **A. General:**

1. Set compressor units level on concrete slab on vibration isolation pads located at each corner of unit. This does not apply to compressor units that have composite non-metal bottom.
2. Do not use capillary tube and piston type refrigerant metering devices.

### **3.3 FIELD QUALITY CONTROL**

#### **A. Manufacturer Services:**

1. Compressor units shall be started up, checked out, and adjusted by compressor unit Installer.
2. Use equipment checkout sheet provided by Manufacturer:
  - a. Complete and sign all items on sheet.

**END OF SECTION**

**SECTION 23 8216****AIR COILS: DX****PART 1 - GENERAL****1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
  - 1. DX air coils as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 23 0501: 'Common HVAC Requirements'.
  - 2. Section 23 2300: 'Refrigerant Piping'.

**1.2 REFERENCES**

- A. Definitions:
  - 1. DX (Direct Expansion): Use of refrigerant directly expanded into evaporation coils in supply air stream of an air conditioning unit.
  - 2. Refrigerant: Absorbs heat by a change of state (evaporation) from liquid to a gas, and releases heat by a change of state (condenses) from gas back to a liquid.
- B. Reference Standards:
  - 1. American National Standards Institute / Air-Conditioning, Heating, and Refrigeration Institute (AHRI).
    - a. ANSI/AHRI Standard 210/240 (2008), 'Performance Rating of Unitary Air-Conditioning & Air-Source Heat Pump Equipment' (formerly ARI Standard 210/240).
  - 2. American National Standards Institute / American Society of Heating, Refrigerating and Air-Conditioning Engineers:
    - a. ANSI/ASHRAE Standard 62.1-2010, 'Ventilation for Acceptable Indoor Air Quality' (ANSI Approved).

**1.3 SUBMITTALS**

- A. Informational Submittals:
  - 1. Manufacturer Reports:
    - a. Equipment check-out sheets.
- B. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Record Documentation:
      - 1) Manufacturers Documentation:
        - a) Equipment checkout sheet: Complete and sign all items for each unit.

**1.4 QUALITY ASSURANCE**

- A. Regulatory Agency Sustainability Approvals:
  - 1. DX Coils:
    - a. Air-Conditioning, Heating, and Refrigeration Institute (AHRI).
      - 1) AHRI Certified.
    - b. American National Standards Institute / Air-Conditioning, Heating, and Refrigeration Institute
      - 1) Comply with requirements of ANSI/AHRI Standard 210/240.
    - c. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):



- 1) Comply with requirements of ANSI/ASHRAE Standard 62.1, Section 5, 'Systems and Equipment' and Section 7, 'Construction and Startup'.
- d. Underwriters Laboratories / Underwriters Laboratories of Canada:
  - 1) Each unit shall be UL / ULC or ETL labeled.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturer:
  1. Manufacturer Contact List:
    - a. Carrier Corporation:
      - 1) Carrier National: Douglas Masch (317) 370-2727 [doug.mash@carrier.utc.com](mailto:doug.mash@carrier.utc.com).
    - b. Carrier Utah: Rich Carpenter (Contractors HVAC Supply) (801) 410-6077 e-mail [rcarpent@mtncornet.net](mailto:rcarpent@mtncornet.net).
    - c. Lennox Industries:
      - 1) For pricing and information call Lennox National Account at 1-800-367-6285.
      - 2) Lennox National Contact : Cory Hickens (951) 332-3658 [cory.hicken@LennoxInd.com](mailto:cory.hicken@LennoxInd.com).
    - d. York International: David E. Carey 405-419-6536 [david.e.carey@jci.com](mailto:david.e.carey@jci.com).

### 2.2 MANUFACTURED UNITS

- A. DX Coils:
  1. Cooling coil shall consist of heavy gauge steel cabinet with baked-on enamel finish to match air handler.
    - a. Coil shall have aluminum fins bonded to seamless copper tubing.
    - b. Comply with ANSI/AHRI Standard 210/240. Provide drain pans with connections at one end.
    - c. Use thermal expansion valve with brazed joints in place of capillary tube metering device. Compression fittings not acceptable.
  2. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a. Horizontal:
      - 1) Carrier: CNPHP.
      - 2) Lennox: CH33.
      - 3) York: MC.
    - b. Vertical:
      - 1) Carrier: CNPVP.
      - 2) Lennox: CH34.
      - 3) York: FC.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install DX Coil to associated air handler per Manufacturer's recommendations.

**END OF SECTION**

**SECTION 26 0501****COMMON ELECTRICAL REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. General electrical system requirements and procedures.
  - 2. Perform excavating and backfilling work required by work of this Division as described in Contract Documents.
  - 3. Make electrical connections to equipment provided under other Sections.
  - 4. Furnish and install Penetration Firestop Systems at electrical system penetrations as described in Contract Documents.
- B. Products Furnished But Not Installed Under This Section:
  - 1. Anchor bolts and templates for exterior lighting equipment bases.
- C. Related Requirements:
  - 1. Section 07 8400: 'Firestopping' for quality of Penetration Firestop Systems to be used on Project and submittal requirements.
  - 2. Section 31 2316: 'Excavation' for criteria for performance of excavating.
  - 3. Section 31 2323: 'Fill' for criteria for performance of backfilling.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. National Fire Protection Association / American National Standards Institute:
    - a. NFPA 70, National Electric Code (NEC).
  - 2. National Electrical Manufacturing Association Standards (NEMA):
    - a. NEMA 250, 'Enclosure for Electrical Equipment (1000 Volts Maximum)'.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate with Owner for equipment and materials to be removed by Owner.
- B. Sequencing:
  - 1. Include detailed sequence of individual electrical demolition operations on Construction Schedule specified in Section 01 3200.

**1.4 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Provide following information for each item of equipment:
      - 1) Catalog Sheets.
      - 2) Assembly details or dimension drawings.
      - 3) Installation instructions.
      - 4) Manufacturer's name and catalog number.
      - 5) Name of local supplier.
    - b. Furnish such information for following equipment:
      - 1) Section 26 2726: 'Wiring Devices' for lighting control equipment.

- 2) Section 26 2816: 'Enclosed Switches And Circuit Breakers'.
  - 3) Section 26 5100: 'Interior Lighting Fixtures'.
  - 4) Section 26 5200: 'Emergency Lighting' for battery units.
  - 5) Section 26 5600: 'Exterior Lighting' for fixtures, poles, and associated control equipment.
  - c. Do not purchase equipment before approval of product data.
- B. Informational Submittals:
1. Test And Evaluation Reports:
    - a. Report of site tests, before Substantial Completion.
  2. Qualification Statement:
    - a. Electrical Subcontractor:
      - 1) Provide Qualification documentation if requested by Architect or Owner.
    - b. Installer:
      - 1) Provide Qualification documentation if requested by Architect or Owner.
- C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Operations and Maintenance Data:
      - 1) Provide operating and maintenance instructions for each item of equipment submitted under Product Data.
    - b. Record Documentation:
      - 1) Manufacturers documentation:
        - a) Manufacturer's literature.
        - b) Include copy of approved shop drawings.
        - c) Provide tritium exit sign tabulations for each exit sign installed on Project including following:
          - (1) Serial number.
          - (2) Expiration number.
          - (3) Installed building location (example – chapel north rear exit, north corridor east end, main west foyer, etc.).

## 1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
1. NEC and local ordinances and regulations shall govern unless more stringent requirements are specified.
  2. Material and equipment provided shall meet standards of NEMA or UL and bear their label wherever standards have been established and label service is available.
- B. Qualifications: Requirements of Section 01 4301 applies, but not limited to following:
1. Electrical Subcontractor:
    - a. Company specializing in performing work of this section.
      - 1) Minimum five (5) years experience in electrical installations.
      - 2) Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
    - b. Upon request, submit documentation.
  2. Installer:
    - a. Licensed for area of Project.
    - b. Designate one (1) individual as project foremen who shall be on site at all times during installation and experienced with installation procedures required for this project.
    - c. Upon request, submit documentation.

**PART 2 - PRODUCTS****2.1 SYSTEMS**

- A. Performance:
  - 1. Design Criteria:
    - a. Materials and equipment provided under following Sections shall be by same Manufacturer:
      - 1) Section 26 2417: Panelboards.
      - 2) Section 26 2816: Enclosed Switches And Circuit Breakers.

**PART 3 - EXECUTION****3.1 INSTALLERS**

- A. Acceptable Installers:
  - 1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

**3.2 EXAMINATION**

- A. Verification Of Conditions:
  - 1. Confirm dimensions, ratings, and specifications of equipment to be installed and coordinate these with site dimensions and with other Sections.
- B. Evaluation And Assessment:
  - 1. All relocations, reconnections, and removals are not necessarily indicated on Drawings. Include such work without additional cost to Owner.

**3.3 PREPARATION**

- A. Disconnect equipment that is to be removed or relocated. Carefully remove, disassemble, or dismantle as required, and store in approved location on site, existing items to be reused in completed work.
- B. Where affected by demolition or new construction, relocate, extend, or repair raceways, conductors, outlets, and apparatus to allow continued use of electrical system. Use methods and materials as specified for new construction.
- C. Perform drilling, cutting, block-offs, and demolition work required for removal of necessary portions of electrical system. Do not cut joists, beams, girders, trusses, or columns without prior written permission from Architect.
- D. Remove concealed wiring abandoned due to demolition or new construction. Remove circuits, conduits, and conductors that are not to be re-used back to next active fixture, device, or junction box.
- E. Patch, repair, and finish surfaces affected by electrical demolition work, unless work is specifically specified to be performed under other Sections of the specifications.

**3.4 INSTALLATION**

- A. General:
  - 1. Locations of electrical equipment shown on Drawings are approximate only. Field verify actual locations for proper installation.

2. Coordinate electrical equipment locations and conduit runs with those providing equipment to be served before installation or rough in.
    - a. Notify Architect of conflicts before beginning work.
    - b. Coordinate locations of power and lighting outlets in mechanical rooms and other areas with mechanical equipment, piping, ductwork, cabinets, etc, so they will be readily accessible and functional.
  3. Work related to other trades which is required under this Division, such as cutting and patching, trenching, and backfilling, shall be performed according to standards specified in applicable Sections.
- B. Install Penetration Firestop System appropriate for penetration at electrical system penetrations through walls, ceilings, and top plates of walls.

### **3.5 FIELD QUALITY CONTROL**

- A. Field Tests:
1. Test systems and demonstrate equipment as working and operating properly. Notify Architect before test. Rectify defects at no additional cost to Owner.
  2. Measure current for each phase of each motor under actual final load operation, i.e. after air balance is completed for fan units, etc. Record this information along with full-load nameplate current rating and size of thermal overload unit installed for each motor.

### **3.6 CLEANING**

- A. Remove obsolete raceways, conductors, apparatus, and lighting fixtures promptly from site and dispose of legally.

### **3.7 CLOSEOUT ACTIVITIES**

- A. Training:
1. Provide competent instructor for three (3) days to train Owner's maintenance personnel in operation and maintenance of electrical equipment and systems. Factory representatives shall assist this instruction as necessary. Schedule instruction period at time of final inspection.

**END OF SECTION**

**SECTION 26 0519****LINE-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Quality of conductors used on Project except as excluded below.
- B. Related Requirements:
  - 1. Section 23 0933: Conductors and cables for temperature control system.
  - 2. Section 26 0501: Common Electrical Requirements.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Line Voltage: Over 70 Volts.

**PART 2 - PRODUCTS****2.1 SYSTEMS**

- A. Line Voltage Conductors:
  - 1. Copper with AWG sizes as shown:
    - a. Minimum size shall be No. 12 except where specified otherwise.
    - b. Conductor size No. 8 and larger shall be stranded.
  - 2. Insulation:
    - a. Standard Conductor Size No. 10 And Smaller: 600V type THWN or XHHW (75 deg C).
    - b. Standard Conductor Size No. 8 And Larger: 600V Type THW, THWN, or XHHW (75 deg C).
    - c. Higher temperature insulation as required by NEC or local codes.
  - 3. Colors:
    - a. 208Y / 120 V System:
      - 1) Black: Phase A.
      - 2) Red: Phase B.
      - 3) Blue: Phase C.
      - 4) Green: Ground.
      - 5) White: Neutral.
    - b. 480Y / 277 Volt System:
      - 1) Brown: Phase A.
      - 2) Orange: Phase B.
      - 3) Yellow: Phase C.
      - 4) Gray: Neutral.
      - 5) Green: Ground.
    - c. Conductors size No. 10 and smaller shall be colored full length. Tagging or other methods for coding of conductors size No. 10 and smaller not allowed.
    - d. For feeder conductors larger than No. 10 at pull boxes, gutters, and panels, use painted or taped band or color tag color-coded as specified above.
- B. Line Voltage Cables:
  - 1. Metal Clad Cable (MC) may be used as restricted below:
    - a. Copper conductors.
    - b. Sizes #12 through #8.
    - c. Use only in indoor dry locations where:
      - 1) Not subject to damage.
      - 2) Not in contact with earth.
      - 3) Not in concrete.

- C. Standard Connectors:
  - 1. Conductors No. 8 And Smaller: Steel spring wire connectors.
  - 2. Conductors Larger Than No. 8: Pressure type terminal lugs.
  - 3. Connections Outside Building: Watertight steel spring wire connections with waterproof, non-hardening sealant.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. General:
  - 1. Conductors and cables shall be continuous from outlet to outlet.
  - 2. Do not use direct burial cable.
- B. Line Voltage Conductors:
  - 1. Install conductors in raceway where indicated on Drawings. Run conductors of different voltage systems in separate conduits.
  - 2. Route circuits at own discretion, however, circuiting shall be as shown in Panel Schedules. Group circuit homeruns to panels as shown on Drawings.
  - 3. Neutrals:
    - a. On three-phase, 4-wire systems, do not use common neutral for more than three circuits.
    - b. On single-phase, 3-wire systems, do not use common neutral for more than two circuits.
    - c. Run separate neutrals for each circuit where specifically noted on Drawings.
    - d. Where common neutral is run for two or three home run circuits, connect phase conductors to breakers in panel which are attached to separate phase legs so neutral conductors will carry only unbalanced current. Neutral conductors shall be of same size as phase conductors unless specifically noted otherwise.
  - 4. Pulling Conductors:
    - a. Do not pull conductors into conduit until raceway system is complete and cabinets and outlet boxes are free of foreign matter and moisture.
    - b. Do not use heavy mechanical means for pulling conductors.
    - c. Use only listed wire pulling lubricants.
- C. Line Voltage Cables:
  - 1. Route circuits at own discretion, however, circuiting and numbering shall be as shown in Panel Schedules.
  - 2. Support cables using approved staples, cable ties, straps, hangers, or similar fittings, spaced as required.
  - 3. Where installing in framing, do not bore holes in joists or beams outside center 1/3 of member depth or within **24 inches** of bearing points. Do not bore holes in vertical framing members outside center 1/3 of member width. Holes shall be one inch diameter maximum.
  - 4. Conceal cables within ceilings and walls of finished areas. Cables may be exposed in unfinished areas but not run on floors of mechanical equipment spaces or in such a way that they obstruct access to, operation of, or servicing of equipment.
  - 5. Install exposed cables parallel to or at right angles to building structure lines.
  - 6. Keep cables **6 inches** minimum from hot water pipes.
  - 7. Do not support cables from mechanical ducts or duct supports without Architect's written approval.
  - 8. Prohibited procedures:
    - a. Boring holes for installation of cables in vertical truss members.
    - b. Notching of structural members for installation of cables.

**END OF SECTION**

**SECTION 26 0523****CONTROL-VOLTAGE ELECTRICAL CABLES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install control-voltage electrical cables as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 23 0933: 'Electric And Electronic Control System For HVAC' for cables for Temperature Control System cables.
  - 2. Section 26 0501: 'Common Electrical Requirements'.
  - 3. Section 26 0924: 'Lighting Control System'.
  - 4. Section 27 1116: 'Communications Cabinets, Racks, Frames, and Enclosures'.
  - 5. Section 27 4117: 'Video Systems' for cables.
  - 6. Section 27 5117: 'Audio Systems' for cables.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Control Voltage: 70 Volts and under.

**PART 2 - PRODUCTS****2.1 SYSTEM**

- A. Manufacturers:
  - 1. Category Four Approved Cable Manufacturers. See Section 01 6200 for definitions of Categories:
    - a. Alpha Wire Co, Elizabeth, NJ [www.alphawire.com](http://www.alphawire.com).
    - b. Belden Wire & Cable Co, Richmond, IN [www.belden.com](http://www.belden.com).
    - c. Liberty Wire & Cable, Colorado Springs, CO [www.libertycable.com](http://www.libertycable.com).
    - d. West Penn Wire Corp, Washington, PA [www.westpenn-cdt.com](http://www.westpenn-cdt.com).
- B. Components:
  - 1. Building Control System Cables.
    - a. CAT 5E, 24 AWG, solid bare copper, four pair, UTP, white cable jacket.
    - b. Sheath Colors:
      - 1) Lighting Control: Yellow.
    - c. Meet requirements of EIA / TIA 568 Standard.
  - 2. Lighting Control Cables and Conductors:
    - a. Provide cable per Lighting Control Panel Manufacturer's recommendations and requirements.
    - b. Lighting Control Cables ran in same raceway as line voltage cables shall have same insulation voltage rating as line voltage conductors.
    - c. Cable Jacket shall be yellow.



**PART 3 - EXECUTION****3.1 INSTALLATION****A. General:**

1. Cables shall be continuous and without splices from source to outlet.
2. Install cables in raceway. Run cables of different systems in separate conduits.
3. Do not run cables within **10 inches of** line voltage conductors/raceways.
4. Extend cables **18 inches** from wall or ceiling at all outlet locations. Extend cables to twice vertical length of cabinet at each cabinet location.
5. Pulling cables into conduit:
  - a. Do not pull cables until raceway system is complete and cabinets and outlet boxes are free of foreign matter and moisture.
  - b. Do not use heavy mechanical means for pulling cables.
  - c. Use only listed wire pulling lubricants.
6. Prohibited procedures:
  - a. Boring holes for installation of cables in vertical truss members.
  - b. Notching of structural members for installation of cables.

**B. Control Cables:**

1. For cables not installed in raceway, do not run cables within **10 inches of** line voltage conductors / raceways. Also, maintain **10 inches minimum** between following exposed cable groups:
  - a. Microphone cables.
  - b. CAT-6, sound system control, telephone, video, or ATC cables.
  - c. Loudspeaker cables.

**END OF SECTION**

**SECTION 26 0526****GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install grounding for electrical installation as described in Contract Documents except as excluded below.
- B. Related Requirements:
  - 1. Section 03 3111: 'Normal Weight Structural Concrete'.
    - a. Pre-installation conference held jointly with other concrete related sections.
  - 2. Section 26 0501: 'Common Electrical Requirements'.
  - 3. Section 26 4301: 'Surge Protection Devices'.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference:
  - 1. Participate in pre-installation conference as specified in Section 03 3111.
  - 2. In addition to agenda items specified in Section 01 3100 and 31 3111, review following:
    - a. Review Architect's inspection of grounding conductor installation before placement of concrete.

**1.3 QUALITY ASSURANCE**

- A. Regulatory Agency Sustainability Approvals: Requirements of Section 27 1501 applies, but is not limited to following:
  - 1. Cable assemblies shall be UL / CE Listed and CSA Certified. Cables shall be a distinctive green or green/yellow in color, and all jackets shall be UL, VW-1 flame rated.
  - 2. Grounding shall conform to all required Commercial Building Grounding and Bonding Requirements for Telecommunications, Electrical Codes, and Manufacturer's grounding requirements.
- B. Qualifications: Requirements of Section 01 4301 applies, but is not limited to following:
  - 1. Installers Qualifications:
    - a. Grounding and Bonding:
      - 1) Licensed electrical contractor shall perform installation and termination of main bonding conductor to building service entrance ground.
      - 2) Licensed in State that Work is to be performed.

**PART 2 - PRODUCTS****2.1 SYSTEM**

- A. Manufacturers:
  - 1. Type One Acceptable Products:
    - a. 'Cadweld' by Erico International, Solon, OH [www.erico.com](http://www.erico.com).
    - b. 'ThermOweld' by Continental Industries, Tulsa, NE [www.conind.com](http://www.conind.com).
    - c. Equal as approved by Architect before bidding. See Section 01 6200.

- B. Performance:
  - 1. Design Criteria:
    - a. Size materials as shown on Drawings and in accordance with applicable codes.
- C. Materials:
  - 1. Grounding And Bonding Jumper Conductors: Bare copper or with green insulation.
  - 2. Make grounding conductor connections to ground rods and water pipes using approved bolted clamps listed for such use.
  - 3. Service Grounding Connections And Cable Splices: Make by exothermic process.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Interface With Other Work: Coordinate with Section 03 3111 in installing grounding conductor and placing concrete. Do not allow placement of concrete before Architect's inspection of grounding conductor installation.
- B. Bond conduit grounding bushings to enclosures with minimum #10 AWG conductor.
- C. Connect equipment grounds to building system ground.
  - 1. Use same size equipment grounding conductors as Phased conductors up through #10 AWG.
  - 2. Use NEC Table 250-95 for others unless noted otherwise in Drawings.
- D. Run separate insulated grounding cable from each equipment cabinet to electrical panel. Do not use intermediate connections or splices. Affix directly to cabinet.
- E. On motors, connect ground conductors to conduit with approved grounding bushing and to metal frame with bolted solderless lug.

### **3.2 FIELD QUALITY CONTROL**

- A. Field Inspections:
  - 1. Notify Architect for inspection two (2) days minimum before placing concrete over grounding conductor.

**END OF SECTION**

**SECTION 26 0533****RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Quality of material and installation procedures for raceway, boxes, and fittings used on Project but furnished under other Divisions.
  - 2. Furnish and install raceway, conduit, and boxes used on Project not specified to be installed under other Divisions.
  - 3. Furnish and install air-vapor barrier boxes as described in Contract Documents.
  - 4. Furnish and install main electrical service raceway as described in Contract Documents and comply with electrical utility company requirements.
  - 5. Furnish and install main telephone service raceway as described in Contract Documents and comply with telephone company requirements.
- B. Related Requirements:
  - 1. Section 23 0933: 'Electric and Electronic Control System for HVAC' for concealed raceway and extensions for temperature control system.
  - 2. Section 26 0501: 'General Electrical Requirements'.
  - 3. Section 26 0503: 'Electrical Utility Services' for electrical primary underground service requirements.

**PART 2 - PRODUCTS****2.1 SYSTEM**

- A. Manufacturers:
  - 1. Manufacturer Contact List:
    - a. Cooper B-Line, Highland, IL [www.b-line.com](http://www.b-line.com).
    - b. Hubbell Incorporated, Milford, CT [www.hubbell-wiring.com](http://www.hubbell-wiring.com) or Hubbell Canada Inc, Pickering, ON (905) 839-4332.
    - c. Square D, Palatine, IL [www.squared.com](http://www.squared.com).
    - d. Thomas & Betts, Memphis, TN [www.tnb.com](http://www.tnb.com) or Thomas & Betts Ltd, Iberville, PQ (450) 347-5318.
    - e. Walker Systems Inc, Williamstown, WV (800) 240-2601 or Walker Systems Inc / Wiremold Canada Inc, Fergus, ON (519) 843-4332.
    - f. Wiremold Co, West Hartford, CT [www.wiremold.com](http://www.wiremold.com).
- B. Materials:
  - 1. Raceway And Conduit:
    - a. Sizes:
      - 1) **3/4 inch** for exterior use, unless indicated otherwise.
      - 2) **1/2 inch** for interior use, unless indicated otherwise.
    - b. Types: Usage of each type is restricted as specified below by product.
      - 1) Galvanized rigid steel or galvanized intermediate metal conduit (IMC) is allowed for use in all areas. Where in contact with earth or concrete, wrap buried galvanized rigid steel and galvanized IMC conduit and fittings completely with vinyl tape.
      - 2) Galvanized Electrical Metallic Tubing (EMT) and Flexible Steel Conduit:
        - a) Allowed for use only in indoor dry locations where it is:
          - (1) Not subject to damage.
          - (2) Not in contact with earth.

- (3) Not in concrete.
    - b) For metal conduit systems, flexible steel conduit is required for final connections to indoor mechanical equipment.
  - 3) Schedule 40 Polyvinyl Chloride (PVC) Conduit:
    - a) Allowed for use only underground or below concrete with galvanized rigid steel or IMC elbows and risers.
  - 4) Listed, Liquid-Tight Flexible Metal Conduit:
    - a) Use in outdoor final connections to mechanical equipment, length not to exceed **36 inches**.
  - 5) Pre-wired **3/8 Inch** Flexible Fixture Whips: Allowed only for connection to recessed lighting fixtures, lengths not to exceed **72 inches**.
  - c. Prohibited Raceway Materials:
    - 1) Aluminum conduit.
    - 2) Armored cable type AC (BX) cable.
- 2. Raceway And Conduit Fittings:
  - a. Rigid Steel Conduit And IMC: Threaded and designed for conduit use.
  - b. EMT:
    - 1) Compression type.
    - 2) Steel set screw housing type.
  - c. PVC Conduit:
    - 1) PVC type. Use PVC adapters at all boxes.
    - 2) PVC components, (conduit, fittings, cement) shall be from same Manufacturer.
  - d. Flexible Steel Conduit: Screw-in type.
  - e. Liquid-tight Flexible Metal Conduit: Sealtite type.
  - f. Expansion fittings shall be equal to OZ Type AX sized to raceway and including bonding jumper.
  - g. Prohibited Fitting Materials:
    - 1) Crimp-on, tap-on, indenter type fittings.
    - 2) Cast set-screw fittings for EMT.
    - 3) Spray (aerosol) PVC cement.
- 3. Outlet Boxes:
  - a. Galvanized steel of proper size and shape are acceptable for all systems. Where metal boxes are used, provide following:
    - 1) Provide metal supports and other accessories for installation of each box.
    - 2) Equip ceiling and bracket fixture boxes with fixture studs where required.
    - 3) Equip outlets in plastered, paneled, and furred finishes with plaster rings and extensions to bring box flush with finish surface.
  - b. Non-metallic boxes may be used only for control voltage wiring systems.
  - c. Telephone / data outlet boxes shall be single device outlet boxes.
  - d. HVAC Instrumentation And Control:
    - 1) Junction boxes in mechanical equipment areas shall be **4 inches** square.
    - 2) Boxes for remote temperature sensor devices shall be recessed single device.
    - 3) Boxes for thermostats shall be **4 inches** square with raised single device cover.
- 4. Air-Vapor Barrier Boxes:
  - a. Pre-molded polyethylene box installed in all exterior framing walls (thermal envelope) around recessed outlet boxes.
  - b. Class Two Quality Standard:
    - 1) Approved Manufacturer. See Section 01 6200 for definitions of Classes.
      - a) Lessco Low Energy Systems Supply Company, Inc., Campbellsport, WI  
[www.lessco-airtight.com](http://www.lessco-airtight.com).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification Of Conditions:
  - 1. Confirm dimensions, ratings, and specifications of materials to be installed and coordinate these with site dimensions and with other Sections.

### 3.2 INSTALLATION

- A. Interface With Other Work:
1. Coordinate with Divisions 22 and 23 for installation of raceway for control of plumbing and HVAC equipment.
  2. Before rough-in, verify locations of boxes with work of other trades to insure that they are properly located for purpose intended.
    - a. Coordinate location of outlets adjacent to or in millwork with Division 06 before rough-in. Refer conflicts to Architect and locate outlets under his direction.
  3. Install pull wires in raceways installed under this Section where conductors or cables are to be installed under other Divisions.
- B. General:
1. Sound and video system electrical components furnished and installed under this Section include following items:
    - a. Metal equipment cabinet and control cabinets.
    - b. Factory-fabricated speaker enclosures.
    - c. Fittings.
- C. Conduit And Raceway:
1. Conceal raceways within ceilings, walls, and floors, except at Contractor's option, conduit may be exposed on walls or ceilings of mechanical equipment areas and above acoustical panel suspension ceiling systems. Install exposed raceway runs parallel to or at right angles to building structure lines.
  2. Keep raceway runs **6 inches** minimum from hot water pipes.
  3. Make no more than four quarter bends, 360 degrees total, in any conduit run between outlet and outlet, fitting and fitting, or outlet and fitting.
    - a. Make bends and offsets so conduit is not injured and internal diameter of conduit is not effectively reduced.
    - b. Radius of curve shall be at least minimum indicated by NEC.
  4. Cut conduit smooth and square with run and ream to remove rough edges. Cap raceway ends during construction. Clean or replace raceway in which water or foreign matter have accumulated.
  5. Bend PVC conduit by hot box bender and, for PVC **2 inches** in diameter and larger, expanding plugs. Apply PVC adhesive only by brush.
  6. Installation In Framing:
    - a. Do not bore holes in joists or beams outside center 1/3 of member depth or within **24 inches** of bearing points. Do not bore holes in vertical framing members outside center 1/3 of member width.
    - b. Holes shall be **one inch** diameter maximum.
  7. Underground Raceway And Conduit:
    - a. Bury underground raceway installed outside building **24 inches** deep minimum.
    - b. Bury underground conduit in planting areas **24 inches (600 mm)**. It is permissible to install conduit **6 inch** below concrete sidewalks, however, conduit must be buried **24 inches (600 mm)** deep at point of exit from planting areas.
      - 1)
  8. Prohibited Procedures:
    - a. Use of wooden plugs inserted in concrete or masonry units for mounting raceway, supports, boxes, cabinets, or other equipment.
    - b. Installation of raceway that has been crushed or deformed.
    - c. Use of torches for bending PVC.
    - d. Spray applied PVC cement.
    - e. Boring holes in truss members.
    - f. Notching of structural members.
    - g. Supporting raceway from ceiling system support wires.
    - h. Nail drive straps or tie wire for supporting raceway.
- D. Telephone / Data Systems:
1. Install raceway from terminal board to each telephone and data outlet as indicated on Drawings.

