

project manual

THE CHURCH OF
JESUS CHRIST
OF LATTER-DAY SAINTS

Logan 1,2
Logan UT Cache West Stake
89 South 200 West – Logan, UT
Project Number: 501735120070101



bradley gygi architect & associates, pllc

po box 521048 • salt lake city, utah 84152
801-747-2451

structural engineer
ARW Structural Engineers
1594 West Park Circle
Ogden, Utah 84404
801.782.6008

mechanical engineer

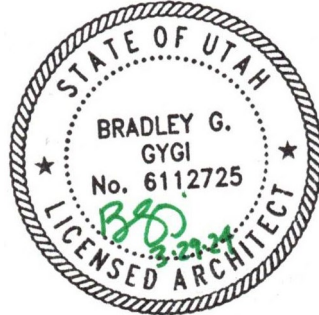
VBFA Consulting Engineers
181 East 5600 South
Murray, Utah 84107
801.530.3148

electrical engineer

VBFA Consulting Engineers
181 East 5600 South
Murray, Utah 84107
801.530.3148

BLANK PAGE

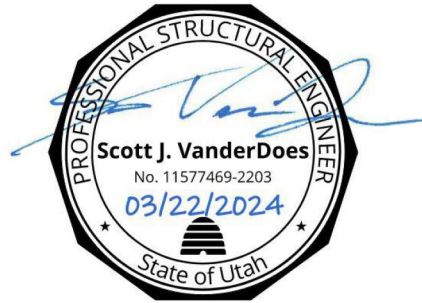
Professional Consultants



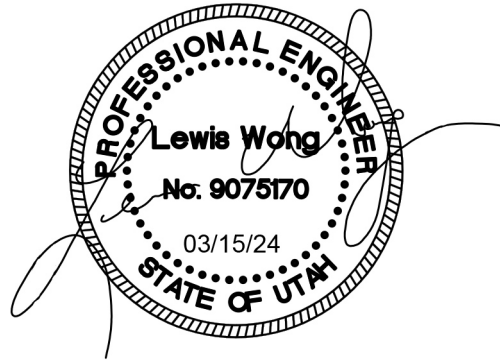
bradley gygi architect & associates, pllc

po box 521048 • salt lake city, utah 84152

801-747-2451



structural engineer
ARW Structural Engineers
1594 West Park Circle
Ogden, Utah 84404
801.782.6008



mechanical engineer
VBFA Consulting Engineers
181 East 5600 South
Murray, Utah 84107
801.530.3148

electrical engineer
VBFA Consulting Engineers
181 East 5600 South
Murray, Utah 84107
801.530.3148

INTRODUCTORY INFORMATION

BLANK PAGE

TABLE of CONTENTS

PROCUREMENT AND CONTRACTING REQUIREMENTS GROUP

INTRODUCTORY INFORMATION

PROJECT TITLE PAGE
SEALS PAGE
TABLE OF CONTENTS
LIST OF DRAWING SHEETS

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
ASBESTOS-CONTAINING MATERIAL

00 4000 PROCUREMENT FORMS AND SUPPLEMENTS

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

CONTRACTING REQUIREMENTS SUBGROUP

00 5000 CONTRACTING FORMS AND SUPPLEMENTS

SAMPLE AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR A FIXED SUM (US)

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 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 4000 QUALITY REQUIREMENTS
- 01 4200 REFERENCES
- 01 4301 QUALITY ASSURANCE - QUALIFICATIONS
- 01 4523 TESTING AND INSPECTION SERVICES