- E. Boxes:
1. Boxes shall be accessible and installed with approved cover.
  2. Do not locate device boxes that are on opposite sides of framed walls in the same stud space. In other wall construction, do not install boxes back to back.
  3. Locate boxes so pipes, ducts, or other items do not obstruct outlets.
  4. Install outlets flush with finished surface and level and plumb.
  5. Support switch boxes larger than two-gang with side brackets and steel bar hangers in framed walls.
  6. At time of substantial completion, install blank plates on uncovered outlet boxes that are for future use.
  7. Install air-vapor barrier boxes.
    - a. Follow Manufacturer's installation instructions.
  8. Location:
    - a. Install boxes at door locations on latch side of door, unless explicitly shown otherwise on Contract Drawings. Verify door swings shown on electrical drawings with architectural drawings, and report discrepancies to Architect before rough-in. Distance of box from jamb shall be **6 inches** from door jamb.
    - b. Properly center boxes located in walls with respect to doors, panels, furring, trim and consistent with architectural details. Where two or more outlets occur, space them uniformly and in straight lines with each other, if possible.
    - c. Center ceramic tile boxes in tile.
- F. Support factory-fabricated speaker enclosures from structure or ceiling suspension system.

**END OF SECTION**

**SECTION 26 0613****ELECTRICAL EQUIPMENT MOUNTING HEIGHT SCHEDULE****PART 1 - GENERAL: Not Used****PART 2 - PRODUCTS: Not Used****PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Unless otherwise indicated, mount center of outlets or boxes at following heights above finish floor. Refer special conditions to Architect before rough-in and locate outlet under his direction.
- B. Mounting Heights:
1. HVAC:
    - a. Temperature Control Junction Boxes: As indicated on Drawings.
    - b. Thermostats not mounted in occupied space: As indicated on Drawings.
    - c. Remote Temperature Sensors and thermostats mounted in occupied space:
      - 1) Wall-Mounted 50 inches to top.
    - d. Indoor Motor Disconnects: 60 inches.
    - e. Outdoor Motor Disconnects: As indicated on Drawings.
    - f. Motor Controls: 60 inches.
  2. Electrical:
    - a. Receptacles: 18 inches.
    - b. Wall Switches: 42 inches.
    - c. Wall-Mounted Exit Lights: 90 inches.
    - d. Emergency Lighting Units: 60 inches.
  3. Communications
    - a. Sound Distribution System Components: As indicated on Drawings.
    - b. Satellite Distribution System Components: As indicated on Drawings.
    - c. TV Distribution System Components: As indicated on Drawings.
    - d. Computer and TV: 18 inches.
    - e. Telephones (wall type): 60 inches.
    - f. Telephones (desk type): 18 inches.
    - g. Telephone / Data (desk type): 18 inches.
    - h. Data (desk type): 18 inches.

**END OF SECTION**



**BLANK PAGE**

**SECTION 26 0924****LIGHTING CONTROL SYSTEM****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install complete lighting control system as described in Contract Documents consisting of the following:
    - a. Photocells.
- B. Related Requirements:
  - 1. Section 26 0501: 'Common Electrical Requirements'.
  - 2. Section 26 0523: 'Control-Voltage Electrical Cables'.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Class A: Equipment has been tested and found to comply with limits for Class A digital device, pursuant to part 15 of FCC Rules. These limits provide reasonable protection against harmful interference when equipment is operated in commercial environment.
- B. Reference Standards:
  - 1. Federal Communications Commission (FCC):
    - a. Emission requirements for Class A applications.
  - 2. Underwriters Laboratories:
    - a. UL 916, 'Energy Management Equipment' (2007).

**1.3 SUBMITTALS**

- A. Informational Submittals:
  - 1. Certifications:
    - a. Technician Certification that equipment has been installed, adjusted and tested in accordance with Manufacturer's recommendations.
- B. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Operations and Maintenance Data:
      - 1) Equipment operation and maintenance manual(s).

**1.4 QUALITY ASSURANCE**

- A. Regulatory Agency Sustainability Approvals:
  - 1. All control equipment shall be in compliance with FCC emissions' standards in Part 15 Subpart J for Class A application.
  - 2. Programmable panelboards shall be UL listed under UL 916 Energy Management Equipment.
- B. Qualifications:
  - 1. Manufacturer Qualifications:
    - a. Manufacturer of assembly shall be manufacturer of major components with assembly.
    - b. Manufacturer of this equipment shall have minimum of five (5) years manufacturing experience.

2. Technician Qualifications:
  - a. Authorized by Manufacturer and trained.
  - b. Have thorough knowledge of software, hardware and system programming.
- C. Certifications:
  1. Provide Technician Certification that equipment has been installed, adjusted and tested in accordance with Manufacturer's recommendations.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
  1. Equipment shall be delivered, handled and stored in accordance with manufacturer's instructions.

## PART 2 - PRODUCTS

### 2.1 ASSEMBLIES

- A. Manufacturers:
  1. Type One Acceptable Manufacturer:
    - a. Acuity Brands Inc., Atlanta, GA [www.acuitybrands.com](http://www.acuitybrands.com).
    - b. Hubbell Building Automation, Austin, TX [www.hubbell-automation.com](http://www.hubbell-automation.com).
    - c. Leviton Manufacturing Co, Little Neck, NY [www.leviton.com](http://www.leviton.com) or Leviton Manufacturing of Canada Ltd, Pointe-Claire, QB (800) 461-2002 or (514) 954-1840.
    - d. Lutron Electronics Co Inc, Coopersburg, PA [www.lutron.com](http://www.lutron.com).
    - e. Watt Stopper Inc., Santa Clara, CA [www.wattstopper.com](http://www.wattstopper.com).
    - f. Equal as approved by Architect before bidding. See Section 01 6200.
- B. Design Criteria:
  1. Lighting Control System shall meet or exceed following capabilities:
    - a. Capable of switching for specific lighting zone for following:
      - 1) Light level sensors.
- C. Components:
  1. Photocells:
    - a. Weatherproof Class 2 photocell shall be provided for exterior light levels.
    - b. Adjustable interior photo cell shall be provided for day-lighting control.
      - 1) Photocell shall provide output suitable for controlling continuously dimming loads.
      - 2) Refer to Contract Drawings for fixtures to be controlled.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General:
  1. Install switches flush with wall, straight and level.
  2. Permanently label switches as shown on drawing schedule in Contract Drawings.
- B. Interface With Other Work:
  1. Coordinate with appropriate Sections of Divisions 26.

### 3.2 FIELD QUALITY CONTROL

- A. Field Testing:

1. Manufacturer shall provide Manufacturer's authorized Technician to adequately test supplied equipment and software to ensure system performs as intended including the following:
    - a. Test start-up system and confirm proper installation, operation, and adjustment of all system components.
  2. Submit Certification in writing that equipment has been installed, adjusted and tested in accordance with Manufacturer's recommendations.
- B. Non-Conforming Work: Non-conforming work as covered in the General Conditions applies, but is not limited to following:
1. Correct any work found defective or not complying with Contract Document requirements at no additional cost to the Owner.

### **3.3 CLOSE-OUT ACTIVITIES**

- A. Instruction of Owner:
1. Provide Manufacturer's authorized Technician training session for Owner's Representative(s) for demonstrating operation and programming of completed system.
    - a. Training program shall include instructions on control system, programming, and other major components. Provide Manufacturer Manual(s) to be submitted to Owner to assist training.
    - b. Training program shall include:
      - 1) System review of all system components and their function.
      - 2) System review of all management software and its function.
      - 3) Operator training to develop experience with control applications.

**END OF SECTION**

**BLANK PAGE**

**SECTION 26 2726****WIRING DEVICES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install wiring devices complete with plates as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 26 0501: 'Common Electrical Requirements'.

**PART 2 - PRODUCTS****2.1 COMPONENTS**

- A. Manufacturers:
  - 1. Manufacturer Contact List:
    - a. Cooper Wiring Devices, Peachtree City, GA [www.cooperwiringdevices.com](http://www.cooperwiringdevices.com).
    - b. General Electric Industrial Systems, Charlotte, NC [www.geindustrial.com](http://www.geindustrial.com).
    - c. Hubbell Building Automation, Austin, TX [www.hubbell-automation.com](http://www.hubbell-automation.com).
    - d. Hubbell Inc, Milford, CT [www.hubbell-wiring.com](http://www.hubbell-wiring.com) (800) 263-4622.
    - e. Hunt Control Systems Inc, Fort Collins, CO [www.huntdimming.com](http://www.huntdimming.com).
    - f. Intermatic Inc, Spring Grove, IL [www.intermatic.com](http://www.intermatic.com).
    - g. IR-TEC America, Inc., Brea, CA [www.irtec.com/en-ira/](http://www.irtec.com/en-ira/).
    - h. Leviton Manufacturing Co, Little Neck, NY [www.leviton.com](http://www.leviton.com) (800) 461-2002.
    - i. Legrand, West Hartford, CT [www.legrand.us.com](http://www.legrand.us.com).
    - j. Lutron Electronics Co Inc, Coopersburg, PA [www.lutron.com](http://www.lutron.com).
    - k. Ortronics, New London, CT [www.ortronics.com](http://www.ortronics.com).
    - l. Paragon Electric Co Inc, Carol Stream, IL [www.icca.invensys.com/paragon](http://www.icca.invensys.com/paragon) (800) 951-5526.
    - m. Pass & Seymour, Syracuse, NY [www.passandseymour.com](http://www.passandseymour.com).
    - n. Philips Lighting Co, Somerset, NJ [www.lighting.philips.com/nam](http://www.lighting.philips.com/nam).
    - o. Red Dot div of Thomas & Betts, Memphis, TN [www.tnbcom](http://www.tnbcom).
    - p. Schneider Electric North America, Palatine, IL [www.schneider-electric.com](http://www.schneider-electric.com) (847) 397-2600.
    - q. Sensorswitch, Wallingford, CT [www.sensorswitch.com](http://www.sensorswitch.com).
    - r. Siemon Company, Watertown, CT [www.siemon.com](http://www.siemon.com).
    - s. Square D Co, Palatine, IL [www.squared.com](http://www.squared.com).
    - t. Suttle, Hector, MN [www.suttleonline.com](http://www.suttleonline.com).
    - u. Tork Inc, Mount Vernon, NY [www.tork.com](http://www.tork.com).
    - v. Watt Stopper Inc, Santa Clara, CA [www.wattstopper.com](http://www.wattstopper.com).
  - 2. Product Options:
    - a. Faces shall be nylon where available.
    - b. Devices of single type shall be from same Manufacturer.
    - c. Devices are listed as white. Use white devices on light colored walls, brown on dark colored walls, and black on black walls.
- B. Switches:
  - 1. Match Existing.
  - 2. Standard Style:
    - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - 1) 20 AMP, single pole:
        - a) Cooper: 2221V.
        - b) Hubbell: HBL1221-I.

- c) Pass & Seymour: 20AC1-I.
      - d) Leviton: 1221-2I.
    - 2) Two Pole:
      - a) Cooper: 2222V.
      - b) Hubbell: HBL1222-I.
      - c) Pass & Seymour: 20AC2-I.
      - d) Leviton: 1222-2I.
    - 3) Three Way:
      - a) Cooper: 2223V.
      - b) Hubbell: HBL1223-I.
      - c) Pass & Seymour: 20AC3-I.
      - d) Leviton: 1223-2I.
  - 3. Exhaust Fan Timer Switches:
    - a. Rest Rooms and Mother's Room:
      - 1) 0-15 minute, no hold position.
      - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
        - a) Intermatic: FD15MWC.
        - b) Paragon: SWD15M-W.
        - c) Tork: A515MW.
- C. Receptacles:
- 1. Standard Style:
    - a. 15 AMP, specification grade, back and side wired, self grounding, tamper resistant.
    - b. Verified by UL to meet Fed Spec WC-596F.
    - c. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - 1) Cooper: TR5262.
      - 2) Hubbell: BR20.
      - 3) Leviton: TBR20.
      - 4) Pass & Seymour: TR20.
  - 2. Ground Fault Circuit Interrupter (GFCI):
    - a. 15 AMP, specification grade.
    - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - 1) Cooper: GF15W.
      - 2) Hubbell: GF5252WA.
      - 3) Leviton: 8599-W.
      - 4) Pass & Seymour: 1594-W.
- D. Telephone Jacks:
- 1. Desk Type:
    - a. 4 conductor, screw terminals, voice grade.
    - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - 1) Cooper: 3532-4W.
      - 2) Leviton: 40249-W.
      - 3) Pass & Seymour: TPTE1-W.
      - 4) Suttle: 625B4-4-85.
  - 2. Wall Type:
    - a. 4 conductor, screw terminals, voice grade.
    - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - 1) Cooper: 3521-4W.
      - 2) Leviton: 40257-W.
      - 3) Pass & Seymour: WMTE14-W.
      - 4) Suttle: 630AC4-85.
  - 3. Module Type:
    - a. For use in data faceplates.
    - b. 8 conductor, punch-down, voice grade.
    - c. Type Two Acceptable Products:
      - 1) Siemon: MX3-F-U3-02.
      - 2) Equal as approved by Architect before use. See Section 01 6200.
- E. Data Jacks:

1. For use in data faceplates.
2. 8 conductor, punch-down T568B wiring configuration, CAT 6.
3. Type Two Acceptable Products:
  - a. Flat Jack: Siemon MX6-F02.
  - b. Angled Jack: Siemon MX6-02.
  - c. Equal as approved by Architect before use. See Section 01 6200.

F. Plates:

1. Standard Cover Plates:
  - a. Office / Occupied Areas:
    - 1) Nylon or high impact resistant thermoplastic.
    - 2) Color shall match wiring device.
  - b. All Other: Steel.
  - c. Ganged switches shall have gang plates.
  - d. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
    - 1) Cooper.
    - 2) Hubbell.
    - 3) Leviton.
    - 4) Pass & Seymour.
2. Data Faceplates:
  - a. Type Two Acceptable Products:
    - 1) Single Module: Siemon MX-FP-S-01-02.
    - 2) Two Modules: Siemon MX-FP-S-02-02.
    - 3) Equal as approved by Architect before use. See Section 01 6200.
3. Weatherproof In-Use Receptacle Covers:
  - a. NEMA 3R rated.
  - b. Cast aluminum.
  - c. Compatible with GFCI receptacles.
  - d. Complete with weather resistant gaskets and stainless steel screws.
  - e. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - 1) Hubbell: WP26MH, horizontal; WP26M, vertical.
    - 2) Intermatic: WP1010HMC, horizontal; WP1010MC, vertical.
    - 3) Red Dot: CKMG, horizontal; CKMGV, vertical.

G. Occupancy Sensors:

1. Ceiling, ultrasonic type.
  - a. Complete with sensor and combined relay / control transformer.
  - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - 1) Cooper Controls:
      - a) Sensor: OAC-U-0501-R.
      - b) Relay / Transformer: SP20-MV.
    - 2) IR-TEC America:
      - a) Sensor: OS-361DT.
      - b) Relay / Transformer: PPU-300.
    - 3) Leviton:
      - a) Sensor: OSC05-RUW.
      - b) Relay / Transformer: OPP20-D2.
    - 4) Sensorswitch:
      - a) Sensor: CMPDT9.
      - b) Relay / Transformer: MP-20-SP0DM.
    - 5) Watt Stopper:
      - a) Sensor: W-500A.
      - b) Relay / Transformer: BZ-150.
  - c. Provide manual ON and OFF momentary override switches. Refer to Contract Drawings for number of switches.

H. Data Patch Panel:

1. Panel:
  - a. Meet requirements of TIA / EIA 568 Standard.
  - b. CAT 6, 48 ports groups in eight 6-port modules, T568B wiring configuration, 19 inch width.



- c. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
  - 1) Leviton: 69586-U48.
  - 2) Ortronics: OR-PHD66U48.
  - 3) Suttle: STAR19110C6-48.
- 2. Mounting Bracket:
  - a. Hinged, wall mounted, 19 inch wide by 5 inch deep.
  - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - 1) Leviton: 49251-W62.
    - 2) Ortronics: OR-604004068.
    - 3) Suttle: 103B1.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Install devices flush with walls, straight, and solid to box.

**END OF SECTION**

**SECTION 26 2816****ENCLOSED SWITCHES AND CIRCUIT BREAKERS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install disconnects as described in Contract Documents, except those provided integral with equipment.
- B. Related Requirements:
  - 1. Section 26 0501: Common Electrical Requirements.

**PART 2 - PRODUCTS****2.1 ASSEMBLIES**

- A. Manufacturers:
  - 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
    - a. Disconnects: Same as Manufacturer of Project's main panelboard.
    - b. Fuses.
      - 1) Cooper Bussmann, Ellisville, IL [www.cooperbussmann.com](http://www.cooperbussmann.com).
      - 2) Edison Fuse, Ellisville, IL (314) 391-3443.
      - 3) Ferraz Shawmut, Newburyport, MA [www.ferrazshawmut.com](http://www.ferrazshawmut.com).
      - 4) Littelfuse Inc, Des Plaines, IL [www.littelfuse.com](http://www.littelfuse.com).
- B. Disconnects:
  - 1. Heavy-duty quick-make, quick-break type, non-fused unless indicated otherwise.
  - 2. Provide interlock to prevent opening of door when switch is in ON position.
  - 3. Provide means to lock switch in OFF position with padlock.
  - 4. Disconnects for motor circuits shall be horsepower rated.
  - 5. Disconnects For Furnace Units And Unit Heaters: Provide manual starter with thermal overload relay. Provide overload relay to match motor full load amps.
  - 6. Enclosures:
    - a. Interior: NEMA / CEMA Type 1.
    - b. Exterior: NEMA / CEMA Type 3R.
  - 7. Fuses:
    - a. Fuse fused disconnects with dual-element time delay fuses and equip with rejection type fuse holders.
    - b. Fuses on Project shall be from single manufacturer.

**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Label disconnects to indicate equipment served, such as Condensing Unit CU-1. Use **1/16 inch** thick laminated plastic composition material with contrasting color core. Engraved letters shall be **1/4 inch** high. Attach labels with screws.
- B. Install furnace disconnects on furnace at location where it is accessible from front of unit and it does not interfere with unit's operation.

**END OF SECTION**

**BLANK PAGE**

**SECTION 26 5100****INTERIOR LIGHTING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install lighting system as described in Contract Documents, complete with lamps.
- B. Related Requirements:
  - 1. Section 26 0501: 'Common Electrical Requirements'.
  - 2. Section 26 5121: 'Interior Lighting: LED Dimming Drivers'.
- C. Reference Standards:
  - 1. American National Standards Institute (ANSI):
    - a. ANSI C78.377-2015, 'American National Standard for Electric Lamps: Specification for the Chromaticity of Solid State Lighting Products'.
  - 2. Federal Communications Commission (FCC):
    - a. Code of Federal Regulations (CFR):
      - 1) FCC 47 CFR Part 18, 'Industrial, Scientific, and Medical Equipment'.
  - 3. Institute of Electrical and. Electronics Engineers (IEEE):
    - a. IEEE C62.41.1-2002, 'Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits'.

**PART 2 - PRODUCTS****2.1 ASSEMBLIES**

- A. Manufacturers:
  - 1. Manufacturer Contact List:
    - a. Advance Transformer Co, Rosemont, IL [www.advancetransformer.com](http://www.advancetransformer.com).
    - b. Cooper Wiring Devices by Eaton, Peachtree City, GA [www.cooperindustries.com](http://www.cooperindustries.com).
    - c. General Electric Lighting, Hendersonville, NC [www.gelighting.com/na](http://www.gelighting.com/na).
    - d. Howard Lighting Products, Laurel, MS [www.howard-ind.com](http://www.howard-ind.com).
    - e. Novitas Inc, Peachtree City, GA [www.novitas.com](http://www.novitas.com).
    - f. Osram Sylvania, Danvers, MA [www.sylvania.com](http://www.sylvania.com).
    - g. Philips Lighting Co, Somerset, NJ [www.lighting.philips.com/nam](http://www.lighting.philips.com/nam).
    - h. Universal Lighting Technologies, Nashville, TN [www.universalballast.com](http://www.universalballast.com).
    - i. Venture Lighting International, Solon, OH [www.venturelighting.com](http://www.venturelighting.com).
    - j. Watt Stopper Inc, Santa Clara, CA [www.wattstopper.com](http://www.wattstopper.com).
    - k. Westinghouse Lighting Corp, Philadelphia, PA [www.westinghouselightbulbs.com](http://www.westinghouselightbulbs.com).
  - 2. Product Options: When several lighting fixtures are specified by name for one use on Drawings, select any one of those specified. Do not mix fixtures from different manufacturers specified for one use.
- B. Materials
  - 1. Lighting Fixtures:
    - a. Type One Acceptable Products:
      - 1) See Fixture Schedule on Drawings for acceptable manufacturers and models.
      - 2) Equals as approved by Architect before bidding. See Section 01 6200.
    - b. See 'Light Fixture Schedule' provided by Owner's Representative.
  - 2. Fluorescent Ballasts:
    - a. Energy saving electronic for T8 lamps:

- 1) Program rapid start type.
  - 2) Parallel circuit type.
  - 3) Minimum power factor of 95 percent.
  - 4) Maximum total harmonic distortion of 10 percent.
  - 5) Operation of lamps in compliance with Lamp Manufacturer's recommendations.
  - 6) Minimum starting temperature 0 deg F for T8 lamps.
  - 7) Class A sound rating.
  - 8) Transient protection in accordance with IEEE / ANSI C62.41.1, Category A.
  - 9) Comply with FCC 47 CFR Part 18.
  - 10) Ballast factor of 0.78.
  - 11) Maximum crest factor of 1.7.
  - 12) Five year full replacement warranty including labor allowance for replacement.
  - 13) Input voltage to match system voltage.
  - 14) Category Four Approved Products and Manufacturers. See Section 01 6200 for definitions of Categories:
    - a) IOP2PSP32LWSC by Advance.
    - b) GE32-MVPS-L by General Electric.
    - c) QHE-UNV-PSX-SC by Osram / Sylvania.
3. Lamps:
- a. T8 Fluorescent Lamps:
    - 1) Minimum initial output of 3100 Lumens.
    - 2) Rated life of 40,000 hrs at 3 hrs per start for lamps operated on instant start ballasts.
    - 3) Minimum CRI 85.
    - 4) Meet Federal TCLP criteria.
    - 5) Category Four approved Manufacturers. See Section 01 6200 for definitions of Categories:
      - a) General Electric.
      - b) Howard.
      - c) North American Philips.
      - d) Osram / Sylvania.
    - 6) Correlated Color Temperature: 3000k.
  - b. Other Lamps:
    - 1) Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories:
      - a) General Electric.
      - b) North American Philips.
      - c) Osram / Sylvania.
      - d) Westinghouse.
- C. Factory Assembly:
1. Fixtures shall be fully assembled complete with necessary wiring, sockets, lamps, reflectors, ballasts, auxiliaries, plaster frames, recessing boxes, hangers, supports, lenses, diffusers, and other accessories essential for complete working installation.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Interface With Other Work:
1. Coordinate with Sections under 09 5000 heading to obtain symmetrical arrangement of fixtures in acoustic tile ceiling as shown on Reflected Ceiling Plan in Contract.
  2. In mechanical equipment rooms, coordinate locations of light fixtures with equipment locations to provide proper room illumination without obstruction. Suspend fixtures that must be mounted below pipes, ducts, etc, with chains or other Architect approved method.
- B. Securely mount fixtures. Support fixtures weighing 50 lbs or more from building framing or structural members.

- C. Where recessed fixtures are to be installed, provide openings, plaster rings, etc, of exact dimensions for such fixtures to be properly installed. Coordinate fixture installation with ceiling type and thickness. Terminate circuits for recessed fixtures in an extension outlet box near fixture and connect with specified flexible conduit.
- D. Do not locate incandescent fixtures in closet or storage areas within **18 inches** and fluorescent fixtures within **6 inches** of shelves.

### **3.2 ADJUSTMENT**

- A. Repair scratches or nicks on exposed surfaces of fixtures to match original undamaged conditions.

**END OF SECTION**

**BLANK PAGE**

**SECTION 26 5200****EMERGENCY LIGHTING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install emergency battery units as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 26 0501: 'Common Electrical Requirements'.

**PART 2 - PRODUCTS****2.1 SYSTEMS**

- A. Manufacturers:
  - 1. Manufacturer Contact List:
    - a. Beghelli, Miramar, FL [www.beghelliusa.com](http://www.beghelliusa.com).
    - b. Bodine Emergency Lighting, Collierville, TN [www.bodine.com](http://www.bodine.com)
    - c. Dual-Lite, Cheshire, CT [www.dual-lite.com](http://www.dual-lite.com).
    - d. Iota Engineering Co, Tucson, AZ [www.iotaengineering.com](http://www.iotaengineering.com)
    - e. Lightolier, Fall River, MA [www.lightolier.com](http://www.lightolier.com).
    - f. Lithonia Lighting, Conyers, GA [www.lithonia.com](http://www.lithonia.com).
    - g. McPhilben / Day-Brite Lighting, Tupelo, MS [www.mcphilben.com](http://www.mcphilben.com).
    - h. Sure-Lites / Cooper Lighting, Elk Grove, IL [www.cooperlighting.com](http://www.cooperlighting.com).
- B. Materials:
  - 1. Fluorescent Battery Packs:
    - a. Design Criteria:
      - 1) Batteries shall be long life nickel cadmium type.
      - 2) Complete with charging indicator light and test switch.
      - 3) Components shall be fully concealed and easily accessible for maintenance or replacement.
      - 4) Factory installed in lighting fixture, or field installed to same standards.
    - b. Linear Fluorescent Lighting Fixtures:
      - 1) Battery pack shall operate one (1) lamp at approximately 600 lumens initially and 60 percent minimum of initial lumens after ninety (90) minutes.
      - 2) Charger shall be capable of full recharge in twenty four (24) hours.
    - c. Compact Fluorescent Fixtures:
      - 1) Battery pack shall operate lamp(s) for ninety (90) minutes minimum.
    - d. Class Two Quality Products: See Section 01 4301 for Manufacturer Qualifications and Section 01 6200:
      - 1) Any Manufacturer that conforms to Contract Documents requirements.
  - 2. Emergency Lighting Units And Fixtures:
    - a. Design Criteria:
      - 1) Shall operate indicated number of lamps for ninety (90) minutes of emergency operation.
      - 2) Sealed, maintenance free, lead calcium type battery.
      - 3) Painted steel housing and complete with power indicator light and test switch.
      - 4) Lamps to be designed for wet locations and with full vertical and horizontal adjustment of lamps.
    - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:



- 1) See Contract Drawings for approved fixtures. Coordinate emergency lighting unit and fixture so that systems function as required.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Battery Packs:
  1. General:
    - a. Wire so unit can be tested with lights on.
    - b. Wire so lamps in normal mode are switched off with other lighting in area. Connect unit to unswitched conductor of normal lighting circuit.
  2. Compact Fluorescent Fixtures:
    - a. If indicator light and test switch cannot be installed within fixture, install on plate adjacent to fixture.
  3. Linear Fluorescent Lighting Fixtures:
    - a. Install in ballast channel of fixture with charging indicator light and test switch mounted on fixture end, or visible and accessible through lens.
- B. Lighting Heads:
  1. Aim lamps to maximize lighting of first **50 feet** of egress path.
  2. Wire so lamps are normally off and operate upon loss of normal building power.
- C. Emergency Lighting Units:
  1. Aim lamps to maximize lighting of first **50 feet** of egress path.
  2. Wire so lamps are normally off and operate upon loss of normal building power.
  3. Connect units to un-switched conductor of normal lighting circuit.

**END OF SECTION**

**SECTION 26 5600****EXTERIOR LIGHTING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install exterior lighting system as described in Contract Documents.
- B. Products Furnished But Not Installed Under This Section:
  - 1. Anchor bolts.
- C. Related Requirements:
  - 1. Section 26 0501: Common Electrical Requirements.

**PART 2 - PRODUCTS****2.1 SYSTEM**

- A. Manufacturers:
  - 1. Manufacturer Contact List:
    - a. Cutler-Hammer Inc, Milwaukee, WI [www.cutler-hammer.eaton.com](http://www.cutler-hammer.eaton.com).
    - b. General Electric Industrial Systems, Charlotte, NC or [www.geindustrial.com](http://www.geindustrial.com).
    - c. Intermatic Inc, Spring Grove, IL [www.intermatic.com](http://www.intermatic.com).
    - d. Paragon Electric Co Inc, Carol Stream, IL [www.icca.invensys.com/paragon](http://www.icca.invensys.com/paragon) (800) 951-5526.
    - e. Siemens Energy & Automation, Alphrata, GA [www.sea.siemens.com](http://www.sea.siemens.com).
    - f. Square D Co, Palatine, IL or [www.squared.com](http://www.squared.com).
    - g. Tork Inc, Mount Vernon, NY [www.tork.com](http://www.tork.com).
- B. Materials:
  - 1. Exterior Fixtures:
    - a. Finish shall be high quality polyester powder coating:
      - 1) Finish process shall consist of cleaning, electrostatically applying power coat, and thermal curing.
      - 2) Weather, scratch, UV, and fade resistant.
    - b. Color shall be Manufacturer's standard white, natural aluminum, or medium bronze as selected by Architect before bidding.
    - c. Type One Acceptable Products:
      - 1) As indicated on Fixture Schedule. Do not mix fixtures from different manufacturers for one use.
      - 2) Equals as approved by Architect before bidding. See Section 01 6200.
  - 2. Exterior Lighting Control:
    - a. Photo Cell:
      - 1) 120 volts.
      - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories.
        - a) Paragon: CW201-00.
        - b) Tork: 2101.

**PART 3 - EXECUTION****3.1 INSTALLATION**

- A. Interface With Other Work:
  - 1. Coordinate location of anchor bolts and conduit in concrete bases so pole will be properly mounted and centered on base.
- B. Lighting Control:
  - 1. Install time switches, manual bypass switches, and contactor inside building to control parking area and building exterior lighting. Label each component to identify lighting controlled, I.E. 'PARKING LIGHTING' or 'BUILDING LIGHTING.' Label with **1/16 inch** thick laminated plastic composition material with contrasting color core. Engraved letters shall be **1/4 inch** high.
  - 2. Locate photocell(s) outside building under soffit and away from any light source and direct sunlight.

**END OF SECTION**

**SECTION 31 0501****COMMON EARTHWORK REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited to:
  - 1. General procedures and requirements for earthwork.
- B. Related Requirements:
  - 1. Pre-Installation conferences held jointly with Section 31 0501 as described in Administrative Requirements on Part 1 of this specification section:
  - 2. Section 32 9001: 'Common Planting Requirements':
    - a. Pre-installation conference held jointly with other landscape related sections.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Aggregate Base: Layer of granular material immediately below concrete and asphalt paving or miscellaneous site concrete (sidewalks, curbs, etc) and below interior concrete slabs on grade.
  - 2. Base: See aggregate base.
  - 3. Building Grading: sloping of grounds immediately adjacent to building. Proper grading causes water to flow away from a structure. Grading can be accomplished either with machinery or by hand.
  - 4. Compacted Fill: Placement of soils on building site placed and compacted per Contract Documents. Used to replace soils removed during excavation or to fill in low spot on building site.
  - 5. Excavation: Removal of soil from project site or cavity formed by cutting, digging or scooping on project site.
  - 6. Fine Grading (FG): Preparation of subgrade preceding placement of surfacing materials (aggregate base, asphalt or concrete paving, and topsoil) for contour of building site required. Fine Grading is conducted to ensure that earth forms and surfaces have been properly shaped and subgrade has been brought to correct elevations. It is performed after rough grading and placement of compacted fill but before placement of aggregate base or topsoil.
  - 7. Finish Grading: Completed surface elevation of landscaping areas for seeding, sodding, and planting on building site.
  - 8. Natural Grade: Undisturbed natural surface of ground.
  - 9. Rough Grading (RG): Grading, leveling, moving, removal and placement of existing or imported soil to its generally required location and elevation. Cut and fill is part of rough grading.
  - 10. Subgrade (definition varies depending upon stage of construction and context of work being performed):
    - a. Prepared natural soils on which fill, aggregate base, or topsoil is placed.
    - or
    - b. Prepared soils immediately beneath paving or topsoil.
  - 11. Topsoil Placement and Grading: Topsoil placement and finish grading work required to prepare site for installation of landscaping.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference:
  - 1. Participate in pre-installation conference for common earthwork sections:
    - a. Schedule conference after completion of site clearing but before beginning grading work.
    - b. Participate in pre-installation conference held jointly with following sections:
      - 1) Section 03 3111: 'Cast-In-Place Structural Concrete'.

- 2) Section 31 1100: 'Clearing and Grubbing'.
- 3) Section 31 1123: 'Aggregate Base'.
- 4) Section 31 1413: 'Topsoil Stripping and Stockpiling'.
- 5) Section 31 2213: 'Rough Grading'.
- 6) Section 31 2216: 'Fine Grading'.
- 7) Section 31 2316: 'Excavation'.
- 8) Section 31 2323: 'Fill'.
- c. In addition to agenda items specified in Section 01 3100, review following:
  - 1) Review common earthwork schedule.
  - 2) Review protection requirements.
  - 3) Review cleaning requirements.
  - 4) Review safety issues.
  - 5) Review field tests and inspections requirements.
- d. In addition to agenda items specified above, review following. These are items that will occur before pre-installation conference for landscape sections:
  - 1) Review clearing and grubbing requirements.
  - 2) Review topsoil stripping and stockpiling requirements.
  - 3) Review landscape grading requirements.
  - 4) Review landscape finish grade tolerance requirements.
  - 5) Review landscape and plant tolerances.
  - 6) Review surface preparation of landscape and planting areas.
  - 7) Review additional agenda items as specified in related sections listed above.
2. Participate in pre-installation conference for landscape sections as specified in Section 32 9001:
  - a. Schedule pre-installation conference after completion of Fine Grading specified in Section 31 2216, but one (1) week minimum before beginning landscape work and held jointly with following sections:
    - 1) Section 32 8423: 'Underground Sprinklers'.
    - 2) Section 32 9120: 'Topsoil And Placement'.
    - 3) 'Topsoil Physical Preparation' (section included based on Topsoil Testing Report).
    - 4) Section 32 9122: 'Topsoil Grading'.
    - 5) Section 32 9223: 'Sodding'.
    - 6) Section 32 9300: 'Plants'.
  - b. In addition to agenda items specified in Section 01 3100 and Section 32 9001, review following that these items have been installed correctly:
    - 1) Review topsoil placement requirements.
    - 2) Review topsoil surface preparation requirements.
    - 3) Review topsoil depth requirements.
    - 4) Review landscape finish grade tolerance requirements.
    - 5) Review surface preparation of landscape and planting areas.
- B. General Earthwork Sequencing:
  1. Excavation.
  2. Rough Grading.
  3. Compacted Fill.
  4. Fine Grading.
  5. Aggregate Base or Topsoil Grading.

## **PART 2 - PRODUCTS: Not Used**

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

#### **A. Verification Of Conditions:**

1. Forty eight (48) hours minimum before performing any work on site, contact **Missouri One Call, 1-800-344-7483** to arrange for utility location services.

2. Perform minor, investigative excavations to verify location of various existing underground facilities at sufficient locations to assure that no conflict with the proposed work exists and sufficient clearance is available to avoid damage to existing facilities.
3. Perform investigative excavating ten (10) days minimum in advance of performing any excavation or underground work.
4. Upon discovery of conflicts or problems with existing facilities, notify Architect by phone or fax within twenty four (24) hours. Follow telephone or fax notification with letter and diagrams indicating conflict or problem and sufficient measurements and details to evaluate problem.

### **3.2 PREPARATION**

- A. Protection:
  1. Spillage:
    - a. Avoid spillage by covering and securing loads when hauling on or adjacent to public streets or highways.
    - b. Remove spillage and sweep, wash, or otherwise clean project, streets, and highways.
  2. Dust Control:
    - a. Take precautions necessary to prevent dust nuisance, both on-site and adjacent to public and private properties.
    - b. Correct or repair damage caused by dust.
  3. Existing Plants And Features:
    - a. Do not damage tops, trunks, and roots of existing trees and shrubs on site that are intended to remain.
    - b. Do not use heavy equipment within branch spread.
    - c. Interfering branches may be removed only with permission of Architect.
    - d. Do not damage other plants and features that are to remain.

### **3.3 REPAIR / RESTORATION**

- A. Adjust existing covers, boxes, and vaults to grade.
- B. Replace broken or damaged covers, boxes, and vaults.
- C. Independently confirm size, location, and number of covers, boxes, and vaults that require adjustment.

### **3.4 FIELD QUALITY CONTROL**

- A. Field Tests:
  1. Owner reserves right to require additional testing to re-affirm suitability of completed work including compacted soils that have been exposed to adverse weather conditions.
- B. Field Inspections:
  1. Notify Architect forty eight (48) hours before performing excavation or fill work.
  2. If weather, scheduling, or any other circumstance has interrupted work, notify Architect twenty four (24) hours minimum before intended resumption of grading or compacting.
- C. Non-Conforming Work:
  1. If specified protection precautions are not taken or corrections and repairs not made promptly, Owner may take such steps as may be deemed necessary and deduct costs of such from monies due to Contractor. Such action or lack of action on Owner's part does not relieve Contractor from responsibility for proper protection of The Work.

**END OF SECTION**

**BLANK PAGE**

**SECTION 31 1100****CLEARING AND GRUBBING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Perform clearing and grubbing as necessary to prepare site for rough grading and structure excavation as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 31 0501: Common Earthwork Requirements:
    - a. General procedures and requirements for earthwork.
    - b. Pre-installation conference held jointly with other common earthwork related sections.
    - c. Pre-installation conference held jointly with other landscape related sections.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference:
  - 1. Participate in pre-installation conferences as specified in Section 31 0501.

**PART 2 - PRODUCTS: Not Used****PART 3 - EXECUTION****3.1 PERFORMANCE**

- A. Tree And Brush Removal:
  - 1. Cut off trees, shrubs, brush, and vegetative growth **12 inches** maximum above ground.
  - 2. Do not pull up or rip out roots of trees and shrubs that are to remain. If excavation through roots is required, excavate by hand and cut roots with sharp axe. Make clean, smooth, sloping cuts.
  - 3. Cut roots **6 inches** or larger in diameter only with Architect's written permission.
- B. Grubbing:
  - 1. Grub out stumps and roots **12 inches** minimum below original ground surface, except as follows:
    - a. Under buildings, remove roots one inch and larger entirely.
    - b. Entirely remove roots of plants that normally sprout from roots, as identified by Architect.

**3.2 CLEANING**

- A. Remove from site trees, shrubs, uprooted stumps, vegetative layer, and surface debris and dispose of legally.
- B. Do not bury cuttings, stumps, roots, and other vegetative matter or burnt waste material on site.

**END OF SECTION**



**BLANK PAGE**

**SECTION 31 1123****AGGREGATE BASE****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install the following as described in Contract Documents:
    - a. Aggregate Base:
      - 1) Interior slabs-on-grade concrete.
      - 2) Miscellaneous cast-in-place concrete and equipment pads.
- B. Furnished Under This Section:
  - 1. Vapor Retarder:
    - a. Interior slabs on grade:
      - 1) Under-slab vapor retarder and seam tape.
- C. Related Requirements:
  - 1. Section 01 1200: 'Multiple Contract Summary' for multiple contracts.
  - 2. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
  - 3. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
  - 4. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
  - 5. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
  - 6. Section 01 6200: Administrative and procedural requirements for product options.
  - 7. Section 01 7800: 'Closeout Submittals'.
  - 8. Section 03 3111: 'Cast-In-Place Structural Concrete'.
  - 9. Section 07 2616: 'Below-Grade Vapor Retarders' for:
  - 10. Section 31 0501: 'Common Earthwork Requirements':
    - a. General procedures and requirements for earthwork.
    - b. Pre-installation conference held jointly with other common earthwork related sections.
  - 11. Section 31 2213: 'Rough Grading'.
  - 12. Section 31 2216: Subgrade procedures.
  - 13. Section 31 2323: Compaction procedures and tolerances.
  - 14. Section 31 3116: Termite control.
  - 15.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. Council of American Structural Engineers. CASE Form 101: *Statement of Special Inspections*. Washington, DC: CASE, 2001. (c/o American Council of Engineering Companies, 1015 15<sup>th</sup> St., NW, Washington, DC 20005; 202-347-7474; [www.acec.org](http://www.acec.org)).
- B. Definitions:
  - 1. AASHTO: The American Association of State Highway and Transportation Officials. Organization of highway engineers from the 50 states that develops guides and standards.
- C. Definitions (Following are specifically referenced for testing):
  - 1. Accreditation: Process in which certification of competency, authority, or credibility is presented. Verify that laboratories have an appropriate quality management system and can properly

- perform certain test methods (e.g., ANSI, ASTM, and ISO test methods) and calibration parameters according to their scopes of accreditation.
2. Approved: To authorize, endorse, validate, confirm, or agree to.
  3. Field Quality Control: Testing, Inspections, Special Testing and Special Inspections to assure compliance to Contract Documents.
  4. Inspection/Special Inspection: Inspection of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards:
    - a. Inspection: Not required by code provisions but may be required by Contract Documents.
    - b. Special Inspection: Required by code provisions and by Contract Documents.
    - c. Inspection-Continuous: Full-time observation of the Work requiring inspection by approved inspector who is present in area where the Work is being performed.
    - d. Inspection-Periodic: Part-time or intermittent observation of the Work requiring inspection by approved inspector who is present in area where the Work has been or is being performed and at completion of the Work.
  5. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform particular construction operation, including installation, erection, application, and similar operations.
  6. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation. They are not samples. Approved mockups establish standard by which the Work will be judged.
  7. Owner's Representative: Owner's Designated Representative (Project Manager or Facilities Manager) who will have express authority to bind Owner with respect to all matters requiring Owner's approval or authorization.
  8. Preconstruction Testing: Tests and inspections that are performed specifically for Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
  9. Product Testing: Tests and inspections that are performed by testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards..
  10. Relative Compaction: Ratio of field dry density as determined by ASTM D6938 or ASTM D2216, and laboratory maximum dry density as determined by ASTM D1557.
  11. Quality Assurance: Testing, Inspections, Special Testing and Special Inspections provided for by Owner.
  12. Quality Control: Testing, Inspections, Special Testing and Special Inspections provided for by Contractor.
  13. Service Provider: Agency or firm qualified to perform required tests and inspections.
  14. Source Quality Control Testing: Tests and inspections that are performed at source, i.e., plant, mill, factory, or shop.
  15. Special Inspection: See Inspection.
  16. Special Inspector: Certified individual or firm that implements special inspection program for project.
  17. Special Test: See Test.
  18. Test/Special Test: Field or laboratory tests to determine characteristics and quality of building materials and workmanship.
    - a. Test: Not required by code provisions but may be required by Contract Documents.
    - b. Special Test: Required by code provisions and by Contract Documents.
  19. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
  20. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
  21. Verification: Act of reviewing, inspecting, testing, etc. to establish and document that product, service, or system meets regulatory, standard, or specification requirements.

D. Reference Standards:

1. ASTM International:
  - a. ASTM C29/C29M-09, 'Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate'.

- b. ASTM C117-13, 'Standard Test Method for Materials Finer than 75- $\mu$ m (No. 200) Sieve in Mineral Aggregates by Washing'.
  - c. ASTM C131/C131M-14, 'Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine'.
  - d. ASTM C136-06, 'Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates'.
  - e. ASTM C1077-14, 'Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation'.
  - f. ASTM D698-12, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>))'.
  - g. ASTM D1556-07, 'Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method'.
  - h. ASTM D1557-12, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>))'.
  - i. ASTM D1557-12, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>))'.
  - j. ASTM D1883-07, 'Standard Test Method for CBR (California Bearing Ratio) of Laboratory-Compacted Soils'.
  - k. ASTM D2216-10, 'Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass'.
  - l. ASTM D2419-14, 'Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate'.
  - m. ASTM D2487-11, 'Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)'.
  - n. ASTM D3666-13, 'Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials'.
  - o. ASTM D3740-12a, 'Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction'.
  - p. ASTM D4318-10, 'Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils'.
  - q. ASTM D6938-10, 'Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)'.
  - r. ASTM E11-13, 'Standard Specification for Wire Cloth and Sieves for Testing Purposes'.
  - s. ASTM E329-14a, 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing'.
  - t. ASTM E543-13, 'Standard Specification for Agencies Performing Nondestructive Testing'.
  - u. ASTM E1212-12, 'Standard Practice for Quality Management Systems for Nondestructive Testing Agencies'.
  - v. ASTM E1643-11, 'Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs'.
2. International Building Code (IBC):
- a. Chapter 17, 'Structural Tests and Special Inspections' (2012 or latest edition available).

### 1.3 ADMINISTRATIVE REQUIREMENTS

#### A. Pre-Installation Conferences:

- 1. Participate in pre-installation conference as specified in Section 31 0501.
- 2. In addition to agenda items specified in Section 01 3100 and Section 31 0501, review following:
  - a. Review termite control application requirements.
  - b. Review aggregate base installation requirements.
  - c. Review vapor retarder installation requirements.
  - d. Review proposed miscellaneous exterior concrete schedule.
  - e. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
    - 1) Review frequency of testing and inspections.

#### B. Sequencing:

- 1. Compaction as described in Section 31 2216 'Fine Grading'.
- 2. Termite Control:

- a. Termite application as described in Section 31 3116 'Termite Control':
    - 1) Application OPTION A:
      - a) Apply termite protection on top of soil base before aggregate base and vapor retarder is installed.
    - 2) Application OPTION B:
      - a) Install vapor retarder after application of termite protection on top of aggregate base.
  3. Exterior Footings and Foundations are installed.
  4. Vapor Retarder:
    - a. Install below-grade vapor retarder on top of soil base or aggregate base.
  5. Aggregate Base:
    - a. Install aggregate base at location shown in Contract Drawings.
  6. Concrete Slab is installed.
- C. Scheduling:
1. Interior slab-on-grade concrete:
    - a. Notify Architect twenty four (24) hours minimum before installation of concrete to allow inspection of vapor retarder installation.
    - b. Notify Testing Agency and Architect twenty four (24) hours minimum before installation of interior concrete slabs to allow inspection of aggregate base.
    - c. Allow special inspector to review all sub grades and excavations to determine if building pad has been prepared in accordance with geotechnical report prior to placing any aggregate base.
  2. Miscellaneous exterior concrete:
    - a. Notify Testing Agency and Architect twenty four (24) hours minimum before placing concrete for exterior site work concrete (sidewalks, curbs, gutters, etc.), footings, foundation walls, and building slabs to allow inspection of aggregate base.

#### 1.4 SUBMITTALS

- A. Informational Submittals:
1. Qualification Statement:
    - a. Installer:
      - 1) Provide Qualification documentation if requested by Architect or Owner.
- B. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Record Documentation:
      - 1) Testing and Inspection Reports:
        - a) Testing Agency Testing and Inspecting Reports of aggregate base.

#### 1.5 QUALITY ASSURANCE

- A. Testing and Inspection:
1. Owner will provide Testing and Inspection for aggregate base:
    - a. Owner will employ testing agencies to perform testing and inspection for aggregate base as specified in Field Quality Control in Part 3 of this specification.
      - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
      - 2) See Section 01 1200: 'Multiple Contract Summary'.
    - b. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control.
      - 1) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.

**1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery And Acceptance Requirements:
1. Materials shall be delivered in original, unopened packages with labels intact.

**1.7 FIELD CONDITIONS**

- A. Ambient Conditions:
1. Do not perform work during unfavorable conditions as specified below:
    - a. Aggregate Base:
      - 1) Presence of free surface water.
      - 2) Over-saturated sub base materials.
    - b. Vapor Retarder:
      - 1) Unacceptable conditions for installation include presence of high winds which would tear or damage vapor retarder.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Aggregate Base:
1. Interior slab-on-grade concrete:
    - a. New Aggregate Base:
      - 1) Gravel: **3/4 inch** minimum to **one inch** maximum well-graded, clean gravel or crushed rock.
      - 2) Base type gravel or crushed rock, graded by weight as follows (three-quarter to one-inch clean gap-graded gravel):
        - a) Road Base type gravel or crushed stone (slag not allowed), graded as follows:
 

(1) Sieve		Percent of Weight Passing
(a) 1 inch	(25.4 mm)	100
(b) 3/4 inch	(19.0 mm)	90 - 80
(c) 1/2 inch	(12.7 mm)	20 - 40
(d) 3/8 inch	(9.5 mm)	5 - 10
(e) No. 4	(4.750 mm)	0 - 5
  2. Miscellaneous exterior concrete (Section 03 3053):
    - a. New Aggregate Base:
      - 1) Road Base to conform to State DOT Specifications.

**PART 3 - EXECUTION****3.1 PREPARATION**

- A. Stockpiles:
1. Provide area for each stockpile of adequate size, reasonably uniform in cross-section, well drained, and cleared of foreign materials.
  2. Locate piles so that there is no contamination by foreign material and no intermingling of aggregates from adjacent piles. Do not use steel-tracked equipment on stockpiles.
  3. Do not store aggregates from different sources, geological classifications, or of different gradings in stockpiles near each other unless bulkhead is placed between different materials.
  4. Do not use washed aggregates sooner than twenty four (24) hours after washing or until surplus water has drained out and material has uniform moisture content.
  5. Do not stockpile higher than **15 feet**. Cover or otherwise protect stockpiles for use in HMA to prevent buildup of moisture.

- B. Surface Preparation (Miscellaneous Exterior Concrete):
  - 1. Subgrade:
    - a. Finish grade to grades required by Contract Documents.
    - b. Compact subgrade as specified in Section 31 2323.
- C. Surface Preparation (Interior Slab-On-Grade Concrete):
  - 1. Vapor retarder:
    - a. Install vapor retarder in accordance with ASTM E1643 except where Contract Documents indicate otherwise and following instructions:
      - 1) Install vapor retarder over aggregate base over compacted subgrade so entire area under slab is covered.
      - 2) Install vapor retarder in accordance with ASTM E1643 at interior stem walls.
      - 3) Lap joints **6 inches** minimum and seal with specified seam tape.
      - 4) Seal vapor retarder around pipes, conduits, and other utility items that penetrate vapor retarder using factory-fabricated boot installed as recommended by Manufacturer.
      - 5) Except for punctures required for reinforcing and anchor bolts at top of stem walls, seal tears and punctures.

### 3.2 INSTALLATION

- A. Aggregate Base:
  - 1. General:
    - a. Do not place aggregate base material when subgrade is frozen or unstable.
    - b. Spread aggregate base material with equipment except in limited or restricted areas where use of hand spreading is allowed.
    - c. Spread aggregate base material in manner that does not break down material and eliminates segregation, ruts, and ridges.
    - d. Correct damage to aggregate base caused by construction activities, and maintain corrected aggregate base until subsequent course is placed.
    - e. Do not allow traffic on aggregate base.
    - f. Remove all standing storm water.
  - 2. Interior concrete slab-on-grade aggregate base (Contractor Option):
    - a. Place **4 inches** minimum of aggregate base under vapor retarder, level, and compact with two passes of **2 1/2 ton** minimum roller.
    - b. Place **4 inches** minimum of aggregate base under vapor retarder, level, and compact with vibratory plate compactor.
  - 3. Miscellaneous exterior concrete aggregate base:
    - a. Except under mow strips, place **4 inches** minimum of aggregate base, level, and compact as specified in Section 31 2323.

### 3.3 FIELD QUALITY CONTROL

- A. Field Tests and Inspections:
  - 1. General:
    - a. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
    - b. Quality Control is sole responsibility of Contractor as specified in Section 01 4523 'Testing And Inspection Services'.
  - 2. Aggregate Base:
    - a. Interior slab-on-grade concrete areas:
      - 1) Testing Agency shall provide testing and inspection for interior aggregate base.
      - 2) Number of tests may vary at discretion of Architect.
      - 3) Testing Agency will test compaction of base in place according to ASTM D1556, ASTM D2167, and ASTM D6938, as applicable. Tests will be performed at following frequency:
        - a) Building Slab Areas: One test for every **2,500 sq. ft.** or less of building slab area but no fewer than three tests.

- b. Miscellaneous exterior concrete areas:
  - 1) Testing Agency shall provide testing and inspection for exterior aggregate base.
  - 2) Number of tests may vary at discretion of Architect.
  - 3) Testing Agency will test compaction of base in place according to ASTM D1556, ASTM D2167, and ASTM D6938, as applicable. Tests will be performed at following frequency:
    - a) Sitework Areas: One test for every 10,000 sq. ft. or less of exterior pads area but no fewer than three tests.

### 3.4 PROTECTION

- A. Interior Slab-On-Grade Concrete:
  - 1. Vapor Retarder:
    - a. Do not allow water onto vapor retarder or aggregate base before placing concrete.
    - b. Protect membrane from possible punctures caused by reinforcing bar supports before placing concrete.

**END OF SECTION**



**BLANK PAGE**

**SECTION 31 1413****TOPSOIL STRIPPING AND STOCKPILING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Strip and stockpile acceptable topsoil as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 31 0501: 'Common Earthwork Requirements':
    - a. General procedures and requirements for earthwork.
    - b. Pre-installation conference held jointly with other common earthwork related sections.
    - c. Pre-installation conference held jointly with other landscape related sections.
  - 2. Section 31 1100: 'Clearing and Grubbing'.
  - 3. Section 31 2213: 'Rough Grading'.
  - 4. Section 31 2316: 'Excavation'.
  - 5. Section 32 9001: 'Common Planting Requirements'.
  - 6. Section 32 9120: 'Topsoil And Placement' for topsoil evaluation and placement required for topsoil grading.
  - 7. Section 32 9122: 'Topsoil Grading' for preparation of topsoil and addition of amendments prior to landscaping.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Existing topsoil: Defined as total amount of soil stripped and stored for reuse, less vegetation layer stripped and disposed of as specified in Paragraphs below.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference:
  - 1. Participate in pre-installation conferences as specified in Section 31 0501.

**PART 2 - PRODUCTS: Not Used****PART 3 - EXECUTION****3.1 PERFORMANCE**

- A. Strip existing vegetation layer **2" inches** deep minimum from areas of site to receive buildings, landscaping, and paving and remove from site before stripping topsoil for storage and reuse.
- B. After stripping vegetation layer, strip existing topsoil additional **4" inches** deep minimum from areas of site to receive buildings and paving and store on site for later use.
  - 1. Existing topsoil is property of Contractor with restriction that topsoil is to be used first for Project landscape topsoil requirements and second for non-structural fill and backfill.
  - 2. After Project fill, backfill, and landscape topsoil requirements are satisfied, remove excess existing topsoil from site. Do not remove existing topsoil from site without Architect's written approval.
- C. Screen existing topsoil to meet standards established as specified in Section 32 9120 'Topsoil And Placement'.

**END OF SECTION**

**BLANK PAGE**

**SECTION 31 2213****ROUGH GRADING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Perform rough grading work required to prepare site for construction as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 01 3100: 'Project Management and Coordination' for pre-installation conference..
  - 2. Section 03 3053: 'Miscellaneous Exterior Cast-In-Place Concrete.'
  - 3. Section 31 0501: 'Common Earthwork Requirements' for:
    - a. General procedures and requirements for earthwork.
    - b. Pre-installation conference held jointly with other common earthwork related sections.
  - 4. Section 31 1123: 'Aggregate Base' for aggregate base requirements.
  - 5. Section 31 1413: 'Topsoil Stripping And Stockpiling' for stripping and storing of existing topsoil.
  - 6. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
  - 7. Section 31 2316: 'Excavation'.
  - 8. Section 31 2323: 'Fill' for compaction procedures and tolerances for base.
  - 9. Section 32 9122: 'Topsoil Grading' for preparation of topsoil and addition of amendments prior to landscaping.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference:
  - 1. Participate in pre-installation conference as specified in Section 31 0501:
  - 2. In addition to agenda items specified in Section 01 3100 and Section 31 0501, review following:
    - a. Identify benchmark to be used in establishing grades and review Contract Document requirements for grades, fill materials, and topsoil.
    - b. Examine site to pre-plan procedures for making cuts, placing fills, and other necessary work.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Materials used for fill shall be as specified for backfill in Section 31 2323 'Fill'.

**PART 3 - EXECUTION****3.1 EXAMINATION**

- A. Verification Of Conditions:
  - 1. Verify elevations of rough grading are correct before compacted fill, fine grading, aggregate base or landscape grading are placed.

**3.2 PREPARATION**

- A. Protection Of In-Place Conditions:
  - 1. When existing grade around existing plants to remain is higher than new finish grade, perform regrading by hand.
  - 2. Do not expose or damage shrub or tree roots.
- B. Surface Preparation:
  - 1. Before making cuts, remove topsoil over areas to be cut and filled that were not previously removed by stripping specified in Section 31 1413 'Topsoil Stripping And Stockpiling'. Stockpile this additional topsoil with previously stripped topsoil.

**3.3 PERFORMANCE**

- A. Subgrade (Natural Soils):
  - 1. Subgrade beneath compacted fill or aggregate base under asphalt or concrete paving shall be constructed smooth and even.
- B. Special Techniques:
  - 1. Compact fills as specified in Section 31 2323 'Fill'.
  - 2. If soft spots, water, or other unusual and unforeseen conditions affecting grading requirements are encountered, stop work and notify Architect.
- C. Tolerances:
  - 1. Maximum variation from required grades shall be **1/10 of one foot**.

**END OF SECTION**

**SECTION 31 2216****FINE GRADING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Perform fine grading of subgrade work required to prepare site for paving finish grading and for placement of topsoil as described in Contract Documents.
  2. Prepare natural soil subgrade as described in Section 31 2213 'Rough Grading' or prepare fill subgrade as described in this specification section for asphalt paving.
- B. Related Requirements:
1. Section 01 1200: 'Multiple Contract Summary' for multiple contracts.
  2. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
  3. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
  4. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
  5. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
  6. Section 01 7800: 'Closeout Submittals'.
  7. Section 31 0501: 'Common Earthwork Requirements' for:
    - a. General procedures and requirements for earthwork.
    - b. Pre-installation conference held jointly with other common earthwork related sections.
  8. Section 31 1123: 'Aggregate Base' for aggregate base requirements.
  9. Section 31 1413: 'Topsoil Stripping And Stockpiling' for stripping and storing of existing topsoil.
  10. Section 31 2213: 'Rough Grading' for grading and preparation of natural soil subgrades below fill and aggregate base materials.
  11. Section 31 2316: 'Excavation'.
  12. Section 31 2323: 'Fill' for compaction procedures and tolerances for base.
  13. Section 32 9001: 'Common Planting Requirements'.
    - a. Pre-installation conference held jointly with other common planting related sections.
  14. Section 32 9120: 'Topsoil And Placement' for topsoil evaluation and placement required for topsoil grading.
  15. Section 32 9122: 'Topsoil Grading' for preparation of topsoil and addition of amendments prior to landscaping.