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: NOT USED

DIVISION 03: CONCRETE

03 1000 CONCRETE FORMING AND ACCESSORIES

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

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
03 6300 EPOXY GROUT

DIVISION 04: NOT USED

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

DIVISION 06: 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

DIVISION 07: THERMAL AND MOISTURE PROTECTION

07 2000 THERMAL PROTECTION

07 2116 BLANKET INSULATION
07 2123 LOOSE-FILL INSULATION

07 3000 STEEP SLOPE ROOFING

07 3113 ASPHALT SHINGLES

07 5000 MEMBRANE ROOFING

07 5419 POLYVINYL-CHLORIDE ROOFING: PVC

07 6000 FLASHING AND SHEET METAL

07 6210 GALVANIZED STEEL FLASHING AND TRIM
07 6310 STEEP SLOPE ROOF FLASHING: ASPHALT SHINGLES

07 7000 ROOF AND WALL SPECIALTIES AND ACCESSORIES

07 7126 REGLETS

07 9000 JOINT PROTECTION

07 9213 ELASTOMERIC JOINT SEALANTS

DIVISION 08: NOT USED

DIVISION 09: FINISHES

09 9000 PAINTS AND COATINGS

09 9001 COMMON PAINTING AND COATING REQUIREMENTS
09 9111 EXTERIOR PAINTED ALUMINUM
09 9112 EXTERIOR PAINTED FERROUS METAL
09 9113 EXTERIOR PAINTED GALVANIZED METAL
09 9114 EXTERIOR PAINTED MASONRY, CONCRETE, STUCCO
09 9115 EXTERIOR PAINTED WOOD

DIVISIONS 10 THROUGH 19: NOT USED

FACILITY SERVICES SUBGROUP

DIVISIONS 20 THROUGH 22: 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 1000 PLUMBING PIPES AND PUMPS

22 1400 FACILITY STORM DRAINAGE

DIVISION 23: HEATING, VENTILATING, AND AIR-CONDITIONING

23 0500 COMMON WORK RESULTS FOR HVAC

23 0501 COMMON HVAC REQUIREMENTS
23 0529 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
23 0553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
23 0713 DUCT INSULATION
23 0719 HVAC PIPING 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 3000 HVAC AIR DISTRIBUTION

23 3001 COMMON DUCT REQUIREMENTS
23 3114 LOW-PRESSURE METAL DUCTS
23 3300 AIR DUCT ACCESSORIES
23 3401 HVAC FANS
23 3723 HVAC GRAVITY VENTILATORS

23 4000 HVAC AIR CLEANING DEVICES

23 4100 AIR FILTERS

23 6000 CENTRAL COOLING EQUIPMENT

23 6215 COMPRESSOR UNITS: AIR CONDITIONING (6 TON OR MORE)

23 7000 CENTRAL HVAC EQUIPMENT

23 7413 PACKAGED, OUTDOOR, CENTRAL-STATION UNITS

DIVISIONS 24 THROUGH 25: NOT USED

DIVISION 26: ELECTRICAL

26 0000 COMMON WORK RESULTS FOR ELECTRICAL

26 0501 COMMON ELECTRICAL REQUIREMENTS
26 0519 LINE-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
26 0519 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 2000 LOW VOLTAGE ELECTRICAL TRANSMISSION

26 2417 CIRCUIT-BREAKER PANELBOARDS
26 2726 WIRING DEVICES
26 2816 ENCLOSED SWITCHES AND CIRCUIT BREAKERS

DIVISIONS 27 THROUGH 29: NOT USED

SITE AND INFRASTRUCTURE SUBGROUP

DIVISIONS 30 THROUGH 39: NOT USED

PROCESS EQUIPMENT SUBGROUP

DIVISIONS 40 THROUGH 49: NOT USED

END OF TABLE OF CONTENTS

BLANK PAGE

BIDDING REQUIREMENTS

FIXED SUM PROJECT (U.S.)

BLANK PAGE

INVITATION TO BID (U.S.)

1. GENERAL CONTRACTORS INVITED TO BID THE PROJECT:

To Be Determined

2. PROJECT:

Logan 1,2
Logan UT Cache West Stake
Project Number: 501735120070101

3. LOCATION:

89 South 200 West
Logan, UT

4. OWNER:

The Church of Jesus Christ of Latter-day Saints, a Utah corporation sole
c/o
Brian Childs, Utah North PM Office
435 North Wall St., Ste. D
Ogden, UT 84484

5. CONSULTANT:

Bradley Gygi Architect & Associates, PLLC
PO Box 521048, Salt Lake City, UT 84152

6. DESCRIPTION OF PROJECT:

- A. Reroofing and roof seismic upgrades, HVAC replacements and upgrades at an existing building.
- B. Products or systems may be provided through relationships the Owner has negotiated with suppliers as indicated 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 one hundred twenty (120) calendar days and will be as noted in the Agreement.

9. BID OPENING: Bids will be received by Owners preferred method at time and date at place to be announced. Bids will be publicly opened at time and date at place to be announced.