**1.2 REFERENCES**

- A. Association Publications:
1. American Concrete Institute, Farmington Hills, MI [www.concrete.org](http://www.concrete.org). Abstracts of ACI Periodicals and Publications:
    - a. ACI 229R-13, '*Report on Controlled Low-Strength Materials*'.
  2. Council of American Structural Engineers. CASE Form 101: *Statement of Special Inspections*. Washington, DC: CASE, 2001. (c/o American Council of Engineering Companies, 1015 15<sup>th</sup> St., NW, Washington, DC 20005; 202-347-7474; [www.acec.org](http://www.acec.org)).
- B. Definitions (Following are specifically referenced for testing):
1. AASHTO: The American Association of State Highway and Transportation Officials. Organization of highway engineers from the 50 states that develops guides and standards.
  2. Accreditation: Process in which certification of competency, authority, or credibility is presented. Verify that laboratories have an appropriate quality management system and can properly perform certain test methods (e.g., ANSI, ASTM, and ISO test methods) and calibration parameters according to their scopes of accreditation.
  3. Approved: To authorize, endorse, validate, confirm, or agree to.

4. Field Quality Control: Testing, Inspections, Special Testing and Special Inspections to assure compliance to Contract Documents.
  5. Inspection/Special Inspection: Inspection of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards:
    - a. Inspection: Not required by code provisions but may be required by Contract Documents.
    - b. Special Inspection: Required by code provisions and by Contract Documents.
    - c. Inspection-Continuous: Full-time observation of the Work requiring inspection by approved inspector who is present in area where the Work is being performed.
    - d. Inspection-Periodic: Part-time or intermittent observation of the Work requiring inspection by approved inspector who is present in area where the Work has been or is being performed and at completion of the Work.
  6. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform particular construction operation, including installation, erection, application, and similar operations.
  7. Observation: Visual observation of building / site elements or structural system by registered design professional for general conformance to approved construction documents at significant construction stages and at completion. Observation does not include or waive responsibility for performing inspections or special inspections.
  8. Owner's Representative: Owner's Designated Representative (Project Manager or Facilities Manager) who will have express authority to bind Owner with respect to all matters requiring Owner's approval or authorization.
  9. Preconstruction Testing: Tests and inspections that are performed specifically for Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
  10. Product Testing: Tests and inspections that are performed by testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
  11. Relative Compaction: Ratio of field dry density as determined by ASTM D6938 or ASTM D2216, and laboratory maximum dry density as determined by ASTM D698.
  12. Quality Assurance: Testing, Inspections, Special Testing and Special Inspections provided for by Owner.
  13. Quality Control: Testing, Inspections, Special Testing and Special Inspections provided for by Contractor.
  14. Service Provider: Agency or firm qualified to perform required tests and inspections.
  15. Source Quality Control Testing: Tests and inspections that are performed at source, i.e., plant, mill, factory, or shop.
  16. Special Inspection: See Inspection.
  17. Special Inspector: Certified individual or firm that implements special inspection program for project.
  18. Special Test: See Test.
  19. Test/Special Test: Field or laboratory tests to determine characteristics and quality of building materials and workmanship.
    - a. Test: Not required by code provisions but may be required by Contract Documents.
    - b. Special Test: Required by code provisions and by Contract Documents.
  20. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
  21. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
  22. Verification: Act of reviewing, inspecting, testing, etc. to establish and document that product, service, or system meets regulatory, standard, or specification requirements.
- C. Reference Standards:
1. ASTM International (Following are specifically referenced for fill and aggregate base testing):
    - a. ASTM D698-12, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>))'.
    - b. ASTM D1556-07, 'Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method'.
    - c. ASTM D1557-12, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>))'.

- d. ASTM D2167-08, 'Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method'.
  - e. ASTM D2216-10, 'Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass'.
  - f. ASTM D2487-11, 'Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)'.
  - g. ASTM D3666-13, 'Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials'.
  - h. ASTM D3740-12a, 'Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction'.
  - i. ASTM D6938-10, 'Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)'.
  - j. ASTM E329-14a, 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing'.
  - k. ASTM E543-13, 'Standard Specification for Agencies Performing Nondestructive Testing'.
  - l. ASTM E1212-12, 'Standard Practice for Quality Management Systems for Nondestructive Testing Agencies'.
2. International Building Code (IBC):
    - a. Chapter 17, 'Structural Tests and Special Inspections' (2012 or latest edition available).

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
  1. Participate in pre-installation conference as specified in Section 31 0501 and Section 32 9001.
  2. In addition to agenda items specified in Section 01 3100 and Section 31 0501, review following:
    - a. Review backfill requirements.
    - b. Review geotechnical report.
    - c. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
      - 1) Review frequency of testing and inspections.
- B. Scheduling:
  1. Notify Testing Agency and Architect twenty four (24) hours minimum before installation of fill / engineered fill to allow inspection.
  2. Allow special inspector to review all subgrades and excavations to determine if site has been prepared in accordance with geotechnical report prior to placing any fill, aggregate base or concrete.
  3. Allow inspection and testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after inspections and test results for previously compacted work comply with requirements.

### 1.4 SUBMITTALS

- A. Closeout Submittals:
  1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Record Documentation:
      - 1) Testing and Inspection Reports:
        - a) Testing Agency Testing and Inspecting Reports of fill / engineered fill.

### 1.5 QUALITY ASSURANCE

- A. Testing and Inspection:
  1. Owner will provide Testing and Inspection for fill / engineering fill:
    - a. Owner will employ testing agencies to perform testing and inspection for fill / engineering fill as specified in Field Quality Control in Part 3 of this specification.



- 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
- 2) See Section 01 1200: 'Multiple Contract Summary'.
- b. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control.
  - 1) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.

## **PART 2 - PRODUCTS: Not Used**

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- A. Protection Of In-Place Conditions: Protect utilities and site elements from damage.
- B. General:
  1. Limit use of heavy equipment to areas no closer than **6 feet** from building or other permanent structures.
- C. Surface Preparation:
  1. Landscaping and Planting Areas:
    - a. Before grading, dig out weeds from planting areas by their roots and remove from site. Remove rocks larger than **1-1/2 inches** in size and foreign matter such as building rubble, wire, cans, sticks, concrete, etc.
    - b. Remove imported paving base material present in planting areas down to natural subgrade or other material acceptable to Architect.

### **3.2 PERFORMANCE**

- A. Interface With Other Work: Do not commence work of this Section until grading tolerances specified in Section 31 2213 are met.
- B. General:
  1. Do not expose or damage existing shrub or tree roots.
- C. Tolerances:
  1. Site Tolerances:
    - a. Subgrade (material immediately below aggregate base):
      - 1) **0.00 inches** high.
      - 2) Measure using string line from curb to curb, gutter, flat drainage structure, or grade break.
    - b. Maximum variation from required grades shall be **1/10 of one foot**.
  2. Landscaping and Planting Tolerances:
    - a. Maximum variation from required grades shall be **1/10 of one foot**.
    - b. To allow for final finish grades as specified in Section 32 9121 of planting areas, fine grade elevations before placing topsoil and mulch are:
      - 1) Sod Areas: **7 inches** below top of walk or curb.
      - 2) Seeded Areas: **6 inches** below top of walk or curb.
      - 3) Ground Cover Areas: **7 inches** below top of walk or curb.
      - 4) Tree And Shrub Areas: **4 inches** below top of walk or curb.
  3. Slope grade away from building as specified in Section 32 9120.

### **3.3 FIELD QUALITY CONTROL**

- A. Field Tests and Inspections:

1. General:
  - a. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
  - b. Quality Control is sole responsibility of Contractor as specified in Section 01 4523 'Testing And Inspection Services'.
2. Site Preparation:
  - a. Prior to placement of fill / engineered fill, inspector shall determine that site has been prepared in accordance with geotechnical report.
  - b. Footing subgrade: At footing subgrades, Certified Inspector is to verify that soils conform to geotechnical report.
3. Fill / Engineered Fill:
  - a. Testing Agency shall provide testing and inspection for fine grading.
  - b. Number of tests may vary at discretion of Architect.
  - c. Testing Agency is to provide one (1) moisture-maximum density relationship test for each type of fill material.

**END OF SECTION**

**BLANK PAGE**

**SECTION 31 2316****EXCAVATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Perform Project excavating and trenching as described in Contract Documents, except as specified below.
  - 2. Procedure and quality for excavating and trenching performed on Project under other Sections unless specifically specified otherwise.
- B. Related Requirements:
  - 1. Section 31 0501: 'Common Earthwork Requirements' for:
    - a. General procedures and requirements for earthwork.
    - b. Pre-installation conference held jointly with other common earthwork related sections.
  - 2. Section 31 1100: Clearing and Grubbing.
  - 3. Section 31 1123: 'Aggregate Base'.
  - 4. Section 31 1413: 'Topsoil Stripping and Stockpiling'.
  - 5. Section 31 2213: 'Rough Grading' for rough grading and preparation of natural soil subgrades below fill and aggregate base materials.
  - 6. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
  - 7. Section 31 2323: 'Fill' for compaction procedures and tolerances for base.
  - 8. Performance of excavating inside and outside of building required for electrical and mechanical work is responsibility of respective Section doing work unless arranged differently by Contractor.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference:
  - 1. Participate in pre-installation conference as specified in Section 31 0501:
  - 2. In addition to agenda items specified in Section 01 3100 and Section 31 0501, review following:
    - a. Review protection of existing utilities requirements.

**PART 2 - PRODUCTS: Not Used****PART 3 - EXECUTION****3.1 EXAMINATION**

- A. Verification Of Conditions:
  - 1. Carefully examine site and available information to determine type soil to be encountered.
  - 2. Discuss problems with Architect before proceeding with work.

**3.2 PREPARATION**

- A. Protection of Existing Utilities:
  - 1. Protect existing utilities identified in Contract Documents during excavation.
  - 2. If existing utility lines not identified in Contract Documents are encountered, contact Architect before proceeding.

**3.3 PERFORMANCE**

- A. Interface With Other Work:

1. Section 31 2213: 'Rough Grading' for rough grading and preparation of natural soil subgrades below fill and aggregate base materials.
2. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.

B. Excavation:

1. Building Footings And Foundations:

a. Under Building:

- 1) Excavate at least 3'6" below existing grade and 5 feet beyond perimeter of buildings and structures and as necessary for proper placement and forming of footings and foundations so that final grade allows for 4'-0" min. of select fill below slab.

b. Under Paving:

- 1) Excavate at least (3'6") and up to ( 4'6") below existing grade so final grade allows for (3'6") of compacted fill below paving.

c. Bottom of excavations to receive footings shall be minimum of 4'-0" of compacted select fill.

d. Excavation Carried Deeper Than Required:

- 1) Under Footings: Fill with concrete specified for footings.
- 2) Under Slabs: Use specified compacted backfill material.

2. Miscellaneous Cast-In-Place Concrete:

- a. Excavate as necessary for proper placement and forming of concrete site elements and pavement structure. Remove vegetation and deleterious material and remove from site.
- b. Backfill over-excavated areas with compacted base material specified in Section 31 1123.
- c. Remove and replace exposed material that becomes soft or unstable.

3. Utility Trenches:

- a. Unless otherwise indicated, excavation shall be open cut. Short sections of trench may be tunneled if pipe or duct can be safely and properly installed and backfill can be properly tamped in tunnel sections and if approved by Architect.
- b. Excavate to proper alignment, depth, and grade. Excavate to sufficient width to allow adequate space for proper installation and inspection of utility piping.
- c. If trenches are excavated deeper than required, backfill until trench bottom is proper depth with properly compacted native material.
- d. Pipe 4 Inches In Diameter Or Larger:
  - 1) Grade bottom of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil at every point along its length.
  - 2) Except where rock is encountered, take care not to excavate below depths indicated.
    - a) Where rock excavations are required, excavate rock with minimum over-depth of 4 inches below required trench depths.
    - b) Backfill over-depths in rock excavation and unauthorized over-depths with loose, granular, moist earth, thoroughly compacted.
  - 3) Whenever wet or unstable soil incapable of properly supporting pipe, as determined by Architect, occurs in bottom of trench, remove soil to depth required and backfill trench to proper grade with coarse sand, fine gravel, or other suitable material acceptable to Architect.

4. If unusual excavating conditions are encountered, stop work and notify Architect.

### 3.4 REPAIR / RESTORATION

- A. Repair damage to other portions of the Work resulting from work of this Section at no additional cost to Owner. On new work, arrange for damage to be repaired by original installer.

### 3.5 CLEANING

- A. Debris and material not necessary for Project are property of Contractor and are to be removed before completion of Project. However, if material necessary for Project is hauled away, replace with specified fill / backfill material.

**END OF SECTION**

**SECTION 31 2323****FILL****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Perform Project backfilling and compacting as described in Contract Documents, except as specified below.
  2. Procedure and quality for backfilling and compacting performed on Project under other Sections unless specifically specified otherwise.
- B. Related Requirements:
1. Section 01 1200: 'Multiple Contract Summary' for multiple contracts.
  2. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
  3. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
  4. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
  5. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
  6. Section 01 7800: 'Closeout Submittals'.
  7. Section 31 0501: 'Common Earthwork Requirements' for:
    - a. General procedures and requirements for earthwork.
    - b. Pre-installation conference held jointly with other common earthwork related sections.
  8. Section 31 1100: 'Clearing and Grubbing'.
  9. Section 31 1123: 'Aggregate Base' for aggregate base requirements.
  10. Section 31 1413: 'Topsoil Stripping And Stockpiling' for stripping and storing of existing topsoil.
  11. Section 31 2213: 'Rough Grading' for grading and preparation of natural soil subgrades below fill and aggregate base materials.
  12. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
  13. Section 31 2316: 'Excavation'.
  14. Section 31 2324: 'Flowable Fill'.
  15. Section 32 9120: 'Topsoil And Placement' for topsoil evaluation and placement required for topsoil grading.
  16. Section 32 9122: 'Topsoil Grading' for preparation of topsoil and addition of amendments prior to landscaping.
  17. Division 32: Compaction of subgrade under walks and paving.
  18. Performance of backfilling and compacting inside and outside of building required for electrical and mechanical work is responsibility of respective Section doing work unless arranged differently by Contractor.

**1.2 REFERENCES**

- A. Association Publications:
1. American Concrete Institute, Farmington Hills, MI [www.concrete.org](http://www.concrete.org). Abstracts of ACI Periodicals and Publications.
    - a. ACI 229R-99, *Controlled Low-Strength Materials* (Reapproved 2005).
  2. Council of American Structural Engineers. CASE Form 101: *Statement of Special Inspections*. Washington, DC: CASE, 2001. (c/o American Council of Engineering Companies, 1015 15<sup>th</sup> St., NW, Washington, DC 20005; 202-347-7474; [www.acec.org](http://www.acec.org)).
- B. Definitions (Following are specifically referenced for testing):
1. Accreditation: Process in which certification of competency, authority, or credibility is presented. Verify that laboratories have an appropriate quality management system and can properly

- perform certain test methods (e.g., ANSI, ASTM, and ISO test methods) and calibration parameters according to their scopes of accreditation.
2. Approved: To authorize, endorse, validate, confirm, or agree to.
  3. Field Quality Control: Testing, Inspections, Special Testing and Special Inspections to assure compliance to Contract Documents.
  4. Inspection/Special Inspection: Inspection of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards:
    - a. Inspection: Not required by code provisions but may be required by Contract Documents.
    - b. Special Inspection: Required by code provisions and by Contract Documents.
    - c. Inspection-Continuous: Full-time observation of the Work requiring inspection by approved inspector who is present in area where the Work is being performed.
    - d. Inspection-Periodic: Part-time or intermittent observation of the Work requiring inspection by approved inspector who is present in area where the Work has been or is being performed and at completion of the Work.
  5. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform particular construction operation, including installation, erection, application, and similar operations.
  6. Observation: Visual observation of building / site elements or structural system by registered design professional for general conformance to approved construction documents at significant construction stages and at completion. Observation does not include or waive responsibility for performing inspections or special inspections.
  7. Owner's Representative: Owner's Designated Representative (Project Manager or Facilities Manager) who will have express authority to bind Owner with respect to all matters requiring Owner's approval or authorization.
  8. Preconstruction Testing: Tests and inspections that are performed specifically for Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
  9. Product Testing: Tests and inspections that are performed by testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
  10. Relative Compaction: Ratio of field dry density as determined by ASTM D6938 or ASTM D2216, and laboratory maximum dry density as determined by ASTM D698 or ASTM D1557.
  11. Quality Assurance: Testing, Inspections, Special Testing and Special Inspections provided for by Owner.
  12. Quality Control: Testing, Inspections, Special Testing and Special Inspections provided for by Contractor.
  13. Service Provider: Agency or firm qualified to perform required tests and inspections.
  14. Source Quality Control Testing: Tests and inspections that are performed at source, i.e., plant, mill, factory, or shop.
  15. Special Inspection: See Inspection.
  16. Special Inspector: Certified individual or firm that implements special inspection program for project.
  17. Special Test: See Test.
  18. Test/Special Test: Field or laboratory tests to determine characteristics and quality of building materials and workmanship.
    - a. Test: Not required by code provisions but may be required by Contract Documents.
    - b. Special Test: Required by code provisions and by Contract Documents.
  19. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
  20. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
  21. Verification: Act of reviewing, inspecting, testing, etc. to establish and document that product, service, or system meets regulatory, standard, or specification requirements.

C. Reference Standards:

1. ASTM International (Following are specifically referenced for fill and aggregate base testing):
  - a. ASTM D698-12, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>))'.
  - b. ASTM D1556-07, 'Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method'.

- c. ASTM D1557-12, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>))'.
  - d. ASTM D2167-08, 'Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method'.
  - e. ASTM D2216-10, 'Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass'.
  - f. ASTM D2487-11, 'Standard Classification of Soils for Engineering Purposes (Unified Soil Classification System)'.
  - g. ASTM D3666-13, 'Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials'.
  - h. ASTM D3740-12a, 'Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction'.
  - i. ASTM D6938-10, 'Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)'.
  - j. ASTM E329-14a, 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing'.
  - k. ASTM E543-13, 'Standard Specification for Agencies Performing Nondestructive Testing'.
  - l. ASTM E1212-12, 'Standard Practice for Quality Management Systems for Nondestructive Testing Agencies'.
2. International Code Council (IBC) (2006):
    - a. IBC Chapter 17, 'Structural Tests and Special Inspections'.

### 1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
  1. Participate in pre-installation conference as specified in Section 31 0501.
  2. In addition to agenda items specified in Section 01 3100, Section 31 0501, and Section 31 2324 if Flowable Fill is included, review following:
    - a. Review backfill requirements.
    - b. Review Geotechnical Evaluation Report.
    - c. Review Section 01 4523 for Testing and Inspection administrative requirements and responsibilities and Field Quality Control tests and inspections required of this section.
      - 1) Review frequency of testing and inspections.
- B. Sequencing:
  1. Do not backfill against bituminous dampproofing for twenty four (24) hours after application of dampproofing.
  2. Before backfilling, show utility and service lines being covered on record set of Drawings. Do not backfill until utilities involved have been tested and approved by Architect and until instructed by Architect.
- C. Scheduling:
  1. Notify Testing Agency and Architect seventy two (72) hours minimum before installation of fill / engineered fill to perform proctor and plasticity index tests on proposed fill or subgrade.
  2. Notify Testing Agency and Architect twenty four (24) hours minimum before installation of fill / engineered fill to allow inspection.
  3. Allow special inspector to review all subgrades and excavations to determine if site has been prepared in accordance with geotechnical report prior to placing any fill (or concrete).
  4. Allow inspection and testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after inspections and test results for previously compacted work comply with requirements.

### 1.4 SUBMITTALS

- A. Closeout Submittals:
  1. Include following in Operations And Maintenance Manual specified in Section 01 7800:



- a. Record Documentation:
  - 1) Testing and Inspection Reports:
    - a) Testing Agency Testing and Inspecting Reports of fill / engineered fill.

## 1.5 QUALITY ASSURANCE

- A. Testing and Inspection:
  - 1. Owner will provide Testing and Inspection for fill / engineering fill:
    - a. Owner will employ testing agencies to perform testing and inspection for fill / engineering fill as specified in Field Quality Control in Part 3 of this specification.
      - 1) Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform the Work in strict accordance with requirements of Contract Documents and perform contractor testing and inspection.
      - 2) See Section 01 1200: 'Multiple Contract Summary'.
    - b. Owner's employment of an independent Testing Agency does not relieve Contractor of Contractor's obligation to perform testing and inspection as part of his Quality Control.
      - 1) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Imported Fill / Backfill:
  - 1. Well graded material conforming to ASTM D2487 free from debris, organic material, frozen materials, brick, lime, concrete, and other material which would prevent adequate performance of backfill.
    - a. Under Building Footprint And Paved Areas: Fill shall comply with soil classification groups GW, CL, GP, GM, SW, SP, or SM. Fill may not contain stones over 6 inches diameter and ninety five (95) percent minimum of fill shall be smaller than 1-1/2 inch in any direction.
    - b. Under Landscaped Areas:
      - 1) Fill more than 36 inches below finish grade shall comply with soil classification groups GW, CL, GP, GM, SW, SP, or SM. Fill may not contain stones over 6 inches diameter and ninety (90) percent minimum of fill shall be smaller than 1-1/2 inch in any direction.
      - 2) Fill less than 36 inches below finish grade shall comply with soil classification groups SW, SP, SM, or SC. Fill may not contain stones larger than 1-1/2 inches in any direction and ninety (90) percent minimum of fill shall be smaller than 3/8 inch in any direction.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Before placing fill, aggregate base, or finish work, prepare existing subgrade as follows:
  - 1. Remove and replace subgrade material which has become frozen, desiccated, saturated or disturbed prior to construction.
  - 2. Proof-rolling:
    - a. Prior to scarifying evaluate by proofing in presence of Geotechnical Engineer. Remove and replace material which fails test. Use unit price for cut and fill to adjust contract amount.
  - 3. Under Building Slab and Equipment Pad Areas:
    - a. Scarify subgrade 8 inches deep, moisture condition to uniform moisture content of between optimum and four (4) percent over optimum, and mechanically tamp 6 inches deep to ninety five (95) percent minimum of relative compaction.
  - 4. Under Miscellaneous Concrete Site Elements And Outside Face of Foundation Walls
    - a. Scarify subgrade 8 inches deep, moisture condition to uniform moisture content between optimum and four (4) percent over optimum, and mechanically tamp to ninety (90) percent minimum of relative compaction.
  - 5. Landscape Areas:

- a. Compact subgrade to eighty five (85) percent relative compaction.

### 3.2 PERFORMANCE

#### A. Interface With Other Work:

1. Section 31 2213: 'Rough Grading' for rough grading and preparation of natural soil subgrades below fill and aggregate base materials.
2. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
3. Section 31 2324: 'Flowable Fill' for backfilling of piping systems and other utilities under paving'.

#### B. Fill / Backfill:

##### 1. General:

- a. Around Buildings And Structures: Slope grade away from building as specified in Section 31 2216. Hand backfill when close to building or where damage to building might result.
- b. Site Utilities:
  - 1) In Landscape Areas: Use backfill consisting of on-site soil.
  - 2) Under Pavement and Concrete Site Elements: Extend excavatable flowable fill / backfill to elevation of subgrade. Do not place aggregate base material until excavatable flowable fill / backfill has cured seventy two (72) hours.
- c. Do not use puddling or jetting to consolidate fill areas.

##### 2. Compacting:

##### a. Fill / Backfill And Aggregate Base:

- 1) All fill material shall be well-graded granular material with maximum size less than 3 inch and with not more than fifteen (15) percent passing No. 200 sieve.
- 2) Under Building Slab and Equipment Pad Areas:
  - a) Place in 8 inch maximum layers, moisture condition to plus or minus two (2) percent of optimum moisture content, and mechanically tamp to ninety six.five (96.5) percent minimum of maximum laboratory density as established by ASTM D698.
- 3) Under Driveways And Parking Areas:
  - a) Place in 8 inch (200 mm) maximum layers, dampen but do not soak, and mechanically tamp to ninety five (95) percent minimum of maximum laboratory density as established by ASTM D698.
- 4) Under Miscellaneous Concrete Site Elements And Outside Face of Foundation Walls:
  - a) Place in 8 inch maximum layers, dampen but do not soak, and mechanically tamp to ninety (90) percent minimum of maximum laboratory density as established by ASTM D698.
- 5) Utility Trenches:
  - a) Site:
    - (1) Place fill in 12 inch layers and moisture condition to plus or minus two (2) percent of optimum moisture content.
    - (2) Compact fill to ninety (90) percent minimum relative compaction to within 12 inches of finish grade.
    - (3) Compact fill above 12 inches to eighty five (85) percent relative compaction.
  - b) Under Slabs:
    - (1) Under Slabs: Place fill in 6 inch layers, moisture condition to plus or minus two (2) percent of optimum moisture content, and compact to ninety five (95) percent minimum relative compaction to within 4 inches of finish grade.
    - (2) Final 4 inches of fill shall be aggregate base as specified in Section 31 1123.
- 6) Fill Slopes: Compact by rolling or using sheepsfoot roller.
- 7) Backfill Under Footings:
  - a) Place in 8 inch maximum layers, moisture condition to plus or minus two (2) percent of optimum moisture content, and mechanically tamp to ninety five (95) percent minimum of maximum laboratory density as established by ASTM D698.
- 8) Landscape Areas:
  - a) Compact fill to eighty five (85) percent minimum relative compaction.
- 9) Other Backfills: Place other fills in 12 inch layers and compact to 90 percent relative compaction.

- 10) Loose material from compacted subgrade surface shall be immediately removed before placing compacted fill or aggregate base course.

### 3.3 REPAIR / RESTORATION

- A. Repair damage to other portions of the Work resulting from work of this Section at no additional cost to Owner. On new work, arrange for damage to be repaired by original installer.

### 3.4 FIELD QUALITY CONTROL

- A. Field Tests and Inspections:

1. General:

- a. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
- b. Quality Control is sole responsibility of Contractor as specified in Section 01 4523 'Testing And Inspection Services'.

2. Fill / Engineered Fill:

- a. Testing Agency shall provide testing and inspection for fill.
- b. Number of tests may vary at discretion of Architect.
- c. Testing Agency is to provide one (1) moisture-maximum density relationship test for each type of fill material.
- d. Prior to placement of engineered fill, inspector shall determine that site has been prepared in accordance with geotechnical report.
- e. Footing subgrade: At footing subgrades Certified Inspector is to verify that soils conform to geotechnical report.
- f. Testing Agency will test compaction of soils according to ASTM D1556, ASTM D2167, and ASTM D6938, as applicable. Lift thicknesses shall comply with geotechnical report. Inspector shall determine that in-place dry density of engineered fill material complies with geotechnical report. Tests will be performed at following locations and frequencies:
  - 1) Paved Areas: At each compacted fill and backfill layer, at least one (1) test for every **10,000 sq. ft.** or less of paved area but in no case less than three (3) tests.
  - 2) Building Slab Areas: At each compacted fill and backfill layer, at least on test for every **2,500 sq. ft.** or less of building slab area but in no case less than three (3) tests.
  - 3) Foundation Wall/Continuous Footing Backfill: At each compacted backfill layer, at least one (1) test for each **40 linear feet** or less of wall length, but no fewer than two (2) tests.
  - 4) Trench Backfill: At each **12 inch** compacted lift for each **100 linear feet** or less of trench length but no fewer than two (2) tests.
  - 5) Sidewalks, Curbs, Gutters, Exterior Pads: Minimum of one (1) test for each lift for each **40 lineal feet** or one (1) test for every **5,000 sq. ft.** or less of pad area but no fewer than three (3) tests.

Required verification and inspection of soils as referenced in 2006 IBC Table 1704.7 'Required Verification And Inspection Of Soils'. Periodic and continuous inspections include:

- 1) Verify materials below shallow foundations are adequate to achieve design bearing capacity (periodic).
- 2) Verify excavations are extended to proper depth and have reached proper material (periodic).
- 3) Perform classification and testing of compacted fill materials (periodic).
- 4) Verify use of proper materials, densities and lift thicknesses during placement and compaction of compacted fill (continuous).
- 5) Prior to placement of compacted fill, observe subgrade and verify that site has been prepared properly (periodic).

**3.5 CLEANING**

- A. Debris and material not necessary for Project are property of Contractor and are to be removed before completion of Project. However, if material necessary for Project is hauled away, replace with specified fill / backfill material.

**END OF SECTION**

**BLANK PAGE**

**SECTION 31 2324****FLOWABLE FILL****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install cement stabilized sand as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 01 3100: 'Project Management and Coordination' for pre-installation conference.
  - 2. Section 01 4000: 'Quality Requirements' for administrative and procedural requirements for quality assurance and quality control.
  - 3. Section 01 4301: 'Quality Assurance – Qualifications' establishes minimum qualification levels required.
  - 4. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
  - 5. Section 01 7800: 'Closeout Submittals'.
  - 6. Section 31 0501: 'Common Earthwork Requirements' for:
    - a. General procedures and requirements for earthwork.
    - b. Pre-installation conference held jointly with other common earthwork related sections.
  - 7. Section 31 1123: 'Aggregate Base' for aggregate base requirements.
  - 8. Section 31 2213: 'Rough Grading' for grading and preparation of natural soil subgrades below fill and aggregate base materials.
  - 9. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
  - 10. Section 31 2316: 'Excavation'.
  - 11. Performance of backfilling and compacting inside and outside of building required for electrical and mechanical work is responsibility of respective Section doing work unless arranged differently by Contractor.

**1.2 REFERENCES**

- A. Association Publications:
  - 1. American Concrete Institute, Farmington Hills, MI [www.concrete.org](http://www.concrete.org). Abstracts of ACI Periodicals and Publications.
    - a. ACI 229R-99, *Controlled Low-Strength Materials* (Reapproved 2005).
- B. Definitions:
  - 1. Controlled Low Strength Material, (CLSM): Self-leveling and selfcompacting, cementitious material.
  - 2. Excavatable Flowable Fill: Unconfined compressive strength of **150 psi** or less. Strengths exceeding this limit can be excavated using mechanical equipment, depending on mix composition and equipment. Due to continued strength-gaining characteristics of component materials such as fly ash and slag, excavatability of mixtures exceeding **150 psi** should be proven prior to final placement.
  - 3. Excavatability: Material property which relates to ease at which material may be removed.
  - 4. Flowability: Material property which relates to rheology of material.
  - 5. Flowable fill: Cementitious slurry consisting of mixture of fine aggregate or filler, water, and cementitious material(s), which is used as fill or backfill in lieu of compacted earth. This mixture is capable of filling all voids in irregular excavations and hard to reach places (such as under undercuts of existing slabs), is self-leveling, and hardens in matter of few hours without need for compaction in layers. Flowable fill is sometimes referred to as excavatable flowable fill, controlled density fill (CDF), controlled low strength material (CLSM), lean concrete slurry, and unshrinkable

fill. Flowable fill is not concrete nor used to replace concrete. It is intended to contain low cementitious content for reduced strength development.

C. Reference Standards:

1. ASTM International (Following are specifically referenced for fill and aggregate base testing):
  - a. ASTM C33/C33M-13, 'Standard Specification for Concrete Aggregates'.
  - b. ASTM C40/C40M-11, 'Standard Test Method for Organic Impurities in Fine Aggregates for Concrete'.
  - c. ASTM C42/C42M-13, 'Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete'.
  - d. ASTM C94/C94M-13b, 'Standard Specification for Ready-Mixed Concrete'.
  - e. ASTM C123/C123M-12, 'Standard Test Method for Lightweight Particles in Aggregate'.
  - f. ASTM C142/C142M-10, 'Standard Test Method for Clay Lumps and Friable Particles in Aggregates'.
  - g. ASTM C150/C150M-12, 'Standard Specification for Portland Cement'.
  - h. ASTM D558-11, 'Standard Test Methods for Moisture-Density (Unit Weight) Relations of Soil-Cement Mixtures'.
  - i. ASTM D1632-07, 'Standard Practice for Making and Curing Soil-Cement Compression and Flexure Test Specimens in the Laboratory'.
  - j. ASTM D1633-00(2007), 'Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders'.
  - k. ASTM D2487-11, 'Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)'.
  - l. ASTM D3665-12, 'Standard Practice for Random Sampling of Construction Materials'.
  - m. ASTM D4318-10, 'Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils'.
  - n. ASTM D6938-10, 'Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)'.

### 1.3 ADMINISTRATIVE REQUIREMENTS

A. Pre-Installation Conferences:

1. Participate in pre-installation conference in conjunction with Section 31 2323.
2. In addition to agenda items specified in Section 01 3100, Section 31 2323, and Section 31 0501, review following:
  - a. Review backfill requirements.

### 1.4 SUBMITTALS

A. Informational Submittals:

1. Design Data:
  - a. Submit mix designs to meet following requirements:
    - 1) Excavatable Fill (Flowable/Controlled Low Strength Materials CLSM):
      - a) Provide mix designs for review.
2. Design Data:
  - a. Submit mix designs to meet following requirements:
    - 1) Excavatable Fill (Flowable/Controlled Low Strength Materials CLSM):
      - a) Provide target cement content and production data for sand-cement mixture in accordance with requirements as specified in Part 2 of this specification.
    - 2) Cement Stabilized Sand:
      - a) Design will be based on strength specimens molded in accordance with ASTM D558 at moisture content within 3 percent of optimum and within four (4) hours of batching.
        - (1) Design will be based on strength specimens molded in accordance with ASTM D558 at moisture content within three (3) percent of optimum and four (4) hours of batching.

- (2) Determine minimum cement content from production data and statistical history. Provide no less than 1.1 sacks of cement per ton of dry sand.

## 1.5 DELIVERY, STORAGE, AND HANDLING

### A. Storage And Handling Requirements:

1. Dosage capsules have storage tolerance in temperature range of 0 deg F to 55 deg F

## PART 2 - PRODUCTS

### 2.1 MATERIALS

#### A. Cement Stabilized Sand:

1. Cement: Type I Portland cement conforming to ASTM C150/C150M.
2. Sand:
  - a. Clean, durable sand meeting grading requirements for fine aggregates of ASTM C33/C33M, and the following requirements:
    - 1) Classified as SW, SP, SW-SM, SP-SM, or SM by Unified Soil Classification System of ASTM D2487.
    - 2) Maximum compressive strength of 125 psi maximum at 28 days.
    - 3) Minimum compressive strength of 65 psi maximum at 28 days.
    - 4) Deleterious Materials:
      - a) Clay lumps, ASTM C142/C142M less than 0.5 percent.
      - b) Lightweight pieces, ASTM C123/C123M less than 5 percent.
      - c) Organic impurities, ASTM C40/C40M color no darker than standard color.
    - 5) Plasticity index of 4 or less when tested in accordance with ASTM D4318.
3. Water: Potable water, free of oils, acids, alkalies, organic matter or other deleterious substances, meeting requirements of ASTM C94/C94M.

#### B. Excavatable Flowable Fill /Controlled Low Strength Materials CLSM:

1. Excavatable application:
2. Follow recommendations of ACI 229R.
3. Contain maximum of 50 lbs to 100 lbs of cement per yard of flowable fill / backfill
4. Air content:
  - a. General:
    - 1) Stable air content of fifteen (15) to thirty five (35) percent.
  - b. Darafill:
    - 1) Stable air content of twenty (20) percent, Darafill dosage as necessary.
5. Fly ash:
  - a. Fly ash between 0 to 900 lbs per cu yd
  - b. When using less than 75 lbs per cu yd of Portland cement, combined quantity of Portland cement and fly ash must be at least 100 lbs per cu yd.
6. Water content:
  - a. Select water content as necessary to produce consistency that will result in flowable, self-leveling product at time of placement.
  - b. Maximum water content of 36 gallons per yard of backfill.
7. Slump: 7 inch minimum.
8. Type Two Acceptable Products:
  - a. Darafill by W R Grace & Co, Cambridge, MA [www.na.graceconstruction.com](http://www.na.graceconstruction.com).
  - b. Equal as approved by Architect before use. See Section 01 6200.

### 2.2 MIXING MATERIALS

#### A. Cement Stabilized Sand:

1. Add required amount of water and mix thoroughly in pug mill-type mixer.



2. Stamp batch ticket at plant with time of loading. Reject material not placed and compacted within four (4) hours after mixing.

## 2.3 MIXING QUALIFICATION

### A. Cement Stabilized Sand:

1. Determine target cement content of material as follows:
  - a. Obtain samples of sand-cement mixtures at production facility representing range of cement content consisting of at least three (3) points.
  - b. Complete molding of samples within four (4) hours after addition of water.
  - c. Perform strength tests (average of two (2) specimens) at forty eight (48) hours and seventy (7) days.
  - d. Perform cement content tests on each sample.
  - e. Perform moisture content tests on each sample.
  - f. Plot average forty eight (48) hour strength vs. cement content.
  - g. Record scale calibration date, sample date, sample time, molding time, cement feed dial settings, and silo pressure (if applicable).
2. Test raw sand for following properties at point of entry into pug-mill:
  - a. Gradation.
  - b. Plasticity index.
  - c. Organic impurities.
  - d. Clay lumps and friable particles.
  - e. Lightweight pieces.
  - f. Moisture content.
  - g. Classification.
3. Present data obtained in format similar to that provided in sample data form attached to this Section.
4. Target content may be adjusted when statistical history so indicates. For determination of minimum product performance use formula:
  - a.  $f_c\% \ 1/2 \text{ standard deviation.}$

## PART 3 - EXECUTION

### 3.1 PERFORMANCE

#### A. Interface With Other Work:

1. Section 31 2323: 'Fill'.

#### B. Fill / Backfill:

- a. Site Utilities:
  - 1) In Landscape Areas: Use backfill consisting of on-site soil.
  - 2) Under Pavement and Concrete Site Elements: Extend excavatable flowable fill / backfill to elevation of subgrade. Do not place aggregate base material until excavatable flowable fill / backfill has cured seventy two (72) hours.
- b. Do not use puddling or jetting to consolidate fill areas.

### 3.2 PLACING

#### A. Cement Stabilized Sand:

1. Place sand-cement mixture in maximum **12 inch** thick loose lifts and compact to ninety five (95) percent of maximum density as determined in accordance with ASTM D558, unless otherwise specified:
  - a. Refer to related specifications for thickness of lifts in other applications.
  - b. Target moisture content during compaction is +3 percent of optimum.
  - c. Perform and complete compaction of sand-cement mixture within four (4) hours after addition of water to mix at plant.
2. Do not place or compact sand-cement mixture in standing or free of water.

### 3.3 FIELD QUALITY CONTROL

#### A. Testing:

1. Testing will be performed under provisions of Section 01 4523 'Testing Laboratory Services':
  - a. One (1) sample of cement stabilized sand shall be obtained for each **150 tons** of material placed per day with no less than one (1) sample per day of production.
  - b. Random samples of delivered cement stabilized sand shall be taken in field at point of delivery in accordance with ASTM D3665.
  - c. Obtain three (3) individual samples of approximately **12 lb to 15 lbs** each from first, middle, and last truck and composite them into one (1) sample for testing purposes.
2. Prepare and mold four (4) specimens (for each sample obtained) in accordance with ASTM D558, Method A, without adjusting moisture content. Samples will be molded at approximately same time material is being used, but no later than four (4) hours after water is added to mix.
3. After molding, specimens will be removed from molds and cured in accordance with ASTM D1632.
4. Specimens will be tested for compressive strength in accordance with ASTM D1633, Method A. Two (2) specimens will be tested at forty eight (48) hours, plus or minus two (2) hours and two (2) specimens will be tested at seven (7) days, plus or minus four (4) hours.
5. Strength test will be average of strengths of two (2) specimens molded from same sample of material and tested at same age. Average daily strength will be average of strengths of all specimens molded during one (1) day's production and tested at same age.
6. Precision and Bias: Test results shall meet recommended guideline for precision in ASTM D1633 Section 9.
7. Reporting: Test reports shall contain, as a minimum, following information:
  - a. Supplier and plant number.
  - b. Time material was batched.
  - c. Time material was sampled.
  - d. Specification section number.
  - e. Indication of compliance / non-compliance.
  - f. Mixture identification.
  - g. Required strength.
  - h. Compressive strength data as required by ASTM D1633.
  - i. Supplier mixture identification.
  - j. Specimen diameter and height, **in.**
  - k. Specimen cross-sectional area, **sq in**

### 3.4 ACCEPTANCE

- A. Strength level of material will be considered satisfactory if:
  1. Maximum compressive strength of **125 psi** maximum at twenty eight (28) days.
  2. Minimum compressive strength of **65 psi** maximum at twenty eight (28) days.
- B. Testing laboratory shall notify Architect/Engineer of tests indicating results falling below specified strength requirements within twenty four (24) hours.
- C. If any strength test of laboratory cured specimens falls below the specified strength, Contractor may, at his own expense, request test of cores drilled from the area in question in accordance with ASTM C42/C42M. In such cases, three (3) cores shall be taken for each strength test that falls below values given in paragraph A above.
- D. Cement stabilized sand in an area represented by core tests shall be considered satisfactory if the average of three (3) cores is equal to at least **100 psi** and if no single core is less than **70 psi**. Additional testing of cores extracted from locations represented by erratic core strength results will be permitted.

**END OF SECTION**

**BLANK PAGE**

**SECTION 31 2500****EROSION AND SEDIMENTATION CONTROLS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Provide permanent erosion and sedimentation controls as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 01 5700: Temporary Erosion and Sedimentation Control.
  - 2. Section 02 4113: Selective Site Demolition.
  - 3. Section 31 0501: Common Earthwork Requirements.
  - 4. Section 31 1100: Clearing and Grubbing.
  - 5. Section 31 1413: Topsoil Stripping And Stockpiling.
  - 6. Section 32 9300: Sections under heading.

**1.2 REFERENCES**

- A. References:
  - 1. United States Environmental Protection Agency:
    - a. EPA Document 832/R-92-005 (Sep 1992), 'Storm Water Management for Construction Activities.'

**1.3 SUBMITTALS**

- A. Informational Submittals:
  - 1. Delegated Design Submittals:
    - a. Sediment and erosion control plan, specific to site, meeting following objectives:
      - 1) Prevent loss of soil, including soil stockpiled for reuse, by storm water runoff and wind erosion.
      - 2) Prevent sedimentation of storm sewers and receiving streams.
      - 3) Prevent air pollution by dust and particulate matter.

**1.4 QUALITY ASSURANCE**

- A. Regulatory Agency Sustainability Approvals:
  - 1. Sediment and erosion control shall conform to EPA Document 832/R-92-005, Chapter 3, or local erosion and sedimentation control standards, whichever is more stringent.
- B. Qualifications:
  - 1. Supervisor of erosion control operations shall be thoroughly familiar with types of erosion control materials being installed and best methods for their installation. Supervisor shall be present when work of this Section is being performed and shall direct work performed under this Section.

**PART 2 - PRODUCTS****2.1 SYSTEM**

- A. Design Criteria:
  - 1. Protect and maintain areas disturbed by the Work, so erosion is adequately controlled and silt and sediments are not allowed to flow into any watercourse, onto adjacent properties, or into storm drains.

**B. Materials:****1. Hay And Straw Mulch:****a. General:**

- 1) Reasonably free from swamp grass, weeds, twigs, debris and other deleterious materials, and free from rot, mold, primary noxious weed seeds, and rough or woody materials.
- 2) Mulches containing mature seed of species which would volunteer and be detrimental to permanent seeding, or would result in over-seeding, or would produce growth which is aesthetically unpleasing, is not permitted.

**b. Hay Mulch:**

- 1) Properly aired native hay, Sudan grass hay, broom sedge hay, legume hay, or similar hay or grass mowings.
- 2) Apply at **2 to 3 tons** per acre unnetted or stabilized, or at **1.5 tons** per acre when net or mulch stabilizer is used. When air-dried and in loose state, contents of representative bale shall lose not more than 15 percent of resulting air-dry weight of bale.

**c. Straw Mulch:**

- 1) Threshed plant residue of oats, wheat, barley, rye, or rice from which grain has been removed.
- 2) Apply at **2 to 3 tons** per acre unnetted or stabilized, or at **1.5 tons** per **acre** when net or mulch stabilizer is used.

**d. Matting:****1) Jute Matting:**

- a) Undyed and unbleached jute yarn woven into uniform open, plain weave mesh and furnished in rolled strips. Matting shall conform to following physical requirements:
- b) **48 inch** wide, plus or minus **one inch**.
- c) 78 warp ends per width of cloth.
- d) 41 weft ends per yard.
- e) **1.22 lbs to 1.80 lbs** per lineal yard, plus or minus 5 percent.

**e. Excelsior Matting:**

- 1) Uniform web of interlocking wood excelsior fibers with a backing of mulch net fabric on one side only and furnished in rolled strips. Mulch net shall be woven of either twisted paper or cotton cord. Matting shall conform to following physical requirements:
  - a) **36 inches** wide, plus or minus **one inch**.
  - b) **0.8 lbs** per sq yd, plus or minus 5 percent.

**f. Soil Erosion Matting:**

- 1) Type Two Acceptable Products.
  - a) 'Enkamat Type 7020' by American Enka Company.
  - b) Equal as approved by Architect before use. See Section 01 6200.

**g. Erosion Control Mulching Blanket:**

- 1) Type Two Acceptable Products.
  - a) 'Hold/Gro' by Gulf States Paper Corp.
  - b) Equal as approved by Architect before use. See Section 01 6200.

**2. Seed And Sod For Erosion Control:**

- a. For Temporary Control: Annual or perennial ryegrass.
- b. For Permanent Control: See Sections under 32 9300 heading.

**3. Hay Bales For Erosion Control:**

- a. Rectangular shaped bales of hay or straw, weighing at least **40 lbs** per bale, free from primary noxious weed seeds and rough or woody materials.

**4. Silt Fences:****a. Type Two Acceptable Products**

- 1) 'Geofab Silt Fence' by Mercantile Development Inc.
- 2) 'Mirafi 100X' by Celanese Fibers Marketing Co.
- 3) Equal as approved by Architect before use. See Section 01 6200.

**2.2 ACCESSORIES****A. For Mulch:****1. Mulch Stabilizers:**

- a. Type Two Acceptable Products
  - 1) 'Curasol' applied at 40 gallons per acre.
  - 2) Dow 'Mulch Binder' applied at 45 gallons per acre.
  - 3) Asphalt binder meeting requirements of AASHTO M140, Type SS-1 or RS-1 as applicable and applied at 400 gallons per acre.
  - 4) Equal as approved by Architect before use. See Section 01 6200.
2. Temporary Type Mulch Nets: Paper yarn, approximately 0.05 inches in diameter, woven into net with openings of approximately 7/8 inch by 1/2 inch and weight of approximately 0.2 lbs per sq yd.
3. Permanent Type Mulch Nets:
  - a. Type Two Acceptable Products:
    - 1) 'Vexar' or 'Erosion-Net' plastic or nylon mesh netting with openings of approximately 3/8 inch to 3/4 inch.
    - 2) Equal as approved by Architect before use. See Section 01 6200.
- B. For Matting / Blankets:
  1. Staples: 11 ga minimum plain iron wire, made from 12 inch minimum lengths of wire bent to form 'U' of 1-1/2 inches to 2 inches in width with equal legs of 5 inch to 5-1/4 inches. Use longer staples for loose soils or where otherwise required.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General:
  1. Take every reasonable precaution to avoid erosion and to prevent silting of rivers, streams, lakes, reservoirs, impoundments, and drainage ditches and swales.
  2. Keep exposure of uncompleted cut slopes, embankments, trench excavations, and site graded areas as short as possible. Initiate seeding and other erosion control measures on each segment as soon as reasonably possible.
  3. Should it become necessary to suspend construction for any length of time, shape excavated and graded areas so runoff will be intercepted and diverted to points where minimal erosion will occur. Provide and maintain temporary erosion and sediment control measures, such as berms, dikes, slope drains, silt stops, and sedimentation basins, until permanent drainage facilities or erosion control features have been completed and are operative.
  4. Handle and treat fine material placed or exposed during The Work so as to minimize possibility of it reaching surface waters. Use diversion channels, dikes, sediment traps, or other effective control measures.
  5. Provide silt stops wherever erosion control measures may not be totally capable of controlling erosion, such as in drainage channels and where steep slopes may exist.
  6. Before water is allowed to flow in any ditch, swale, or channel, install permanent erosion control measures in waterway so waterway will be safe against erosion.
  7. Take precautions in using construction equipment to minimize erosion. Do not leave wheel tracks where erosion might begin.
  8. Unless specifically required in Contract Documents, operation of mechanized equipment in watercourses is not permitted. Where work is required in watercourses, minimize movement of equipment in the water and remove false work, pilings, debris, and other temporary work as soon as construction will allow.
  9. Wherever crossings of live streams are necessary, provide temporary culverts or bridges to allow equipment to cross them without fording. Disturbance of lands and waters outside limits of construction is prohibited, except as may be found necessary and approved in writing by Architect.
  10. Mulching shall follow seeding operations by no more than 24 hours.
  11. Continue erosion control measures until permanent measures have been sufficiently established and are capable of controlling erosion on their own.
- B. Hay And Straw Mulching:

1. Install hay or straw mulch immediately after areas have been properly prepared.
  - a. When permanent seed or seed for temporary erosion control is sown prior to placing mulch, place mulch on seeded areas within 24 hours after seeding.
  - b. Architect may authorize blowing of chopped mulch provided that 95 percent of mulch fibers will be **6 inches** or more in length and that mulch can be applied in so there will be a minimum amount of matting that would retard plant growth.
  - c. Hay mulch should cover ground enough to shade it, but should not be so thick that a person standing cannot see ground through mulch.
  - d. Remove matted mulch or branches.
2. Where mild winds that may blow mulch are probable, when ground slopes exceed 15 percent, or when otherwise required to maintain mulch firmly in place, apply a system of pegs and strings, a chemical stabilizer, or temporary type netting to mulch. Unless otherwise directed, remove strings and netting prior to acceptance of the Work.
3. Where high winds or heavy rainstorms are likely, where ground surfaces are steeper than 15 percent, or where other conditions require, apply temporary type netting over mulch and take whatever other measures are necessary to maintain mulch firmly in place.
4. Unless otherwise specified, use of permanent type netting is not permitted without prior written approval of Architect.

C. Matting:

1. General:
  - a. Use of mulch with matting is not permitted. However, **4 to 6 inch** overlap of mulch over edge of matting is allowed.
  - b. Prepare surfaces of ditches and slopes to conform to grades, contours, and cross sections shown on Drawings. Finish to smooth, even condition with debris, roots, stone, and lumps raked out and removed. Loosen soil surface sufficient to permit bedding of matting. Unless otherwise noted, place seed prior to placement of matting.
  - c. Unroll matting parallel to direction of water flow and loosely drape, without folds or stretching, so continuous ground contact is maintained.
  - d. In ditches and swales and on slopes, place each upslope and each downslope end of each piece of matting in 6 inch trench, stapled at **12 inches** on center, backfilled, and tamped. Similarly, bury edges of matting along edges of catch basins and other structures. Architect may require that other edges exposed to more than normal flow of water be buried in similar fashion.
  - e. Tightly secure matting to soil with staples driven approximately vertically into ground, flush with matting surface. Do not form depressions or bulges in matting surface with staples.
  - f. Increase specified spacing of staples when factors such as season of year or amount of water encountered or anticipated require additional anchoring.
2. Jute Matting:
  - a. Where strips are laid parallel or meet, as in a tee, overlap **4 inches** minimum. Overlap ends **6 inches** minimum, shingle fashion.
  - b. Space check slots built at right angles to direction of water flow so one check slot or one end occurs within each **50 feet** of slope length. Construct check slots by placing tight fold of matting **6 inches** minimum vertically into ground. Tamp these same as upslope ends.
  - c. Press jute matting onto ground with light lawn roller or other satisfactory means.
  - d. On slopes flatter than 4:1, place staples **36 inches** apart maximum in three rows for each strip, with one row along each edge and one row alternately spaced down center. On grades 4:1 or steeper, place staples in the same three rows, but spaced **24 inches** apart. On lapping edges, reduce spacing of staples by half. At ends of matting and at required check slots, space staples **12 inches** apart. Staple matting placed adjacent to boulders or other obstructions with no spaces between staples.
  - e. Spread additional seed over jute matting, particularly those locations disturbed by building of slots.
3. Excelsior Matting:
  - a. Where strips of excelsior matting are laid end-to-end, butt adjoining ends.
  - b. When adjoining rolls of excelsior matting are laid parallel to one another, butt matting snugly.
  - c. On slopes flatter than 4:1, place staples **36 inches** maximum apart in three rows for each strip, with one row along each edge and one row alternately spaced down center. On grades 4:1 or steeper, place staples in same three rows, but spaced **24 inches** apart. Space

staples in ends of matting **12 inches** apart. Staple matting placed adjacent to boulders or other obstructions with no spaces between staples.

4. Erosion Control Mulching Blanket:

- a. Where one roll ends and second roll begins, bring end of upslope piece over end of downslope roll so there is **12 inch** overlap. Place overlap in **4 inch** deep trench, staple at **12 inches** on center, and backfill and tamp.
- b. On slopes where two or more widths of blanket are applied, overlap edges **4 inches** and staple at **12 inch** intervals along exposed edge of lap joint.
- c. Staple body of blanket in grid pattern with staples **36 inches** on center, each way.

D. Seed For Erosion Control:

1. Seeding for permanent erosion control shall be carried out in accordance with appropriate Section under 32 9300 heading.
2. Areas that will be regraded or otherwise disturbed later during construction may be seeded with rye grass to obtain temporary control. Sow seed at **one lb** per **1,000 sq ft**, on pure live seed basis.

E. Hay Bales And Silt Fences:

1. Provide hay bales or silt fences, as required, for temporary control of erosion and to stop silt and sediment from reaching surface waters, adjacent properties, or entering catch basins, or damaging the Work.
2. Stake hay bales firmly in place. Use sufficient number of bales to accommodate runoff without causing flooding and to adequately store any silt, sediment, and debris reaching them.
3. Erect silt fences and bury bottom edge in accordance with Manufacturer's recommended installation instructions. Provide sufficient length of fence to accommodate runoff without causing flooding and to adequately store any silt, sediment, and debris reaching it.

### 3.2 REPAIR / RESTORATION

- A. If any staple becomes loosened or raised, if any matting becomes loose, torn, or undermined, or if any temporary erosion and sediment control measures are disturbed, repair them immediately.
- B. If seed is washed out before germination, repair damage, refertilize, and reseed.
- C. Maintain mulched and matted areas, silt stops, and other temporary control measures until permanent control measures are established and no further erosion is likely.

**END OF SECTION**



**BLANK PAGE**

**SECTION 31 3116****TERMITE CONTROL****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install complete soils treatment with termiticide under and adjacent to building to provide uniform toxic barrier continuous treated zone in all routes of termite entry.
- B. Related Requirements:
  - 1. Section 31: Earthwork.
    - a. Section 31 0501: 'Common Earthwork Requirements'.
    - b. Section 31 1123: 'Aggregate Base':
      - 1) Installation of below-grade vapor retarder.
    - c. Section 31 2216: 'Fine Grading'.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate soil treatment application with excavation, filling, grading, and concreting operations. Treat soil under footings and ground-supported slabs before construction.
  - 2. Interior slab-on-grade concrete:
    - a. Coordinate work so vapor retarder can be installed as soon as possible after application of termite protection on top of soil base or aggregate base.
- B. Pre-Installation Conference:
  - 1. Participate in mandatory pre-installation conference.
  - 2. Schedule pre-installation conference for new Projects after completion of Fine Grading specified in Section 31 2216, but before beginning Aggregate Base as specified in Section 31 1123. This conference may be held jointly with pre-installation conference for Common Planting Requirements specified in Section 32 9001.
  - 3. In addition to agenda items specified in Section 01 3100, review following:
    - a. Review Applicator Qualification requirements.
    - b. Review Ambient Conditions for acceptability for application of termiticide products.
    - c. Review Delivery, Storage, and Handling requirements.
    - d. Review Examination, Preparation, and Application requirements as called out in Part 3 Execution.
- C. Review Field Quality Control and Protection requirements as called out in Part 3 Execution.
- Sequencing:
  - 1. Application OPTION A:
    - a. Apply termite protection on top of soil base before aggregate base and vapor retarder is installed.
  - 2. Application OPTION B:
    - a. Install vapor retarder after application of termite protection on top of aggregate base.
    - b. Increase application rate for volume as per Manufacturer's instruction.
    - c. Install below-grade vapor retarder on top of soil base or aggregate base.

**1.3 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:

- a. Submit Chemical Manufacturer's printed literature regarding chemical composition, concentration, and rates and method of application.
  - b. Submit MSDS information.
- B. Informational Submittals:
1. Certificates:
    - a. Provide certificates required by any authorities having jurisdiction (AHJ).
  2. Design Data Submittals:
    - a. Certified Applicator's statement indicating total amount of chemical required for Project to provide required amount of mix solution at specified concentration and application rates.
    - b. Certified Applicator to submit take-off showing amounts of square foot and lineal foot application at specified application rate. Also indicate total amount of mix solution required for Project.
  3. Manufacturers' Instructions:
    - a. Manufacturer's printed label on product regarding chemical composition, concentration, and rates and method of application.
  4. Qualification Submittals:
    - a. Provide BASF Partner Number and evidence of license from authorities having jurisdiction (AHJ).
- C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Warranty Documentation:
      - 1) Include copy of final, executed warranty.
    - b. Record Documentation:
      - 1) Soil Treatment Application Report: After application of termiticide is complete, submit report including the following:
        - a) Date and time of application.
        - b) Moisture content of soil before application.
        - c) Termiticide brand name and batch number of concentrate.
        - d) Mix rate and quantity of diluted termiticide used.
        - e) Areas of application.
        - f) Weather at time of application.
        - g) Water source for application.

## 1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
1. Formulate and apply termiticides and termiticide devices according to the EPA-Registered Label.
- B. Qualifications:
1. Applicator: Requirements of Section 01 4301 applies but not limited to the following:
    - a. Applicator shall be licensed pest professional according to regulations of authorities having jurisdiction (AHJ) with Manufacturer's Certification training in correct application methods to apply termite control treatment and products in jurisdiction where Project is located.
    - b. Applicator should be familiar with trenching, rodding, short rodding, subslab injection, low-pressure banded surface applications, and foam delivery techniques.
- C. Source Limitations:
1. Obtain termite control products from single source from single manufacturer.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery, Storage, and Handling:
1. Certified Applicator responsible for delivery, storage, handling, and dispose of specified products of this section.

**B. Storage And Handling Requirements:**

1. Storage:
  - a. Keep containers closed when not in use.
  - b. Store unused product in original container only, out of reach of children and animals.
  - c. Do not store near food or feed.
  - d. Protect from freezing.
2. Spills or leaks:
  - a. General:
    - 1) In case of spill or leak on floor or paved surfaces, soak up with sand, earth, or synthetic absorbent.
    - 2) Avoid skin contact.
    - 3) Remove residue to chemical waste area.
    - 4) Ensure adequate decontamination of tools and equipment following cleanup.
  - b. All leaks resulting in application of this product in locations other than those prescribed must be cleaned up prior to leaving application site.
    - 1) DO NOT allow people or pets to contact contaminated areas until cleanup is completed.

**C. Packaging Waste Management:**

1. Disposal:
  - a. Dispose of empty containers in accordance with Manufacturer's and regulatory agency's requirements.
  - b. Do not contaminate water, food, or feed by storage or disposal.

**1.6 FIELD CONDITIONS****A. Ambient Conditions**

1. Comply with EPA-Registered Label and requirements of authorities having jurisdiction (AHJ) and Manufacturer's written recommendations regarding environmental conditions under which termiticide shall be applied.