10. BIDDING DOCUMENTS:

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

- 1) Dodge Data and Analytics
Office # (859) 885-1091
Fax # (801) 606-7722
email: kim.mccallon@construction.com

Steps for downloading from McGraw-Hill Dodge:

Purchasing Individual Reports/Plans/Specs/Addenda from Dodge Data and Analytics

- Access the web-page <http://dodgeprojects.construction.com/>
- Search the Dodge Database by state (required) using the Dodge Report Number or Project Name for a single project report. To see a listing of all of the LDS projects in a particular state, enter the State name from the drop down box and then enter LDS in the second search box. Click Search.
- Select the project from the results list. By clicking on the blue project description, a more descriptive title will help to make sure you are purchasing the correct documents.
- When you find the correct project, select: Get This Report, Get Plans & Specs, or Monthly Access. Add to Cart and Proceed to Checkout or Continue Shopping. After the purchase, select View This Project.

2) NA

- B. Bidding Documents may be obtained from the Architect.
 - C. Bidding Documents may be obtained from Owner's electronic bidding tool.
11. **BID BOND:** If required, 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 2 business days prior to bid opening.

4. BIDDING PROCEDURES:

A. Form and Style of Bids

- 1) Use Owner's online bidding tool.
- 2) Fill in all blanks on online bidding tool. Signatures will be 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) If required, 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) Follow the instructions in the Owner's bidding tool when submitting your bid.
- 2) It is bidder's sole responsibility to see that its bid is received at specified time.
- 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 from Owner's bidding tool.

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 within 24 hours after bid opening.

7. PERFORMANCE BOND AND PAYMENT BOND:

- A. Bond Requirements - Performance Bond and Labor and Material Payment bond may 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.)", "General Conditions Fixed Sum (U.S.)" and "Supplementary Conditions Fixed Sum (U.S.)".

9. MISCELLANEOUS:

- A. Pre-Bid Conference
 - 1) A pre-bid conference will be held at a time and place to be announced.
- 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) Coordinate any site examination and access to the building outside of the Pre-Bid Conference with the FM Manager.
- 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) No information provided for this project.

2. ASBESTOS-CONTAINING MATERIAL (ACM)

- A. The building upon which work is being performed has been examined for asbestos-containing material.
- B. Owner will provide a report to the Contractor to maintain on site during construction activities.
- C. Refer to Section 01 3500, Article 1.3 "Environmental Procedures" for requirements to be followed.

END OF DOCUMENT

BLANK PAGE

SUBCONTRACTORS AND MAJOR MATERIALS SUPPLIERS LIST

Project Name: Logan 1,2 Date: _____

Stake: Logan UT Cache West Stake Project No: 501735120070101

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 _____

Wood Flooring _____

Other _____

Other _____

SUBCONTRACTORS AND SUPPLIERS

Grading / Site work _____

Site Utilities _____

Demolition _____

Paving _____

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: Logan 1,2 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:** _____

CONSTRUCTION MATERIAL ASBESTOS STATEMENT (U.S.)

**PROJECTS FOR:
THE CHURCH OF JESUS CHRIST OF LATTER-DAY SAINTS,
a Utah corporation sole**

Building Name: Logan 1,2

Building Plan Type: Non-Standard, Historic

Building Address: 89 South 200 West - Logan, UT

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

Project Number: 501735120070101

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

Bradley Gygi Architect & Associates, PLLC
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

BLANK PAGE

AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR A FIXED SUM (U.S.)

The Church of Jesus Christ of Latter-day Saints, a Utah corporation sole ("Owner") and _____ ("Contractor") hereby enter into this *Agreement Between Owner and Contractor for a Fixed Sum (U.S.)* ("Agreement") and agree as follows:

1. **Property/Project.**

Property/Project Number:
Property Address ("Project Site"):
Project Type:
Project Name ("Project"):
Stake Name:

2. **Scope of the Work.** Contractor will furnish all labor, materials, equipment, construction, and services necessary to complete the Work in accordance with the Contract Documents.

3. **Contract Documents.**

- a. The Contract Documents consist of:
 - 1) This Agreement;
 - 2) The General Conditions for a Fixed Sum (U.S.), the Supplementary Conditions for a Fixed Sum (U.S.), and the Specifications (Divisions 01 through 49) contained in the Project Manual entitled _____, dated _____ and prepared by _____ (Architect);
 - 3) The Drawings prepared by Architect entitled _____ sheet numbers _____, dated _____;
 - 4) Addendum No. _____ dated _____; and
 - 5) All Modifications to the Contract Documents.
- b. The Contract Documents are incorporated into this Agreement by reference as if fully set forth herein.
- c. The definitions set forth in the General Conditions for a Fixed Sum (U.S.) will apply to the Contract Documents.
- d. The Contract Documents contain the entire and integrated agreement between the parties hereto and supersede all prior negotiations, representations, or agreements, either written or oral.
- e. Modifications or other amendments to the Contract Documents must be in writing and as provided in the General Conditions for a Fixed Sum (U.S.).