**B. Environmental Limitations:**

1. To ensure penetration, do not treat soil that is water saturated or frozen.
2. Do not treat soil (or aggregate base) while precipitation is occurring or movement from treatment area (site) is likely to occur.
3. Do not treat soil (or aggregate base) while large precipitation is expected to occurring within two to four (2-4) hours after application.

**1.7 WARRANTY****A. Manufacturer Warranty:**

1. Provide Manufacturer's written warranty:
  - a. Warranty shall guarantee effectiveness of treatment against subterranean termite infestation for five (5) years minimum from acceptance date of Project and be signed by applicator and Contractor as co-guarantors.
  - b. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

**PART 2 - PRODUCTS****2.1 MATERIALS****A. Termiticide:**

1. Description:
  - a. Provide EPA-Registered termiticide, complying with requirements of authorities having jurisdiction (AHJ), in aqueous solution formulated to prevent termite infestation.

- b. Provide quantity required for application at label volume and rate for maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.
2. Design Criteria:
  - a. Undetectable:
    - 1) Non-repellent or undetectable chemical technology.
  - b. Transfer Effect:
    - 1) Slow-acting treatment allowing individual termite's ample time to transfer treatment to other termites as they come in contact within the colony.
  - c. Service Life of Treatment:
    - 1) Soil treatment termiticide that is effective for not less than five (5) years against infestation of subterranean termites.
3. Mixes:
  - a. Mix chemicals and water at Manufacturer's recommended printed requirements.
    - 1) To provide maximum control and protection against termite infestation, apply as per Manufacturer printed instructions including but not limited to the following:
      - a) To maximize termiticide potency, product should be applied in manner to provide continuous treated zone to prevent termites from infesting wood to be protected.
      - b) Product is labeled for use at 0.06 percent, 0.09 percent or 0.125 percent finished dilution. The 0.06 percent finished dilution should be used for typical control situations. Where severe termite infestations, problem soils, or difficult construction types are encountered, it may be advisable to use either 0.09 percent or 0.125 percent.
4. Category Four Approved Product. See Section 01 6200 for definitions of Categories. (No substitution of specified product or alteration of Manufacturer's application requirements is allowed):
  - a. Termidor by BASF Professional Pest Control, Research Triangle Park, NC  
[www.termidorhome.com](http://www.termidorhome.com), or [www.pestcontrol.basf.us](http://www.pestcontrol.basf.us).

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Evaluation And Assessment:
  1. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label requirements, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.
  2. Proceed with application only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Protection Of In-Place Conditions:
  1. Allow no disturbance of treated soil (aggregate base) between application of solution and placing of concrete. (Disturbed defined as removing fill and/or replacing fill).
  2. Protect neighboring property, water sources, and personnel on site from contamination.
    - a. Use anti-backflow equipment or procedures.
    - b. Do not treat soil beneath structures that contain wells or cisterns.
    - c. Take extreme care to avoid runoff. Do not treat soil that is water-saturated or frozen.
  3. Maintain, on job site, empirical name of chemical, Manufacturer's precautions, and phone numbers of proper authorities to notify in case of spillage or other accident.
- B. General Preparation:
  1. Comply with the most stringent requirements of authorities having jurisdiction (AHJ) and with Manufacturer's written instructions for preparation before beginning application of termite control treatment.

2. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, trash, and construction waste wood from soil within and around foundations.
  3. Do not apply application of termite control until location of air ducts, vents, water, and sewer lines are known and identified. Take extreme caution to avoid contamination of these structural elements and airways.
- C. Soil Treatment Preparation:
1. Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated.
  2. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings.
  3. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.
  4. Fit filling hose connected to water source at site with backflow preventer, complying with requirements of authorities having jurisdiction (AHJ).

### 3.3 APPLICATION

- A. Interface With Other Work:
1. Interior slab-on-grade concrete:
    - a. Installation of vapor retarder, geomembrane if used, and aggregate base.
- B. General:
1. Comply with the most stringent requirements of authorities having jurisdiction (AHJ) and with Manufacturer's EPA-Registered Label for products.
    - a. Application Restrictions:
      - 1) Do not apply while precipitation is occurring or large precipitation is expected to occurring within two to four (2-4) hours after application'.
      - 2) Do not contaminate water, food or feed. Cover or remove all exposed food, feed and drinking water.
      - 3) Do not apply with **15 feet** of bodies of fresh water lakes, reservoirs, rivers, permanent streams, marshes, and natural ponds.
      - 4) Do not allow residents, children, other persons or pets into immediate area during application.
      - 5) Do not allow residents, children, other persons or pets into treated area until sprays have dried. After application, applicator is required to check for leaks resulting in deposition of treatment dilution in locations other than those prescribed.
      - 6) Do not apply to wasp or hornet nests if they are not attached to structure exterior or inside wall voids.
      - 7) Do no treat within distance of **one foot** out from drip line of edible plants.
      - 8) Do not spray air conditioning units or air intake vents.
      - 9) Doors and windows adjacent to application site must be closed during surface application.
  2. Application OPTION B as specified in Sequencing of this specification in Part 1 General:
    - a. Increase application rate for volume as per Manufacturer's instruction.
- C. Applying Soil Treatment:
1. Mix treatment termiticide solution to a uniform consistency.
  2. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.
  3. If impervious soils make reduction in volume of solution necessary, increase percentage of toxicant used in proportion to insure same amount of insecticide be used per linear or square **foot**.
  4. Apply overall treatment to entire surface to be covered by concrete slab.

- D. Pre-Construction Treatment:
  - 1. For Slab-on-Grade Construction:
    - a. 4 gallons per 10 linear ft along outside of exterior foundation.
    - b. One gallon per 10 sq ft as overall treatment under slab and attached porches.
    - c. 4 gallons per 10 linear ft along inside of exterior foundation walls, both sides of interior partition foundation walls, and around utility services and other features that will penetrate slab or where there will be break in concrete (grade changes, zip strips, cold joints, etc.).
- E. Treatment For Existing Construction:
  - 1. Use sub-slab injection, rodding, or trenching with low-pressure spray.
  - 2. 4 gallons per 10 linear ft along outside of exterior foundation walls.
  - 3. At locations of termite activity in building interior, expose or penetrate areas of termite activity within building and treat at rate of 4 gallons per 10 sq ft for 2 feet in two or more directions radiating from site.

### 3.4 RE-APPLICATION

- A. Reapply treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

### 3.5 FIELD QUALITY CONTROL

- A. Non-Conforming Work. Non-conforming work as covered in the General Conditions applies, but is not limited to the following:
  - 1. Applicator:
    - a. Substitution of specified product or alteration of Manufacturer's application requirements is considered defective or not complying with Contract Document requirements. Correct such work at no cost to the Owner.

### 3.6 PROTECTION

- A. Allow sufficient time (12 hours minimum) for drying after application before resuming construction activities.
- B. Keep off treated areas until completely dry. Do not allow workers or other personnel to enter treatment area until chemical has been absorbed into soil.
- C. Protect application areas from precipitation as recommended by Manufacturer.
- D. Protect termiticide solution, dispersed in treated soils and fill, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.
- E. Post signs in areas of application warning of poison application. Remove signs when areas with application are covered by other construction.

**END OF SECTION**

**SECTION 32 3113****CHAIN LINK FENCES AND GATES****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install complete fence and gates as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 05 0503: 'Shop-Applied Metal Coatings' for priming and galvanizing repair.
  - 2. Section 05 0523: 'Metal Fastening' for welding requirements.

**1.2 REFERENCES**

- A. Association Publications: / Organizations:
  - 1. Chain Link Fence Manufacturers Institute (CLFMI), Columbia, MD [www.chainlinkinfo.org](http://www.chainlinkinfo.org).
    - a. WLG 2445, '*Chain Link Fence Wind Load Guide for the Selection of Line Post and Line Post Spacing*' (2012).
    - b. CLF-SFR0111, '*Chain Link Fence Manufacturers Institute Security Fencing Recommendations*'.
    - c. CLF-PM0610, '*Field Inspection Guide*'.
    - d. CLF-TP0211, '*Tested and Proven Performance of Security Grade Chain Link Fencing Systems*'.
- B. Reference Standards:
  - 1. ASTM International:
    - a. ASTM A123/A123M-12, 'Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products'.
    - b. ASTM A153/A153M-09, 'Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware'.
    - c. ASTM A392-11a, 'Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric'.
    - d. ASTM A1011/A1011M-12b, 'Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength'.
    - e. ASTM C1107/C1107M-13, 'Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)'.
    - f. ASTM F1043-12, 'Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework'.
    - g. ASTM F1083-10, 'Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures'.

**1.3 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data: Manufacturer literature or cut sheets on fence components.



**PART 2 - PRODUCTS****2.1 ASSEMBLIES****A. Materials:**

1. Fabric:
  - a. Chain link fabric of **9 ga** wire, galvanized before or after weaving with **1.2 ounce** zinc coating conforming to requirements of ASTM A392, Class I.
  - b. Mesh:
    - 1) Without Visual Privacy / Security slats:
      - a) **2 inch** square mesh or **3-1/2 inch by 5 inch** mesh as selected by Architect.
  - c. Knuckle both selvages.
2. Framework:
  - a. Posts and rails shall be roll-formed, self-draining shapes meeting strength requirements of ASTM F1043, Table 3, and with **2 ounce (56.7 grams)** zinc coating per **1 sq ft** of surface area conforming to ASTM A123/A123M.
  - b. Line Posts:
    - 1) Line Posts **8 feet** and under:
      - a) **1.875 by 1.625 inch** C-section roll formed from steel conforming to ASTM A1011/A1011M, Grade 45, with minimum theoretical bending strength of **247 lbs** under **6 foot** cantilever load.
      - b) **2.375 inch** outside diameter Schedule 40 tubular section weighing **3.65 lbs** per lineal **1 ft** meeting requirements of ASTM F1083.
      - c) **2.375 inch** outside diameter Schedule 40 tubular section weighing **3.12 lbs** per lineal **1 ft** formed from steel meeting requirements of ASTM A1011/A1011M.
  - c. Terminal And Gate Posts:
    - 1) Gate posts and gate posts for gate leaves under **6 feet** wide:
      - a) **3 inch** outside diameter Schedule 40 pipe weighing **5.79 lbs** per lineal **1 ft** meeting requirements of ASTM F1083.
      - b) **3 inch** outside diameter Schedule 40 tubular section weighing **4.64 lbs** per lineal **1 ft** formed from steel meeting requirements of ASTM A1011/A1011M.
  - d. Top And Brace Rail:
    - 1) **1.660 inch** outside diameter Schedule 40 pipe weighing **2.27 lbs** per lineal **1 ft** meeting requirements of ASTM F1083.
    - 2) **1.660 inch** outside diameter Schedule 40 tubular section weighing **1.84 lbs** per lineal **1 ft** formed from steel meeting requirements of ASTM A1011/A1011M.
  - e. Fittings:
    - 1) Pressed steel or malleable iron, hot-dip galvanized conforming to ASTM A153/A153M.
    - 2) Tie wires shall be **12 ga** minimum galvanized steel or **9 ga** minimum aluminum wire.
  - f. Tension Wire: **7 ga** minimum galvanized spring steel.
3. Gate Leafs Wider Than **6 Feet**:
  - a. Fabricate perimeter frames from metal and finish to match fence framework. Assemble frames by welding or with special fittings and rivets, for rigid connections, providing security against removal or breakage connections.
    - 1) Provide same fabric as for fence. Install fabric with stretcher bars at vertical edges and at top and bottom edges. Attach stretchers bars to frame at not more than **15 inches** on center.
  - b. Swing Gates: Fabricate perimeter frames of minimum **1.90 inches** OD pipe.
  - c. Gate Hardware: Provide hardware and accessories for each gate, galvanized per ASTM A153/A153M, and in accordance with following:
    - 1) Hinges: Size and material to suit gate size, non-lift-off type, offset to permit 180 degree gate opening. Provide 1-1/2 pair of hinges for each leaf over **6 foot** nominal height.
    - 2) Latch At Paving: Forked type or plunger-bar type to permit operation from either side of gate, with padlock eye as integral part of latch.
  - d. Keeper: Provide keeper for vehicle gates, which automatically engages gate leaf and holds it in open position until manually released.

- B. Mixes:
  - 1. Post Foundation Concrete:
    - a. One cu ft cement, 2 cu ft sand, 4 cu ft gravel, and 5 gallons minimum to 6 gallons maximum water.
    - b. Mix thoroughly before placing.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Fence shall be installed by mechanics skilled and experienced in erecting fences of this type and in accordance with Contract Documents.
  - 1. When general ground contour is to be followed, make changes of grade in gradual, rolling manner.
  - 2. Evenly space posts in line of fence a maximum of 10 feet center to center.
- B. Post Foundations:
  - 1. Except atop retaining walls, set posts with concrete post foundations as specified below:
    - a. Line Posts Diameter 8 inches Depth 36 inches.
    - b. Gate, End, And Corner Posts Diameter 12 inches Depth 42 inches.
    - c. Where fences are incorporated into slabs, measure post foundation depth from top of slab. Extend bottom of slab footing sufficient to allow specified amount of concrete around post. At existing slabs, install fence outside perimeter of slab.
- C. Fence:
  - 1. After posts have been permanently positioned and concrete cured for one (1) week minimum, install framework, braces, and top rail. Join top rail with 6 inch minimum couplings at not more than 21 foot centers.
  - 2. Stretch fabric by attaching one end to terminal post and supplying sufficient tension to other end of stretch so slack is removed.
    - a. Fasten fabric to line posts with tie wires. Pass ties over one strand of fabric and hook under line post flange.
    - b. Place one tie as close to bottom of fabric as is possible with additional ties equally spaced between top and bottom band on approximately equal spacing not to exceed 14 inches on center.
    - c. Attach fabric to roll formed terminals by weaving fabric into integral lock loops formed in post. Attach fabric to tubular terminals with tension bars and bands.
    - d. Hold fabric approximately 2 inches above finish grade line.
    - e. On top rail, space tie wires at no more than 24 inches on center.
    - f. Securely attach fittings and firmly tighten nuts.
- D. Gates:
  - 1. Weld gate frames and provide for free and easy operation.
  - 2. Provide gate latching device with padlocking capabilities. Provide cane bolt to engage sleeve set in concrete at double gates.
  - 3. Align top bar of gates with top rail of fence.
  - 4. Gates shall be plumb and on same plane as fence, both vertically and horizontally.
  - 5. Set gate stops and other catches in concrete.

### 3.2 CLEANING

- A. Spread dirt from foundation excavations evenly around surrounding area unless otherwise directed. Leave area free of excess dribbles of concrete, pieces of wire, and other scrap materials.

END OF SECTION

**BLANK PAGE**

## SECTION 32 8423

### UNDERGROUND SPRINKLERS

#### PART 1 - GENERAL

##### 1.1 SUMMARY

- A. Includes But Not Limited To:
  - 1. Furnish and install planting irrigation system as described in Contract Documents complete with accessories necessary for proper function.
- B. Related Requirements:
  - 1. Section 31 2213: 'Rough Grading'.
  - 2. Section 31 2216: 'Fine Grading'.
  - 3. Section 31 2316: 'Excavation'.
  - 4. Section 32 9001: 'Common Planting Requirements'.
    - a. Pre-installation conference held jointly with other common planting related sections.
  - 5. Section 32 9120: 'Topsoil And Placement' for topsoil evaluation and placement required for topsoil grading.
  - 6. Section 32 9121: 'Topsoil Physical Preparation' for physical preparation of topsoil (section included based on Topsoil Testing Report).
  - 7. Section 32 9122: 'Topsoil Grading' for preparation of topsoil and addition of amendments prior to landscaping.
  - 8. Section 32 9223: 'Sodding'.
  - 9. Section 32 9300: 'Plants'.

##### 1.2 REFERENCES

- A. Definitions:
  - 1. Automated Self Flushing Filter: Filter located immediately downstream from point of connection in-lieu of backflow prevention device for irrigation systems that utilize non-potable, secondary and/or reclaimed water that is automatically self flushing to control unwanted debris from infiltrating remaining irrigation system.
  - 2. Dielectric Fittings: Special type of fitting used between dissimilar metals to prevent galvanic action from causing corrosion failure.
  - 3. High Wind Area: As defined in this specification, area with average sustained wind speed of over 7.5 mph.
  - 4. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.
  - 5. Lateral Line: Downstream from electric control valves to pop-up spray heads and drip valve assemblies to emitters. Piping or tubing is under pressure during flow. In areas where potable or secondary water are used, pressure supply line shall be white. In areas where non-potable or reclaimed water are used, pressure supply line shall be purple.
  - 6. Main Line: Downstream from point of connection to electric control valves. Piping is under water-distribution-system pressure when activated by master valve or hydrometer. In areas where potable or secondary water are used, pressure supply line shall be white. In areas where non-potable or reclaimed water are used, pressure supply line shall be purple.
  - 7. Peak Flow: Maximum required flow for given month based on six (6) day week, nine (9) hour day watering window to be used for irrigation system design and to be used in hydraulic analysis.
  - 8. Point of Connection: Location where meter for irrigation system is located.
  - 9. Static Water Pressure: Pressure at point of connection when system is not operable.
  - 10. Working Pressure: Pressure at point of connection when system is operable.
- B. Definitions (Following are specifically referenced for testing):

1. Field Quality Control: Testing, Inspections, Special Testing and Special Inspections to assure compliance to Contract Documents.
2. Inspection: Inspection of materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved construction documents and referenced standards:
3. Installer: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform particular construction operation, including installation, erection, application, and similar operations.
4. Observation: Visual observation of building / site elements or structural system by registered design professional for general conformance to approved construction documents at significant construction stages and at completion. Observation does not include or waive responsibility for performing inspections or special inspections.
5. Owner's Representative: Owner's Designated Representative (Project Manager or Facilities Manager) who will have express authority to bind Owner with respect to all matters requiring Owner's approval or authorization.
6. Product Testing: Tests and inspections that are performed by testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
7. Quality Assurance: Testing, Inspections, Special Testing and Special Inspections provided for by Owner.
8. Quality Control: Testing, Inspections, Special Testing and Special Inspections provided for by Contractor.
9. Service Provider: Agency or firm qualified to perform required tests and inspections.
10. Test: Field or laboratory tests to determine characteristics and quality of building materials and workmanship.
11. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
12. Verification: Act of reviewing, inspecting, testing, etc. to establish and document that product, service, or system meets regulatory, standard, or specification requirements.

C. Reference Standards:

1. ASTM International:
  - a. ASTM D2564-12, 'Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems'.
  - b. ASTM E329-14a, 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing'.
  - c. ASTM F656-10, 'Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings'.

### 1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Provide Coordination for required tests and inspections as described under Field Quality Control in Part 3 EXECUTION for following:
  - a. Manufacturer's Field Service: Provide necessary manufacturer's field service.
  - b. Pressure Test: In presence of Landscape Architect or designated Representative(s), provide pressure test.
  - c. Substantial Completion Walkthrough: In presence of Landscape Architect or designated Representative(s), plan and provide walk through after completion of irrigation system.
  - d. Irrigation Final Acceptance: In presence of Landscape Architect or designated Representative(s), plan and provide final walk through after completion of all work listed on Substantial Completion walk through list provided by Landscape Architect.

B. Pre-Installation Conference:

1. Participate in pre-installation conference as specified in Section 32 9001.
  - a. Irrigation Subcontractor's Representative and Foreman responsible for installation of irrigation system required to be in attendance.
  - b. Schedule pre-installation conference before irrigation system installation begins.
  - c. In addition to agenda items specified in Section 01 3100, review following:

- 1) Architect or designated Representative will demonstrate or describe method to be used to maintain head spacing from concrete and to stabilize heads.
- 2) Within project site, provide one (1) installed example of each type of irrigation detail for review and approval by Architect and Owner prior to beginning site work.
- 3) Review required tests and inspections.

C. Sequencing:

1. Install sleeves before installation of cast-in-place concrete site elements and paving.

## 1.4 SUBMITTALS

A. Action Submittals:

1. Product Data:
  - a. Manufacturer's cut sheets for each element of system.
  - b. Parts list for operating elements of system.

B. Informational Submittals:

1. Manufacturer Instructions:
  - a. Manufacturer's printed literature on operation and maintenance of operating elements of system.
  - b. Instruction Manual:
    - 1) Includes complete directions for system operation and maintenance, including winterizing, controller program worksheet and scheduling based on local site specific conditions.
    - 2) Provide plant establishment schedule and long term maintenance establishment schedule.
  - c. Complete instructions on how to drain entire backflow preventer to prevent freezing.

C. Closeout Submittals:

1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
  - a. Operations And Maintenance Data:
    - 1) Include one (1) copy in Operations and Maintenance Manual specified in Section 01 7800.
    - 2) Instruction Manual.
    - 3) Manufacturer's printed literature.
    - 4) Manufacturer's cut sheets for each element of system.
    - 5) Manufacturer's parts list.
    - 6) Freezing prevention instructions.
    - 7) Record Drawings: As installation occurs, prepare accurate record drawing to be submitted before final inspection, including:
      - a) Detail and dimension changes made during construction.
      - b) Significant details and dimensions not shown in original Contract Documents.
      - c) Field dimensioned locations of valve boxes, manual drains, quick-coupler valves, control wire runs not in mainline ditch, soil moisture sensors (if soil moisture sensor technology is selected for site) and both ends of sleeves.
      - d) Take dimensions from permanent constructed surfaces or edges located at or above finish grade.
      - e) Take and record dimensions at time of installation.
      - f) Reduced copy of Record Drawings to **11 by 17 inches**, with color key circuits and laminated both sides with 5 mil thick or heavier plastic. Mount on **12 x 18 inch** hard board drilled with two (2) **1/2 inch** holes at top of board and hang on hooks in Custodial Room or location designated by Owner's Representative.
      - g) Two (2) additional reduced copies of Record Drawings to **11 by 17 inches**, with color key circuits, un-laminated, and un-mounted to be given to Owner's Representative.
  - 8) Photographs: Provide photographs prior to burial of key elements including but not limited to:
    - a) Valves.
    - b) Drains.

2. Final payment for system will not be authorized until Closeout Submittals are received and accepted by Architect.

## **1.5 QUALITY ASSURANCE**

- A. Regulatory Requirements:
  1. General:
    - a. Work and materials shall be in accordance with latest rules and regulations, and other applicable state or local laws.
    - b. Nothing in Contract Documents is to be construed to permit work not conforming to these codes.
- B. Qualifications: Requirements of Section 01 4301 applies, but not limited to following:
  1. Irrigation Subcontractor:
    - a. Company specializing in performing work of this section.
    - b. Minimum five (5) years experience in irrigation sprinkler installations.
    - c. Minimum five (5) satisfactorily completed irrigation sprinkler installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
    - d. Use trained personnel familiar with required irrigation sprinkler procedures and with Contract Documents.
  2. Irrigation Installer:
    - a. Perform installation under direction of foreman or supervisor.
    - b. Minimum three (3) years experience in irrigation sprinkler installations similar in size, scope, and complexity.
    - c. Upon request, submit documentation.

## **1.6 DELIVERY, STORAGE, AND HANDLING**

- A. Storage And Handling Requirements:
  1. Storage and handling during installation; protect materials from damage and prolonged exposure to sunlight.

## **1.7 WARRANTY**

- A. Manufacturer Warranty:
  1. Irrigation System:
    - a. Standard one (1) year guarantee stipulated in General Conditions Article 12.2 shall include:
      - 1) Filling and repairing depressions and replacing plantings due to settlement of irrigation system trenches.
      - 2) Adjusting system to supply proper coverage of areas to receive water.
      - 3) Ensuring system can be adequately drained.
    - b. Filling and repairing depressions and replacing plantings due to settlement of irrigation system trenches.
    - c. Adjusting system to supply proper coverage of areas to receive water.

## **PART 2 - PRODUCTS**

### **2.1 SYSTEM**

- A. Manufacturers:
  1. Manufacturer Contact List:
    - a. 3M, Austin, TX [www.3m.com/elpd](http://www.3m.com/elpd).
    - b. Action Machining Inc, Bountiful, UT [www.actionfilters.com](http://www.actionfilters.com).

- c. Amiad [www.amiadusa.com](http://www.amiadusa.com).
- d. Apollo Valves by Conbraco Industries, Matthews, NC [www.apollovalves.com](http://www.apollovalves.com).
- e. Carson Industries LLC, Glendora, CA [www.carsonind.com](http://www.carsonind.com).
- f. GPH Irrigation Products, Fontana, CA [www.gphirrigation.com](http://www.gphirrigation.com).
- g. Harrington Corporation (Harco), Lynchburg, VA [www.harcofittings.com](http://www.harcofittings.com).
- h. Hunter Industries, San Marcos, CA [www.hunterindustries.com](http://www.hunterindustries.com).
- i. HydroRain, North Salt Lake, UT [www.hydorain.com](http://www.hydorain.com).
- j. King Innovation, St Charles, MO [www.kinginovation.com](http://www.kinginovation.com).
- k. IPS Corporation, Compton, CA [www.ipscorp.com](http://www.ipscorp.com).
- l. Leemco, Colton, CA [www.leemco.com](http://www.leemco.com).
- m. Netafim, Inc. [www.netafimusa.com](http://www.netafimusa.com).
- n. Nibco Inc, Elkhart, IN [www.nibco.com](http://www.nibco.com).
- o. Northstar Industries, LLC, Methuen MA [www.northstarind.com](http://www.northstarind.com).
- p. Orbit Irrigation Products, Inc. Bountiful, UT [www.orbitonline.com](http://www.orbitonline.com).
- q. Paige Electric, Union, NJ [www.paigewire.com](http://www.paigewire.com).
- r. Rain Bird Sprinkler Manufacturing Corp, Glendora, CA [www.rainbird.com](http://www.rainbird.com).
- s. Salco by Weathermatic Irrigation Products, Garland, TX [www.weathermatic.com](http://www.weathermatic.com).
- t. Toro Company, Irrigation Div, Riverside, CA [www.toro.com](http://www.toro.com).
- u. T. Christy Enterprises, Inc. (Christy's), Anaheim, CA [www.tchristy.com](http://www.tchristy.com).
- v. Valve and Filter Corporation, Arvada, CO [www.valveandfilter.com](http://www.valveandfilter.com).
- w. Weathermatic Irrigation Products, Garland, TX [www.weathermatic.com](http://www.weathermatic.com).
- x. Wilkins a Zurn Company, Paso Robles, CA [www.zurn.com](http://www.zurn.com).

B. Materials:

- 1. Rock-Free Soil:
  - a. For use as backfill around PVC pipe.
- 2. Native Material:
  - a. Soil having rocks no larger than **1/2 inch** in any dimension.
- 3. Pea Gravel:
  - a. For use around drains, valves, and quick couplers.
  - b. **1/2 inch** maximum dimension, washed rock.
- 4. Sand: Fine granular material naturally produced by rock disintegration and free from organic material, mica, loam, clay, and other deleterious substances.
- 5. Native Material: Soil native to project site free of wood and other deleterious materials and rocks over **1-1/2 inches**.
- 6. Topsoil:
  - a. Use soil as described in Section 32 9120, Section 32 9121, and Section 32 9122.
  - b. Achieve depths as described in Section 32 9122.
- 7. Pipe, Pipe Fittings, And Connections:
  - a. General:
    - 1) Pipe shall be continuously and permanently marked with Manufacturer's name, size, schedule, type, and working pressure.
    - 2) Pipe sizes shown on Contract Drawings are minimum. Larger sizes may be substituted at no additional cost to Owner.
  - b. Piping:
    - 1) Main Line: Schedule 40 PVC.
    - 2) Lateral Lines: Schedule 40 PVC.
    - 3) Backflow Assembly Piping: Galvanized steel.
  - c. Fittings: Same material as pipe, except where detailed otherwise.
    - 1) Fittings **3 inch** or larger: Harco or Leemco of matching size.
  - d. Sleeves:
    - 1) Class 200 PVC Pipe.
    - 2) Sleeve diameter shall be two (2) times larger than pipe installed in sleeve.
- 8. Sprinkler Heads:
  - a. Each type of head shall be product of single manufacturer.
  - b. Shrub Head Bubblers:
    - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - a) Hunter: 2, 4, 6 Short Radius, S-8A, S-16A series (stream spray), PCN, PCB, MSBN, AFB, 5-CST-B series.
      - b) Rainbird: 1400 series pressure compensating.



- c) Weathermatic: 102 Series, 106 series.
- c. Spray Heads in Shrub and Ground Cover Areas:
  - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a) Hunter: PR30 or shrub adapter on Schedule 80 PVC nipple. Supply with MPR nozzles. CV optional.
    - b) Hydro-Rain: 200 series, 04, 06, 12 Model PRHS with shrub adapter No. 94525.
    - c) Rainbird: RD 1804, RD 1806, or RD 1812 PRS Series or PA-8S shrub adapter. Supply with MPR, U-series, or HE-VAN series nozzles. SAM optional.
    - d) Toro: 570 ZPRX MPR series with shrub adapter and MPR plus or Precision Series Spray nozzles.
    - e) Weathermatic: LX4 or LX6 series or LXS (shrub adapter). Supply with MPR nozzle.
- d. Spray Heads in Lawn Areas:
  - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a) Hunter: PRS30, Pro-Spray Series with MPR nozzles, optional with CV.
    - b) Hydro-Rain: HRS 200 Series, 04, 06 Model PRHS with MPR nozzle.
    - c) Rainbird: RD 1804 or RD 1806 Series with MPR, U-Series, or HE-VAN nozzles. SAM optional.
    - d) Toro: 570 ZPRX series with MPR plus or Precision Series Spray nozzles.
    - e) Weathermatic: LX4 or LX6 series with MPR nozzles.
- e. Rotary Stream Heads in Lawn and Shrub Areas:
  - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a) Hunter: PRS40 with MP Rotator nozzle.
    - b) Rainbird: 1806-SAM-P45 with R13-18 or R17-24 nozzles.
    - c) Toro: 570 ZPRX Series with Precision Series Rotating nozzles.
- f. Rotor Pop-ups:
  - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - a) Hunter: PGS Series (Shrub), PGP Series (17 to 46 feet), I-10 Series (Shrub) I-20 Series (17 to 46 feet), I-25 or I-40 Series (40 to 76 feet).
    - b) Rainbird: 5000/5000 plus MPR series, (25'-35'), 5500 Series (33'-55') 8005 Series (39'-81').
    - c) Toro: Mini 8 series (20-35 feet), Super 800 (28'-50') series with 5 inch pop.
    - d) Weathermatic: T3 (23'-61'), CT-70 series, (49'-74').
- 9. Sprinkler Risers:
  - a. Spray Heads (Pre-Manufactured Swing Assemblies):
    - 1) Type Two Acceptable Products:
      - a) Hunter: SJ-512 (12 inch x 1/2 inch thread) or SJ-7512 (12 inch x 3/4 inch x 1/2 inch thread).
      - b) Rain Bird model SA125050.
      - c) Hydorain: Blu-lock model BLJ-050-MC-1..
      - d) Equal as approved by Architect before use. See Section 01 6200.
  - b. Spray Heads (Field Manufactured Assemblies):
    - 1) Three (3) schedule 40 street ells or Marlex street ells connected to lateral tee to form an adjustable riser or pop-up riser as detailed.
    - 2) Risers for sprinkler heads 14 inches long minimum and 24 inches maximum.
      - a) Type Two Acceptable Products:
        - (1) Hunter: FLEXsg tubing with HSBE spiral barbed fittings.
        - (2) Hydro-Rain: Blu-lock Swing pipe & fittings.
        - (3) Rainbird: Swing Pipe with barbed fittings.
        - (4) Toro: Super Funny Pipe with barbed fittings, SPFA-5125, SPFA-51275.
        - (5) Equal as approved by Architect before installation. See Section 01 6200.
  - c. Rotor Pop-Up Sprinklers (Pre-Manufactured Assemblies):
    - 1) Type Two Acceptable Products:
      - a) 3/4 inch rotor pop-up sprinklers shall have an adjustable pre-assembled swing assembly riser. Swing assemblies shall be 3/4 inch x 12 inch and shall be threaded both ends. Swing assemblies shall be:
        - (1) Blu-lock: Model BLJ-075-TT-12.
        - (2) Rain Bird: Model TSJ-12075.
        - (3) Hunter: SJ-712 12 inch thread.

- b) **1 inch** inlet rotor pop-up sprinklers shall have an adjustable pre-assembled double swing joint riser. Swing joints shall be **1 inch x 12 inch** and shall be threaded both ends. Swing joint riser shall be:
          - (1) Rain Bird: Model TSJ-12075.
          - (2) Equal as approved by Architect before installation:
    - d. Rotor Pop-Up Sprinkler Heads (Field Manufactured Assemblies):
      - 1) Pop-up rotor sprinkler heads shall have adjustable riser assembly, three (3) ell swing joint assembly, unless detailed otherwise on Contract Drawings:
        - a) These swing joint fittings shall be of schedule 40 PVC plastic and nipples schedule 80 gray PVC unless otherwise designated on Contract Drawings.
        - b) Horizontal nipple parallel to side of lateral line shall be **8 inches** long minimum.
        - c) All other nipples on swing joint riser shall be of length required for proper installation of sprinkler heads.
10. Automatic Irrigation Controller And Control Wiring:
- a. Control Wiring:
    - 1) Wiring:
      - a) Traditional control wire shall be UF-UL listed, color coded PE insulated copper conductor direct burial size 14. For wire runs exceeding **3,300 feet**, use 12 AWG wire. Do not use green color coded wire.
    - 2) Waterproof Wire Connectors:
      - a) Control wire connections shall consist of properly-sized wire nut inserted in waterproof grease cap:
      - b) Type Two Acceptable Products:
      - c) Valve Box Support:
        - (1) DBY or DBR by 3M.
        - (2) 'One Step' 20111SP by King Innovation.
        - (3) DB 57905, 57505 by Orbit.
        - (4) Equal as approved by Architect before installation. See Section 01 6200.
11. Valves:
- a. Manual Drain Valves:
    - 1) Brass ball valve with 'T' handle on main lines and in valve boxes on lateral lines.
    - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - a) Apollo Valves: 78-621-01 Series ball valve, **3/4 inch**.
  - b. Automatic Valves:
    - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - a) Hunter: PGV or ICV series. If required, provide with Accu-sync pressure regulator.
      - b) Hydro-Rain: HRB series.
      - c) Rainbird: DVFUU Series, PGA series, PEB series, PESB series. If required, provide with Accu-sync pressure regulator.
      - d) Toro: 252E Series.
      - e) Weathermatic: 21000 CR series, 11000 CR series.
  - c. Isolation Valves:
    - 1) PVC ball valves, size to match pipe size (use in warm climates- eco-regions 8.2, 10.2, 11.0, 12.0, 13.0, 14.0, 15.0).
    - 2) Non-rising stem gate valve, size to match pipe size (use in cold, northern climates- eco-regions 1.0, 5.0, 6.0, 7.0, 9.1, 9.2, and 10.1).
    - 3) Class Two Quality Standards. See Section 01 6200:
      - a) Nibco: 4660T (warm climates).
      - b) Nibco: T-113 (cold, northern climates).
12. Valve Accessories:
- a. Valve manifolds:
    - 1) Type Two Acceptable Products.
      - a) Action Machining: 1800 Series, Models 18001, 18001-1-5, and 18001-2.0, **1, 1-1/2, and 2 inch** sizes.
      - b) Hydro-Rain: HRM Series.
      - c) Equals as approved by Architect before use. See Section 01 6200.
  - b. Valve Boxes And Extensions:
    - 1) Lid Colors:
      - a) Green: Lawn areas (potable and secondary water).

- b) Tan: Bare soil and rock areas (potable and secondary water).
    - c) Purple: Reclaimed water.
  - 2) Type Two Acceptable Products:
    - a) Carson Industries:
      - (1) 12 Inch Model 1419-12.
      - (2) 10 Inch Model 0910.
    - b) Hydro-Rain: ProSeries:
      - (1) 12 inch VB1419 (standard).
      - (2) 10 inch VB 0910.
    - c) Rainbird:
      - (1) 12 Inch Model PVB (standard).
      - (2) 10 Inch Model PVB (round).
    - d) Equal as approved by Architect before use. See Section 01 6200.
  - c. Valve ID tags:
    - 1) Type Two Acceptable Products:
      - a) Christy's: Stamped ID tag.
      - b) Equal as approved by Architect before use. See Section 01 6200.
  - d. Valve Box Supports:
    - 1) Standard size fired clay paving bricks without holes.
    - 2) Standard size 6 inch x 8 inch x 16 inch CMU Block.
- 13. Drip System:
  - a. Drip Valve Assembly:
    - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - a) Hunter: PCZ 101 Series, ICZ 101 Series.
      - b) Netafim:
        - (1) Over 4 GPM: LVCZ10075-HF.
        - (2) Under 4 GPM: LVCZ10075-LF.
      - c) Rainbird:
        - (1) Over 6 GPM: XCZ-150-PRB-COM series (15-40 gpm).
        - (2) Over 4 GPM: XCZ-100-B COM series (3-20 gpm).
        - (3) Under 4 GPM: XCZ-075-PRF series.
      - d) Toro:
        - (1) Over 8 GPM: DZK-700-1-MF.
        - (2) Under 8 GPM: DZK-700-1-LF.
  - b. Distribution Tubing (from lateral lines to emitter):
    - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - a) GPH: GPST IH Series, pre-assembled flexible riser w/fittings (size as required).
      - b) Salco: IH Series, pre-assembled flexible riser with fittings (size as required).
      - c) Rainbird: SPX swing pipe with barbed fittings.
      - d) Hunter: SJ Series with barbed fittings.
  - c. Drip Emitters:
    - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - a) GPH: GPST-CV Series.
      - b) Rainbird: XBT Series.
      - c) Salco: PST-CV Series.
  - d. Indicator Emitter:
    - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
      - a) Tree drip indicator:
        - (1) Rainbird: XB-10PC with barbed fittings, DBC-025 diffuser cap, TS-025 stake, and XQ 1/4 inch tubing.
  - e. Valve Box Supports:
    - 1) Standard size fired clay paving bricks without holes.
    - 2) Standard size 6 inch x 8 inch x 16 inch CMU Block.
- 14. Solvent Cement:
  - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
    - 1) Primer:
      - a) Meet ASTM F656 standard and applicable sections of latest edition of 'Uniform Plumbing Code'.
      - b) Meet NSF/ANSI standard for use on potable water applications.
      - c) Low VOC emissions and compliant with LEED.

- d) Product: Weld-On P-70 primer by IPS.
- 2) PVC Solvent Cement:
  - a) Heavy bodied, medium setting, high strength:
    - (1) Meet ASTM D2564 standard and applicable sections of latest edition of *'Uniform Plumbing Code'*.
    - (2) Meet NSF/ANSI standard for use on potable water applications.
    - (3) Meet CSA standards for use in pressure and non-pressure potable water applications.
    - (4) Low VOC emissions and compliant with LEED.
    - (5) Product: Weld-On 711 Low VOC PVC Cement by IPS.
  - b) Flexible, medium bodied, fast setting, high strength (flexible pipe only):
    - (1) Meet ASTM D2564 standard and applicable sections of latest edition of *'Uniform Plumbing Code'*.
    - (2) Meet NSF/ANSI standard for use on potable water applications.
    - (3) Low VOC emissions and compliant with LEED.
    - (4) Product: Weld-On 795 Low VOC Flex PVC Cement by IPS.
- 15. Other Components:
  - a. Recommended by Manufacturer and subject to Architect's review and acceptance before installation.
  - b. Provide components necessary to complete system and make operational.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verification Of Conditions:
  - 1. Perform pressure test at stub-out on main water line provided for irrigation system, or at near-by fire hydrant.
  - 2. Notify Architect if pressures over **70 psi** or under **55 psi** are found to determine if some re-design of system is necessary before beginning work on system.

### 3.2 PREPARATION

- A. Protection:
  - 1. Protection Of In-Place Conditions:
    - a. Repair or replace work damaged during course of Work at no additional cost to Owner. If damaged work is new, installer of original work shall perform repair or replacement.
    - b. Do not cut existing tree roots measuring over **2 inches** in diameter in order to install irrigation lines.
- B. Surface Preparation:
  - 1. Layout of Irrigation Heads:
    - a. Location of heads and piping shown on Contract Drawings is approximate. Actual placement may vary slightly as is required to achieve full, even coverage without spraying onto buildings, sidewalks, fences, etc.
    - b. During layout, consult with Architect to verify proper placement and make recommendations, where revisions are advisable.
    - c. Minor adjustments in system layout will be permitted to avoid existing fixed obstructions.
    - d. Make certain changes from Contract Documents are shown on Record Drawings.

### 3.3 INSTALLATION

- A. Trenching And Backfilling:
  - 1. Pulling of pipe is not permitted.

2. Excavate trenches to specified depth. Remove rocks larger than **1-1/2 inch** in any direction from bottom of trench. Separate out rocks larger than **1-1/2 inch** in any direction uncovered in trenching operation from excavated material and remove from areas to receive landscaping.
  3. Cover pipe both top and sides with **2 inches** of rock-free soil or sand as specified under PART 2 PRODUCTS. Remainder of backfill to topsoil depth as specified in Section 32 9122 using native material as specified under PART 2 PRODUCTS and topsoil as specified in Section 32 9120, Section 32 9121 and Section 32 9122.
  4. Do not cover pressure main, irrigation pipe, or fittings until Architect has inspected and approved system.
- B. Sleeving:
1. Sleeve water lines and control wires under walks and paving. Extend sleeves **6 inches** minimum beyond walk or pavement edge. Cover sleeve ends until pipes and wires are installed to keep sleeve clean and free of dirt and debris.
  2. Position sleeves with respect to buildings and other obstructions so pipe can be easily removed.
- C. Grades And Draining:
1. In localities where winterization is required, grade piping so system can be completely drained or blown out with compressed air. If system is not designed to be blown out with compressed air:
    - a. Slope pipe to drain to control valve box where possible.
    - b. Where this is not possible, slope pipe to minimum number of low points. At these low points, install:
      - 1) **3/4 inch** brass ball valve for manual drain. Do not use automatic drain valves.
      - 2) Install **2 inch** Class 200 PVC pipe over top of drain and cut at finish grade.
      - 3) Provide rubber valve cap marker.
      - 4) Provide **one cu ft** pea gravel sump at outlet of each drain.
    - c. Slope pipes under parking areas or driveways to drain outside these areas.
- D. Installation of Pipe:
1. Install pipe in manner to provide for expansion and contraction as recommended by Manufacturer.
  2. Unless otherwise indicated on Contract Drawings, install main lines with minimum cover of **18 inches** based on finished grade. Install lateral lines, including those connecting drip tubing, with minimum of **12 inches** of cover based on finish grade.
  3. Install pipe and wires under driveways or parking areas in specified sleeves **18 inches** below finish grade or as shown on Contract Drawings.
  4. Locate pipe so no sprinkler head will be closer than **12 inches** from building foundation.
  5. Cut plastic pipe square. Remove burrs at cut ends before installation so unobstructed flow will result.
  6. Make solvent weld joints as follows:
    - a. Do not make solvent weld joints if ambient temperature is below **35 deg F**.
    - b. Clean mating pipe and fitting with clean, dry cloth and apply one (1) coat of primer to each surface.
    - c. Apply uniform coat of solvent cement to outside of pipe.
    - d. Apply solvent cement to fitting in similar manner.
    - e. Insert pipe completely into fitting.
    - f. Give pipe or fitting quarter turn to insure even distribution of solvent and make sure pipe is inserted to full depth of fitting socket.
    - g. Allow joints to set at least twenty four (24) hours before applying pressure to PVC pipe.
  7. Tape threaded connections with teflon tape.
- E. Control Valves And Control Valve Wiring:
1. Install valves in plastic boxes with reinforced heavy duty plastic covers. Locate valve boxes within **12 inches to 24 inches** of sidewalks and shrub bed edges with tops at finish grade. Do not install more than two (2) valves in single box.
  2. Place **3 inches** minimum of pea gravel below bricks supporting valve boxes to drain box. Set valve boxes over valve so all parts of valve can be reached for service. Set cover of valve box even with finish grade. Valve box cavity shall be reasonably free from dirt and debris.
  3. Wiring:

- a. For traditional wiring, tape control wire to side of main line every **10 feet**. Where control wire leaves main or lateral line, enclose it in gray conduit.
  - b. Use waterproof wire connectors consisting of properly-sized wire nut and grease cap at splices and locate all splices within valve boxes.
  - c. Use white or gray color for common wire and other colors for all other wire. Each common wire may serve only one (1) controller.
  - d. Run one (1) spare control wire from panel continuously from valve to valve throughout system similar to common wire for use as replacement if wire fails:
    - 1) Spare wire shall be different color than other wires. Use of green wire is not acceptable.
    - 2) Mark spare control wire visibly within valve box as an 'Un-Connected Wire'. Extend spare control wires **24 inches** and leave coiled in each valve box. Mark spare wire visibly within controller as 'Un-Connected Wire'.
- F. Sprinkler Heads And Rotor Pop-ups:
- 1. Set sprinkler heads and quick-coupling valves perpendicular to finish grade.
  - 2. Do not install sprinklers using side inlets. Install using base inlets only.
  - 3. Heads immediately adjacent to mow strips, walks, or curbs shall be **one inch** below top of mow strip, walk, or curb and have **one inch** to **3 inch** clearance between head and mow strip, walk, or curb.
  - 4. Set sprinkler heads at consistent distance from walks, curbs, and other paved areas and to grade by using specified components or other method demonstrated in Pre-Construction Conference.
- G. Drip Assembly:
- 1. Install pipe providing for expansion and contraction as recommended by Manufacturer.
  - 2. Cut tubing square and remove burrs at cut ends.
  - 3. Distribution tubing shall be between **14 inches** minimum and **48 inches** maximum long. Layout PVC lateral lines as necessary to keep distribution tubing lengths within specified tolerances.
  - 4. Locate drip emitter on uphill side of plant within rootball zone.
  - 5. Layout in-line tubing for trees as indicated on Contract Drawings. Layout in-line tubing for shrubs and groundcovers so plants receive water within rootball zones.
  - 6. Locate in-line tubing on top of soil but under bark mulch and weed barrier fabric.
  - 7. Staple in-line tubing to ground at **6 foot** maximum intervals and within **12 inches** of ends and intersections.
  - 8. Assembly Using Solvent Weld Joints:
    - a. Do not make solvent weld joint if ambient temperature is below **35 deg F**
    - b. Clean mating pipe and fitting with clean, dry cloth.
    - c. Apply uniform coat of PVC solvent cement to outside of pipe and inside socket of fitting.
    - d. Insert pipe completely into fitting.
    - e. Give pipe or fitting quarter turn to insure even distribution of solvent and make sure pipe is inserted to full depth of fitting socket.
    - f. Allow joints to set twenty four (24) hours minimum before applying pressure to pipe.
  - 9. Assembly Using 'Funny Pipe' Type Joints:
    - a. Connect distribution tubing to lateral line using barbed ell fitting.
    - b. Connect fitting to distribution tubing using straight barbed fitting with **1/2 inch** threaded end.
- H. Before installation of sprinkler heads and drip emitters, open control valves and use full head of water to flush out system.
- I. Arrange valve stations to operate in an easy-to-view progressive sequence around building. Tag valves with waterproof labels showing final sequence station assignments.

### 3.4 FIELD QUALITY CONTROL

- A. Field Tests and Inspections:
  - 1. Irrigation System:
    - a. Pressure Test:



- 1) In presence of Architect, pressure test main line with all valves installed. Notify Architect two (2) working days minimum before conducting test.
    - 2) Before backfilling main line, test pressure at **100 psi** minimum for two (2) hours minimum and make certain there are no leaks.
  2. Substantial Completion Walkthrough:
    - a. Landscape Architect or designated representative(s) will inspect site and create list of non-conforming items to be resolved prior to Irrigation Final Acceptance. Date on this list will act as date of Landscape Substantial Completion.
    - b. Installations completed after water source has been turned off for season, as determined by Landscape Architect, will be inspected following spring after system can be checked for proper operation.
  3. Irrigation Final Acceptance:
    - a. Irrigation Final Acceptance will be awarded when all non-conforming work is brought into conformance.
- B. Non-Conforming Work: Non-conforming work as covered in General Conditions applies, but is not limited to following:
1. Underground Sprinkler System:
    - a. Correct any work found defective or not complying with Contract Document requirements at no additional cost to Owner.

### **3.5 ADJUSTING**

- A. Sprinkler Heads:
1. Adjust sprinkler heads to proper grade when turf is sufficiently established to allow walking on it without appreciable harm. Such lowering and raising of sprinkler heads shall be part of original contract with no additional cost to Owner.
  2. Adjust sprinkler heads for proper distribution and trim so spray does not fall on building.
- B. Watering Time:
1. Adjust watering time of valves to provide proper amounts of water to plants.

### **3.6 CLOSEOUT ACTIVITIES**

- A. Training:
1. After system is installed and approved, instruct Owner's designated personnel in complete operation and maintenance procedures.
    - a. Describe difference between plant establishment schedule and long term maintenance schedule.
    - b. Describe annual and regular filter maintenance.

### **END OF SECTION**

**SECTION 32 9001****COMMON PLANTING REQUIREMENTS****PART 1 - GENERAL****1.1 SUMMARY**

Includes But Not Limited To:

1. Common procedures and requirements for landscaping work.
2. Provide maintenance for new landscaping as described in Contract Documents.

Related Requirements:

3. Pre-Installation conferences held jointly with Section 32 9001 as described in Administrative Requirements on Part 1 of this specification section:
4. Section 01 4301: 'Quality Assurance – Qualifications'.
5. Section 31 0501: 'Common Earthwork Requirements'.
6. Section 31 1100: 'Clearing and Grubbing'.
7. Section 31 1413: 'Topsoil Stripping and Stockpiling'.
8. Section 31 2213: 'Rough Grading'.
9. Section 31 2216: 'Fine Grading'.
10. Section 31 2316: 'Excavation'.
11. Section 31 2323: 'Fill'.
12. Section 32 8423: 'Underground Sprinklers'.
13. Section 32 9120: 'Topsoil And Placement'.
14. Section 32 9122: 'Topsoil Grading'.
15. Section 32 9223: 'Sodding'.
16. Section 32 9300: 'Plants'.

**1.2 ADMINISTRATIVE REQUIREMENTS**

Pre-Installation Conference:

17. Participate in pre-installation conference as specified in Section 01 3100 and held jointly with following sections:
  - a. Section 32 8423: 'Underground Sprinklers'.
  - b. Section 32 9120: 'Topsoil And Placement'.
  - c. Section 32 9122: 'Topsoil Grading'.
  - d. Section 32 9223: 'Sodding'.
  - e. Section 32 9300: 'Plants'.
18. In addition to agenda items specified in Section 01 3100, review the following:
  - a. Site Visits:
    - 1) Site visits caused by lack of work progress by Landscape Subcontractor shall reimburse Architect amount determined by Architect or Owner for additional site visits.
  - b. Landscape Maintenance:
    - 1) Establish responsibility for maintenance of new landscaping during all phases of construction period.

**1.3 SUBMITTALS**

Informational Submittals:

19. Special Procedure Submittals:
  - a. Landscape Architect and Landscape Subcontractor shall jointly provide the following:
    - 1) Maintenance recommendations for Site Management Plan (SMP).
    - 2) Recommendation procedures to be established by Owner for maintenance of landscape work for one (1) full year after contract maintenance period ends required by Contract Documents.



## 20. Qualification Statement:

- a. Landscape Subcontractor:
  - 1) Provide Qualification documentation if requested by Architect or Owner.
- b. Installer:
  - 1) Provide Qualification documentation if requested by Architect or Owner.

## B. Closeout Submittals:

1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
  - a. Operations And Maintenance Data:
    - 1) At completion of landscape work, submit two (2) copies of typewritten instructions of the following:
      - a) Provide maintenance recommendations for Site Management Plan (SMP).
      - b) Provide recommended procedures to be established by Owner for maintenance of landscape work for one (1) full year after contract maintenance period ends.

**1.4 QUALITY ASSURANCE**

## A. Regulatory Agency Sustainability Approvals:

1. Post-Emergent Weed Control:
  - b. Products shall be recognized for intended use by AHJ.

## B. Qualifications:

1. Landscape Subcontractor. Requirements of Section 01 4301 applies, but not limited to following:
  - c. Company specializing in performing work of this section.
  - d. Minimum five (5) years experience in landscaping installations.
  - e. Minimum five (5) satisfactorily completed installations in past three (3) years of projects similar in size, scope, and complexity required for this project before bidding.
  - f. Upon request, submit documentation.
2. Installer:
  - a. Planting shall be performed under direction of foreman or supervisor with minimum three (3) years experience in landscape installations similar in size, scope, and complexity.
  - b. Foreman or supervisor required to attend pre-installation conference.
  - c. Use trained personnel familiar with required planting procedures and with Contract Documents.
  - d. Upon request, submit documentation.

**1.5 DELIVERY, STORAGE, AND HANDLING**

## A. Storage And Handling Requirements:

1. Deliver packaged materials in containers showing weight, analysis, and name of Manufacturer.
2. Deliver sod, plants, trees, and shrubs in healthy and vigorous condition.
3. Protect materials from deterioration during delivery.

## B. Storage And Handling Requirements:

1. Store in location on site where they will not be endangered and where they can be adequately watered and kept in healthy and vigorous condition.
2. Protect materials from deterioration while stored at site.

**PART 2 - PRODUCTS:****2.1 POST-EMERGENT WEED CONTROL:**

## A. Type Two Acceptable Products:

1. Enide by Upjohn.
2. Dymid by Elanco.
3. Treflan or Surflan by Dow Agrosiences.

4. Eptan by Syngenta.
5. Equal as approved by Architect before use. See Section 01 6200.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLERS**

- A. Acceptable Installers:
  1. Meet Quality Assurance Installer Qualifications as specified in Part 1 of this specification.

#### **3.2 EXAMINATION**

- A. Verification Of Conditions:
  1. Inspect site and Contract Documents to become thoroughly acquainted with locations of irrigation, ground lighting, and utilities.

#### **3.3 PREPARATION**

- A. Before proceeding with work, verify dimensions and quantities. Report variations between Drawings and site to Architect before proceeding with landscape work.
  1. Plant totals are for convenience of Contractor only and are not guaranteed. Verify amounts shown on Drawings.
  2. All planting indicated on Contract Documents is required unless indicated otherwise.
- B. Protection:
  1. Take care in performing landscaping work to avoid conditions that will create hazards. Post signs or barriers as required.
  2. Provide adequate means for protection from damage through excessive erosion, flooding, heavy rains, etc. Repair or replace damaged areas.
  3. Keep site well drained and landscape excavations dry.

#### **3.4 INSTALLATION**

- A. Interface With Other Work:
  1. Do not plant trees and shrubs until major construction operations are completed. Do not commence landscaping work until work of Section 31 2216 and Section 32 8423 has been completed and approved.
- B. Coordinate installation of planting materials during normal planting seasons for each type of plant material required.
- C. Hand excavate as required.
- D. Maintain grade stakes until parties concerned mutually agree upon removal.
- E. When conditions detrimental to plant growth are encountered, such as rubble fill or adverse drainage conditions, notify Architect before planting.

#### **3.5 FIELD QUALITY CONTROL**

- A. Field Inspection:
  1. Architect will inspect landscaping installation approximately two (2) weeks before Substantial Completion.
- B. Non-Conforming Work. Non-conforming work as covered in the General Conditions applies, but is not limited to the following:

1. Replace landscaping that is dead or appears dead as directed by Architect within ten (10) days of notification and before Substantial Completion at no additional cost to Owner.
2. Replace damaged plantings at no additional cost to Owner.
3. Repair damage to irrigation, ground lighting, utilities, asphalt paving, concrete paving, concrete sidewalks, concrete curb and gutters and other items adjacent to landscaping caused by work of this Section or replace at no additional cost to Owner.

### 3.6 CLEANING

#### A. Waste Management:

1. Immediately clean up soil or debris spilled onto pavement and dispose of deleterious materials.

### 3.7 PROTECTION

- A. Protect planted areas against traffic or other use immediately after planting is completed by placing adequate warning signs and barricades.
- B. Provide adequate protection of planted areas against trespassing, erosion, and damage of any kind. Remove this protection after Architect has accepted planted areas.

### 3.8 MAINTENANCE

#### A. General:

1. Before beginning maintenance period, plants shall be in at least as sound, healthy, vigorous, and in approved condition as when delivered to site, unless accepted by Architect in writing at final landscape inspection.
2. Maintain landscaping from completion of landscape installation to thirty (30) days after Substantial Completion Meeting. Areas sodded or seeded after November 1st will accepted following spring approximately one (1) month after start of growing season, May 1st or as determined by Architect, if specified conditions have been met.
3. Replace landscaping that is dead or appears unhealthy or non-vigorous as directed by Architect before end of maintenance period. Make replacements within ten (10) days of notification. Lawn that does not live and has to be replaced shall be guaranteed and maintained an additional thirty (30) days from date of replacement.

#### Sodded Lawn:

1. Maintain sodded lawn areas until lawn complies with specified requirements and throughout maintenance period.
2. Water sodded areas in sufficient quantities and at required frequency to maintain sub-soil immediately under sod continuously moist **3 to 4 inches** deep.
3. Cut grass first time when it reaches **3 inches** high. Continue to mow at least once each week throughout maintenance period. Remove clippings.
4. Apply weed killer as necessary to maintain weed-free lawn. Apply weed killer in accordance with manufacturer's instructions during calm weather when air temperature is between **50 and 80 deg F**.
5. At end of thirty (30) day maintenance period, fertilize lawns as recommended in Section 32 9113.

#### C. Trees, Shrubs, And Plants:

1. Maintain by pruning, cultivating, and weeding as required for healthy growth.
2. Restore planting basins.
3. Tighten and repair stake and guy supports and reset trees and shrubs to proper grades or vertical positions as required.
4. Spray as required to keep trees and shrubs free of insects and disease.
5. Provide supplemental water by hand as needed in addition to water from sprinkling system.

### END OF SECTION

**SECTION 32 9120****TOPSOIL AND PLACEMENT****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Perform topsoil evaluation and placement required prior to topsoil grading as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 31 0501: 'Common Earthwork Requirements':
  - 2. Section 31 1413: 'Topsoil Stripping And Stockpiling' for stripping and storing of existing topsoil.
  - 3. Section 31 2216: 'Finish Grading' for landscaping and planting areas.
  - 4. Section 32 9001: 'Common Planting Requirements':
    - a. Pre-installation conference held jointly with other common planting related sections.
  - 5. Section 32 9121: 'Topsoil Physical Preparation' for physical preparation of topsoil (section included based on Topsoil Testing Report).
  - 6. Section 32 9122: 'Topsoil Grading' for preparation of topsoil and addition of amendments prior to landscaping.

**1.2 REFERENCES**

- A. Reference Standards:
  - 1. ASTM International:
    - a. ASTM D1557-12, 'Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft)'.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference:
  - 1. Participate in pre-installation conference as specified in Section 32 9001.
  - 2. In addition to agenda items specified in Section 01 3100 and Section 32 9001, review the following:
    - a. Review finish grade elevation and tolerance requirements.
    - b. Review surface preparation requirements including disking, tilling, ripping, or aerating.
    - c. Review test requirements as per Attachment 'Topsoil Testing Report' in this specification.

**1.4 SUBMITTALS**

- A. Informational Submittals:
  - 1. Installer Reports:
    - a. Delivery slips indicating amount of physical amendments delivered to Project site.
- B. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Record Documentation:
      - 1) 'Topsoil Testing Report'.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Topsoil:
  - 1. Design Criteria:
    - a. Topsoil used in landscaped areas, whether imported, stockpiled, or in place, shall be weed free, fertile, loose, friable soil meeting following criteria:
      - 1) Chemical Characteristics:
        - a) pH 5.5 to 8.0.
        - b) Soluble Salts: less than 3.0 mmhos/cm.
        - c) Sodium Absorption Ratio (SAR): less than 6.0.
        - d) Organic Matter: greater than one percent.
      - 2) Physical Characteristics:
        - a) Gradation as defined by USDA triangle of physical characteristics as measured by hydrometer.
          - (1) Sand: 15 to 60 percent.
          - (2) Silt: 10 to 60 percent.
          - (3) Clay: 5 to 30 percent.
        - b) Clean and free from toxic minerals and chemicals, noxious weeds, rocks larger than or equal to **1-1/2 inch** in any dimension, and other objectionable materials.
        - c) Soil (Coordinate screening as specified in Section 31 1413 'Topsoil Stripping And Stockpiling' to meet these characteristics):
          - (1) Soil shall not contain more than five (5) percent by volume of rocks measuring over **1/4 inch** in largest size.
          - (2) Soil shall be topsoil in nature.
          - (3) Soil resembling road base or other like materials are not acceptable.
  - 2. Project Topsoil Requirements:
    - a. It is anticipated that following percentages of material will be required to meet topsoil requirements of Project site:

**PART 3 - EXECUTION****3.1 EXAMINATION**

- A. Verification Of Conditions:
  - 1. Do not commence work of this Section until grading tolerances specified in Section 31 2216 are met.
  - 2. Do not commence work of this Section until coordination with Section 32 9121 'Physical Preparation' and Section 32 9122 'Topsoil Grading' and if required by these specifications prior to placement.
  - 3. Receive approval from Landscape Architect of subgrade elevations prior to commencement of this Work.

**3.2 PREPARATION**

- A. Protection Of In-Place Conditions:
  - 1. Protect utilities and site elements from damage.
- B. Surface Preparation:
  - 1. Surfaces to receive Imported and Stockpiled Topsoil:
    - a. Disk, till, rip, or aerate with approved agricultural aerator to depth of **6 inches**.
    - b. Place specified and approved topsoil on prepared surface.

**3.3 PERFORMANCE**

- A. General:
1. After Surface Preparation requirements are completed, limit use of heavy equipment to areas no closer than **6 feet** from building or other permanent structures. Use hand held tillers for preparation of subsoil in areas closer than **6 feet**.
  2. Do not expose or damage existing shrub or tree roots.
- B. Topsoil Depth/Quantity:
1. Total topsoil depth of **5 inches** minimum in lawn and groundcover planting areas.
  2. No topsoil as defined in this Section is required over tree and shrub planting areas or native grass, shrub, or tree areas as long as what is in place is not excessively rocky or otherwise unfavorable to healthy plant growth.
  3. Provide no less than quantity required to achieve tolerance described in Section 32 9122 'Topsoil Grading' along with additional physical soil amendments required in Section 32 9121 'Topsoil Physical Preparation'. Installer of this section responsible for providing sufficient topsoil material.
- C. Imported Topsoil:
1. Place tested and approved topsoil:
    - a. Before placing topsoil, remove organic material, rocks and clods greater than **1-1/2 inch** in any dimension, and other objectionable materials.
    - b. Do not place topsoil whose moisture content makes it prone to compaction during placement process.
    - c. Do not place topsoil when subgrade is either wet or frozen enough to cause clodding.
- D. Stockpiled Topsoil:
1. Redistribute tested and approved existing topsoil stored on site as result of work of Section 31 1413 'Topsoil Stripping And Stockpiling'.
    - a. Before placing topsoil, remove organic material, rocks and clods greater than **1-1/2 inch** in any dimension, and other objectionable materials.
    - b. Do not place topsoil whose moisture content makes it prone to compaction during placement process.
    - c. Do not place topsoil when subgrade is either wet or frozen enough to cause clodding.
- E. In Place Topsoil:
1. At locations where topsoil can remain in place and has been tested and approved, perform the following:
    - a. Remove existing vegetation as required in preparation for new landscaping.
    - b. Remove vegetative layer, roots, organic material, rocks and clods greater than **1-1/2 inch** in any dimension, and other objectionable materials.
- F. Grading:
1. Slope grade away from building for **12 feet** minimum from walls at slope of **1/2 inch in 12 inches** minimum unless otherwise noted.
    - a. High point of finish grade at building foundation shall be **6 inches** minimum below finish floor level.
    - b. Direct surface drainage in manner indicated on Contract Documents by molding surface to facilitate natural run-off of water.
    - c. Fill low spots and pockets with topsoil and grade to drain properly.

**END OF SECTION**

**BLANK PAGE**

**SECTION 32 9122****TOPSOIL GRADING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Perform topsoil grading required to prepare site for installation of landscaping as described in Contract Documents.
  - 2. Perform topsoil placement and finish grading work required to prepare site for installation of landscaping as described in Contract Documents.
  - 3. Furnish and apply soil amendments as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 31 0501: Common Earthwork Requirements:
  - 2. Section 31 1413: Stripping and storing of existing topsoil.
  - 3. Section 31 2216: 'Finish Grading' for landscaping and planting areas.
  - 4. Section 32 9001: 'Common Planting Requirements':
    - a. Pre-installation conference held jointly with other common planting related sections.
  - 5. Section 32 9120: 'Topsoil And Placement' for topsoil evaluation and placement required for topsoil grading.

**1.2 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference:
  - 1. Participate in pre-installation conference as specified in Section 32 9001.
  - 2. In addition to agenda items specified in Section 01 3100, review the following:
    - a. Review compost requirements to be within acceptable range as per Attachment 'Compost Quality Guidelines For Landscaping' and 'Compost Verification Report' in this specification.

**1.3 SUBMITTALS**

- A. Action Submittals:
  - 1. Product Data:
    - a. Soil Fertility Amendments and Fertilizer:
      - 1) Product literature and chemical / nutrient analysis of soil amendments and fertilizers.
  - 2. Samples:
    - a. Soil Fertility Amendments and Fertilizer:
      - 1) Sample of soil conditioner for approval before delivery to site.
      - 2) Include product analysis list.
- B. Informational Submittals:
  - 1. Field Quality Control Submittals:
    - a. Soil Fertility Amendments and Fertilizer:
      - 1) Submit proposed amendments and application rates necessary to bring topsoil up to minimum specified requirements.
      - 2) Submit report stating location of source of imported topsoil and account of recent use.
      - 3) Submit report to verify compost meets Ideal or Acceptable requirements.
  - 2. Installer Reports:
    - a. Soil Fertility Amendments and Fertilizer:
      - 1) Delivery slips indicating amount of soil amendments, compost, conditioner, and fertilizer delivered to Project site.



- C. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Record Documentation:
      - 1) 'Compost Verification Report'.

## **PART 2 - PRODUCTS – NOT USED**

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- A. Verification Of Conditions:
  - 1. Do not commence work of this Section until imported, stockpiled and in place topsoil are placed as specified in Section 32 9120 'Topsoil And Placement'.

### **3.2 PREPARATION**

- A. Protection Of In-Place Conditions:
  - 1. Protect utilities and site elements from damage.
- B. Surface Preparation:
  - 1. Surfaces that meet specified topsoil elevations.
    - a. Seven (7) days maximum before beginning seeding and planting:
      - 1) Loosen topsoil **6 inch** deep, dampen thoroughly, and cultivate to properly break up clods and lumps.
      - 2) Rake area to remove clods, rocks, weeds, roots, debris or other material **1-1/2 inches** or more in any dimension.
      - 3) Grade and shape landscape area to bring surface to true uniform planes free from irregularities and to provide drainage and proper slope to catch basins.
  - 2. Addition of Soil Amendments:
    - a. Add specified soil amendments at specified rates to topsoil as directed by Topsoil Testing Report found in Section 32 9120 'Topsoil And Placement'.
    - b. Roto-till or otherwise mix soil amendments evenly into topsoil.

### **3.3 PERFORMANCE**

- A. General:
  - 1. Limit use of heavy equipment to areas no closer than **6 feet** from building or other permanent structures. Use hand held tillers for preparation of subsoil in areas closer than **6 feet**.
  - 2. Do not expose or damage existing shrub or tree roots.
- B. Finish Grade Tolerances (As shown on General Planting Details in Contract Documents):
  - 1. Finish topsoil grade of planting areas before planting and after addition of soil additives shall be specified distances below top of adjacent pavement of any kind:
    - a. Ground Cover Areas: **2 inches** below.
    - b. Seeded Areas: **One inch** below.
    - c. Sodded Areas: **2 inches** below.
    - d. Tree and Shrub Areas (not individual trees): **4 inches** below.
- C. Placed Topsoil:
  - 1. At locations where topsoil has been placed as per Section 32 9120 'Topsoil And Placement', perform the following:
    - a. Remove existing vegetation as required in preparation for new landscaping.

- b. Remove organic material, rocks and clods greater than 1-1/2 inch in any dimension, and other objectionable materials.
- D. Grading:
  - 1. Coordinate grading as described in Section 32 9120 'Topsoil And Placement'.
- E. Immediately before planting lawn and with topsoil in semi-dry condition, roll areas that are to receive lawn in two directions at approximately right angles with water ballast roller weighing 100 to 300 lbs, depending on soil type.
- F. Rake or scarify and cut or fill irregularities that develop as required until area is true and uniform, free from lumps, depressions, and irregularities.

### 3.4 PROTECTION

- A. After landscape areas have been prepared, take no heavy objects over them except lawn rollers.

**END OF SECTION**

**ATTACHMENTS**

BLANK PAGE

## COMPOST QUALITY GUIDELINES FOR LANDSCAPING

[Source: Von Isaman MS, President of QA Consulting and Testing LLC, Dr. Rich Koenig, USU Cooperative Extension Soils Specialist, and Dr. Teresa Cerny, USU Cooperative Extension Horticulturalist, 3 March 2003]

Category	pH <sup>a</sup>	Soluble Salts <sup>a</sup> dS/m or mmho/cm	Sodium Adsorption Ratio <sup>a</sup> (SAR)	Carbon Nitrogen Ratio <sup>b</sup> (C:N)	Percent Moisture <sup>c</sup>	≥ 98 percent Coarse Material Passing (dry wt basis)
Ideal	6 to 8	≤ 5	< 10	≤ 20:1	25 to 35	3/8 inch
Acceptable	5-6, 8-9	≤ 10	≤ 20	21:1 to 30:1	< 25, > 35	3/4 inch
Suspect	< 5, > 9	> 10	> 20	<10:1, > 30:1	< 20, > 50	< 98 percent 3/4 inch

<sup>a</sup> 1.5 Compost: Water Slurry on Coarse Material passing 3/8 inch.

<sup>b</sup> on Coarse Material passing 3/8 inch

<sup>c</sup> on Total Sample

For composts with biosolid feedstocks, biosolids must meet EPA 503 Class A standard.

Acceptable level Soluble Salts and/or SAR composts should not exceed 3 cu yds /1,000 sq ft for every 3 inches of soil depth.

## COMPOST VERIFICATION REPORT

	pH <sup>a</sup>	Soluble Salts <sup>a</sup> dS/m or mmho/cm	Sodium Adsorption Ratio <sup>a</sup> (SAR)	Carbon Nitrogen Ratio <sup>b</sup> (C:N)	Percent Moisture <sup>c</sup>	≥ 98 percent Coarse Material Passing (dry wt basis)
Results						

See Compost Quality Guidelines for Landscaping for footnote references.

I hereby certify that the Compost meets Ideal or Acceptable requirements as set forth in COMPOST QUALITY GUIDELINES FOR LANDSCAPING as listed with the COMPOST VERIFICATION STATEMENT. If Compost does not fall within this range, explain why and justify.

---



---



---



---

Signature: \_\_\_\_\_ Printed Signature: \_\_\_\_\_

Date: \_\_\_\_\_

**BLANK PAGE**

**SECTION 32 9223****SODDING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install sodded lawn as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 32 8423: Irrigation system.
  - 2. Section 32 9001: Common Planting Requirements:
    - a. Pre-installation conference held jointly with other common planting related sections.
  - 3. Section 32 9120: 'Topsoil And Placement'.
  - 4. Section 32 9122: 'Topsoil Grading'.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Crop Coefficients and Hydro-Zones: Crop coefficients (Kc) are used with ETo to estimate specific plant evapotranspiration rates. The crop coefficient is a dimensionless number (between 0 and 1.2) that is multiplied by the ETo value to arrive at a plant ET (ETc) estimate. Plants grouped by water needs, organized into one irrigation zone.
  - 2. Eco-Region Irrigation Design: A bio-regional approach to irrigation and planting design that is relevant to the geographic area for which the planting plan and irrigation system is designed. These geographic areas are defined by the Environmental Protection Agency and have been modified by the LDS church into 15 geographical areas throughout North America, and the Hawaiian Islands.
  - 3. Hardiness Zone: A hardiness zone is a more precisely geographically-defined zone within an Eco-Region in which a specific category of plant life is capable of growing, as defined by temperature hardiness, or ability to withstand the minimum temperatures of the zone. Hardiness Zones may be defined by one of two sources:
    - a. Sunset Western Garden Book Maps.
    - b. USDA Hardiness Zone Map.Plant Hardiness zone sources shall be listed by the architect through the planting and irrigation design process.
  - 4. Hydro-Zone: Plants grouped by water needs (similar Crop Coefficients (Kc), organized into one irrigation zone.
  - 5. Reference Evapotranspiration (ETo): The total water lost from the soil (evaporation) and from the plant surface (transpiration) over some period.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference:
  - 1. Participate in pre-installation conference as specified in Section 32 9001.

**1.4 SUBMITTALS**

- A. Informational Submittals:
  - 1. Source Quality Control Submittals:
    - a. Written certification confirming lawn seed quality and mix.

## 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
  - 1. Harvest, deliver, store, and handle sod in accordance with requirements of Turfgrass Producers International (TPI) (formally American Sod Producers Association) Specifications for Turfgrass Sod Materials and Transplanting / Installing.
  - 2. Schedule deliveries to coincide with topsoil operations and laying. Keep storage at job site to minimum without causing delays.
    - a. Deliver, unload, and store sod on pallets within 24 hours of being lifted.
    - b. Do not deliver small, irregular, or broken pieces of sod.
- B. Storage And Handling Requirements:
  - 1. Cut sod in pieces approximately **3/4 to one inch** thick. Roll or fold sod so it may be lifted and handled without breaking or tearing and without loss of soil.
  - 2. During wet weather, allow sod to dry sufficiently to prevent tearing during lifting and handling.
  - 3. During dry weather, protect sod from drying before installation. Water as necessary to insure vitality and to prevent excess loss of soil in handling. Sod that dries out before installation will be rejected.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Description:
  - 1. Superior sod grown from certified, high quality, seed of known origin or from plantings of certified grass seedlings or stolons:
    - a. Assure satisfactory genetic identity and purity.
    - b. Assure over-all high quality and freedom from noxious weeds or an excessive amount of other crop and weedy plants at time of harvest.
  - 2. Sod shall be composed of three varieties minimum of **Turf Type Tall Fescue**.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Interface With Other Work:
  - 1. Do not commence work of this Section until work of Sections 32 9122 and 32 9300 has been completed and approved.
- B. Tolerances:
  - 1. Final grade of soil after sodding of lawn areas is complete shall be **one inch** below top of adjacent pavement of any kind.
- C. Laying of Sod:
  - 1. Lay sod during growing season and within 48 hours of being lifted.
  - 2. Lay sod while top **6 inches** of soil is damp, but not muddy. Sodding during freezing temperatures or over frozen soil is not acceptable.
  - 3. Lay sod in rows perpendicular to slope with joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with a sharp knife.
  - 4. Lay sod flush with adjoining existing sodded surfaces.
  - 5. Do not sod slopes steeper than 3:1. Consult with Architect for alternate treatment.
- D. After Laying of Sod Is Complete:
  - 1. Roll horizontal surface areas in two directions perpendicular to each other.

2. Repair and re-roll areas with depressions, lumps, or other irregularities. Heavy rolling to correct irregularities in grade will not be permitted.
3. Water sodded areas immediately after laying sod to obtain moisture penetration through sod into top 6 inches of topsoil.

### 3.2 FIELD QUALITY CONTROL

- A. Field Inspection:
  1. Sodded areas will be accepted at Project closeout if:
    - a. Sodded areas are properly established.
    - b. Sod is free of bare and dead spots and is without weeds.
    - c. No surface soil is visible when grass has been cut to height of 2 inches.
  2. Sodded areas have been mowed a minimum of twice.

**END OF SECTION**



**BLANK PAGE**

**SECTION 32 9300****PLANTS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
  - 1. Furnish and install landscaping plants as described in Contract Documents.
- B. Related Requirements:
  - 1. Section 32 8423: Irrigation system.
  - 2. Section 32 9001: 'Common Planting Requirements'.
    - a. Pre-installation conference held jointly with other common planting related sections.
  - 3. Section 32 9120: 'Topsoil And Placement'.
  - 4. Section 32 9122: 'Topsoil Grading'.
  - 5. Section 32 9223: 'Sodding'.

**1.2 REFERENCES**

- A. Definitions:
  - 1. Crop Coefficients and Hydro-Zones: Crop coefficients (Kc) are used with ETo to estimate specific plant evapotranspiration rates. Crop coefficient is dimensionless number (between 0 and 1.2) that is multiplied by ETo value to arrive at plant ET (ETc) estimate. Plants grouped by water needs, organized into one irrigation zone.
  - 2. Eco-Region Irrigation Design: Bio-regional approach to irrigation and planting design that is relevant to geographic area for which planting plan and irrigation system is designed. These geographic areas are defined by Environmental Protection Agency and have been modified by the LDS Church into 15 geographical areas throughout North America, and Hawaiian Islands.
  - 3. Hardiness Zone: Hardiness zone is more precisely geographically-defined zone within an Eco-Region in which specific category of plant life is capable of growing, as defined by temperature hardiness, or ability to withstand minimum temperatures of zone. Hardiness Zones may be defined by one of two sources:
    - a. Sunset Western Garden Book Maps.
    - b. USDA Hardiness Zone Map.Plant Hardiness zone sources shall be listed by Landscape Architect through planting and irrigation design process.
  - 4. Hydro-Zone: Plants grouped by water needs (similar Crop Coefficients (Kc), organized into one irrigation zone.
  - 5. Reference Evapotranspiration (ETo): Total water lost from the soil (evaporation) and from plant surface (transpiration) over some period.
- B. Reference Standards:
  - 1. American Nursery & Landscape Association / American National Standards Institute:
    - a. ANLA / ANSI Z60.1-2004, 'American Standard for Nursery Stock.'

**1.3 ADMINISTRATIVE REQUIREMENTS**

- A. Pre-Installation Conference:
  - 1. Participate in pre-installation conference as specified in Section 32 9001.

**1.4 SUBMITTALS**

- A. Action Submittals:
  - 1. Samples:
    - a. Top dressing mulch for approval before delivery to site.
- B. Closeout Submittals:
  - 1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
    - a. Operations And Maintenance Data:
      - 1) Installer Instructions:
        - a) Provide written instructions covering maintenance requirements by Owner for one year beyond Contract maintenance period specified in Section 32 9001.
    - b. Warranty Documentation:
      - 1) Include final, executed copy of warranty.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- A. Delivery And Acceptance Requirements:
  - 1. Deliver trees, shrubs, ground covers, and plants after preparations for planting have been completed and install immediately.
  - 2. Do not prune before delivery, except as approved by Landscape Architect.
  - 3. Protect bark, branches, and root systems from sun scald, drying, whipping, and other handling and tying damage.
  - 4. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape.
  - 5. Provide protective covering during delivery.
- B. Storage And Handling Requirements:
  - 1. Handle balled stock by root ball or container. Do not drop trees and shrubs during delivery.
  - 2. If planting is delayed more than six hours after delivery, set planting materials in shade and protect from weather and mechanical damage.
  - 3. Set balled stock on ground and cover ball with soil, saw dust, or other acceptable material approved by Landscape Architect.
  - 4. Do not remove container-grown stock from containers before time of planting.
  - 5. Do not store plant material on pavement.
  - 6. Water root systems of trees and shrubs stored on site with fine spray. Water as often as necessary to maintain root systems in moist condition. Do not allow plant foliage to dry out.

**1.6 WARRANTY**

- A. Special Warranty:
  - 1. Provide written warranties as follows:
    - a. Guarantee shrubs, ground covers, and vines to live and remain in strong, vigorous, and healthy condition for 90 days minimum from date landscape installation is accepted as complete and meet or exceed material standards set forth in Materials heading of Part 2 of this specification.

**PART 2 - PRODUCTS****2.1 MATERIALS**

- A. Plants:
  - 1. Conform to requirements of Plant List and Key on Contract Documents and to ANLA / ANSI Z60.1.
  - 2. Nomenclature:

- a. Plant names used in Plant List conform to 'Standardized Plant Names' by American Joint Committee on Horticultural Nomenclature except in cases not covered. In these instances, follow custom of nursery trade. Plants shall bear tag showing genus, species, and variety of at least 10 percent of each species delivered to site.
- 3. Quality:
  - a. Plants shall be sound, healthy, vigorous, free from plant disease, insect pests or their eggs, noxious weeds, and have healthy, normal root systems. Container stock shall be well established and free of excessive root-bound conditions.
  - b. Do not prune plants or top trees prior to delivery.
  - c. Plant materials shall be subject to approval by Landscape Architect as to size, health, quality, and character.
  - d. Bare root trees are not acceptable.
  - e. Provide plant materials from licensed nursery or grower.
- 4. Measurements:
  - a. Measure height and spread of specimen plant materials with branches in their normal position as indicated on Contract Documents or Plant List.
  - b. Measurement should be average of plant, not greatest diameter. For example, plant measuring 15 inches in widest direction and 9 inches in narrowest would be classified as 12 inch stock.
  - c. Plants properly trimmed and transplanted should measure same in every direction.
  - d. Measure caliper of trees 6 inches above surface of ground.
  - e. Where caliper or other dimensions of plant materials are omitted from Plant List, plant materials shall be normal stock for type listed.
  - f. Plant materials larger than those specified may be supplied, with prior written approval of Landscape Architect, and:
    - 1) If complying with Contract Document requirements in all other respects.
    - 2) If at no additional cost to Owner.
    - 3) If sizes of roots or balls are increased proportionately.
- 5. Shape and Form:
  - a. Plant materials shall be symmetrical or typical for variety and species and conform to measurements specified in Plant List.
  - b. Well grown material will generally have height equal to or greater than spread. However, spread shall not be less than 2/3's of height.

## 2.2 ACCESSORIES

- A. Planting Mix:
  - 1. Mixture of three (3) parts excavated soil and one part well rotted composted manure, approved commercial mix.
- B. Fertilizer:
  - 1. Fertilizer as recommended on 'Topsoil Testing Report'.
    - a. .
    - b. .
- C. Tree Guys:
  - 1. Type Two Acceptable Products:
    - a. Duckbill Model 68DTS guying kit.
    - b. Equal as approved by Landscape Architect before installation. See Section 01 6200.
- D. Pre-Emergent Herbicide:
  - 1. Category Four Approved Products. See Section 01 6200 for definitions of Categories.
    - a. Chipco Dimension Granular by The Andersons Inc, Maumee, IL [www.andersonsinc.com](http://www.andersonsinc.com).
    - b. Elanco XL2G granular by Crop Data Management Systems, Marysville, CA [www.cdms.net](http://www.cdms.net).
    - c. Ronstar G granular by Bayer Crop Science, Monheim, Germany [www.bayercropscience.com](http://www.bayercropscience.com).
    - d. Surflan AS liquid by United Phosphorous Inc, Trenton, NJ [www.upi-usa.com](http://www.upi-usa.com).
    - e. Oryzalin 4 A.S. liquid by FarmSaver, Seattle, WA [www.farmsaver.com](http://www.farmsaver.com).

- E. Weed Barrier:
  - 1. Type Two Acceptable Products:
    - a. DeWitt 4.1 oz 20 year woven polypropylene weed barrier.
    - b. Equal as approved by Landscape Architect before bidding. See Section 01 6200.
    - c. .
- F. Rock Mulch:
  - 1. Type Two Acceptable Products:
    - a. Screened River Gravel
      - 1) Size: 1-1/2"
        - a) No rock should be less than 1" or greater than 2" in size.
      - 2) Equal as approved by Architect before installation. See Section 01 6200.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Evaluation And Assessment:
  - 1. Before proceeding with work, check and verify dimensions and quantities. Report variations between Drawings and site to Landscape Architect before proceeding with work of this Section.
  - 2. Plant totals are for convenience only and are not guaranteed. Verify amounts shown on Contract Documents. All planting indicated on Contract Documents is required unless indicated otherwise.
  - 3. Do not commence with this Work until grading tolerances specified in Section 32 9122 'Topsoil Grading' are met.

### 3.2 PREPARATION

- A. Plant Approval:
  - 1. Compliance:
    - a. Prior to any plant installation, evaluate plants for compliance with material standards.
    - b. Remove plants from site that do not comply.
  - 2. Inspection:
    - a. In presence of Architect or by video recording, remove root container/packing material and inspect root balls for soil depth, firmness and root structure by washing soil off of roots.
    - b. If delivered plants exhibit soil 1 inch or more above root collar, demonstrate that all trees have had excess soil removed prior to planting or that they meet standard.
    - c. If roots are loose, significantly circling, significantly asymmetrical or damaged, all tree plant material to be removed from site and replaced.
    - d. Continue inspection process until trees meet standard.
- B. Layout individual tree and shrub locations and areas for multiple plantings:
  - 1. Stake locations and outline areas.
  - 2. Secure Landscape Architect 's acceptance before planting.
  - 3. Make minor adjustments as may be requested.

### 3.3 INSTALLATION

- A. Interface With Other Work:
  - 1. Do not commence work of this Section until work of Section 32 9122 has been completed and approved.
- B. Excavation:
  - 1. If underground construction work or obstructions are encountered in excavation of planting holes, Architect will select alternate locations.
  - 2. Plant Excavation Size:

- a. Diameter: Twice diameter of root ball or container minimum.
    - b. Depth: Equal to container or rootball depth.
  3. Unless excavated material meets topsoil requirements as specified in Section 32 9113, remove from landscape areas and do not use for landscaping purposes.
  4. Roughen sides and bottoms of excavations.
  5. With approval of Architect, select five (2) typical planting excavations throughout site for drainage testing.
    - a. Fill selected excavations with water and verify that water drains away at rate of **3 inches** per hour minimum. Inform Architect in writing of excavations where water does not drain properly.
    - b. Select three (3) excavations approximately **5 feet** away from each non-draining excavation and repeat tests. Continue testing process until non-draining areas have been identified.
    - c. In excavations located in identified non-draining areas, auger **6 inch** diameter hole **4 feet** deep in low point of each excavation and fill with tamped planting mix.
    - d. Do not plant trees or shrubs in holes that do not properly drain.
- C. Planting:
  1. Removing Binders And Containers:
    - a. Remove top one / third of wire basket and burlap binders.
    - b. Remove plastic and twine binders from around root ball and tree trunk.
    - c. Remove plastic containers.
    - d. Remove wood boxes from around root ball. Remove box bottoms before positioning plant in hole. After plant is partially planted, remove remainder of box without injuring root ball.
  2. Plant immediately after removing binding material and containers:
    - a. Place tree and shrub root balls on undisturbed soil.
    - b. After watering and settling, top of tree root balls shall be approximately **two inches** higher than finished grade and trunk flare is visible.
    - c. Shrub root balls shall be approximately **one inch** higher than finished grade.
  3. Properly cut off broken or frayed roots.
  4. Center plant in hole, remove remaining wire basket and burlap taking care not to damage root ball:
    - a. Replace damaged material.
    - b. Backfill with specified planting mix.
    - c. Except in heavy clay soils, make ring of mounded soil around hole perimeter to form watering basin.
  5. Add fertilizer in plant pit as recommended by nursery during proper season.
  6. Fill landscape excavations with tamped planting mix and recommended fertilizer:
    - a. Compact in **6 inch** lifts.
    - b. Settle by watering to ensure top of root ball is **one inch** higher for shrubs than surrounding soil following compaction and settling.
  7. Do not use muddy soil for backfilling.
  8. Make adjustments in positions of plants as directed by Architect.
  9. Thoroughly water trees and shrubs immediately after planting.
- D. Ground Covers:
  1. Container-grown unless otherwise specified on Contract Documents. Space evenly to produce a uniform effect, staggered in rows and intervals shown.
- E. Post Planting Weed Control:
  1. Apply specified pre-emergent herbicide to shrub and ground cover planting areas and grass-free areas at tree bases after completion of planting.
  2. Areas shall be weed free growth before application of herbicide.
- F. Weed Barrier Fabric:
  1. After planting and application of herbicide in shrub beds, apply covering of specified weed barrier fabric.
  2. Achieve 100 percent coverage over ground areas.
  3. Overlap seams **6 inches** minimum.
  4. Staple at **5 feet** on center each way and within **3 inches** of edge of shrub bed, with two (2) at each corner.

## G. Mulching:

1. After application of herbicide, mulch shrub and ground cover planting areas with **3 inches** deep layer of specified top dressing or rock mulch.
2. Cover grass-free area at tree bases with **3 inches** of top dressing mulch or rock mulch.
3. Place mulch to uniform depth and rake to neat finished appearance.

**END OF SECTION**