4. **Time of Commencement and Substantial Completion.**

- a. Contractor will commence the Work on the date for commencement set forth in the Written Notice to proceed from Owner to Contractor.
- b. Contractor will achieve Substantial Completion and have the Work ready for Owner's inspection no later than _____ (_____) days from the date of commencement set forth in the Written Notice to proceed from Owner to Contractor, as adjusted in accordance with the Contract Documents.
- c. Time is of the essence.

5. **Contract Sum.**

- a. Owner will pay Contractor for performance of Contractor's obligations under the Contract Documents the Contract Sum in the amount of _____ Dollars (_____), subject to additions and deductions as provided in the Contract Documents.
- b. Owner will make payments to Contractor in accordance with the Contract Documents.

6. **Independent Contractor Relationship.** Contractor is an independent contractor and is not the agent or employee of Owner.

7. **Assignment.** Neither party to this Agreement will assign any right or obligation hereunder without the prior written consent of the other, which consent may be granted or withheld in such party's absolute discretion. Contractor will not assign moneys due or to become due to Contractor hereunder, nor will Contractor pledge the credit of Owner or bind Owner to any third party.

8. **Notice.** The parties designate the addresses, facsimile numbers, and email addresses as set forth in the signature blocks below to be used for sending Written Notice to the other party:
9. **Effective Date.** The effective date of this Agreement is the date indicated by the Owner's signature.

OWNER: The Church of Jesus Christ of Latter-day Saints, a Utah corporation sole	CONTRACTOR: (company)
Signature: _____	Signature: _____
Print Name: _____	Print Name: _____
Title: _____	Title: _____
Address: _____ _____	Address: _____ _____
Telephone No: _____	Telephone No: _____
Facsimile No: _____	Facsimile No: _____
Email: _____	Email: _____
Effective Date: _____	Fed. I.D. or SSN: _____
	License No: _____
Reviewed By: _____	Date Signed: _____

EXAMPLE

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, attorney 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, attorney 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;
 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 and its consultants as the Certificate Holders 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 better. 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 herein 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, attorney 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, Meetinghouse 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 attorney 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 attorney 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 provision of the Contract Documents, the prevailing party will be entitled to recover its attorney 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 Agreement and General Conditions 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 \$500.00 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 \$500.00 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 \$200.00 per day.

ITEM 3 - PERMITS

1. Delete Section 3.6, Paragraph B of the General Conditions and replace with the following:
 - B. The Owner will pay the costs of permits, fees and improvement bonds required by local agencies necessary for the proper execution and completion of the work. Contractor shall obtain all permits and pay all fees, which will be reimbursed by the Owner without markup. These costs shall not be included in the bid amount. Contractor will conform to all ordinances and covenants governing the Project Site and/or Work.

ITEM 4 - STATE SPECIFIC SUPPLEMENTARY CONDITIONS

RETENTION APPLIED TO CONTRACTOR PAYMENTS FOR PROJECTS IN UTAH:

Replace section 9.5.F of the General Conditions with the following:

- F. In addition and notwithstanding the foregoing, Owner may also withhold and retain 5% of payments made to Contractor. These retention funds will be held in an interest bearing account.

PAYMENT OF RETAINED FUNDS IN UTAH:

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

- G. After Contractor achieves Substantial Completion and submits its payment request for retained funds and delivers to the Architect Owner's form entitled "Contractor's Substantial Completion Affidavit and Consent of Surety" fully executed by Contractor and its surety, if any, and provides statutory Conditional Waiver and Release documents executed by all subcontractors and suppliers having claim against the retained funds, Owner will pay any unpaid retention less any amounts withheld pursuant to Section 9.4

within forty-five (45) days from the later of (a) the date Owner received Contractor's payment request for retained funds and fully executed Contractor's Substantial Completion Affidavit and Consent of Surety, (b) the date a certificate of occupancy is issued; (c) the date that a building inspector having authority to issue its own certificate of occupancy does not issue that certificate but permits occupancy.

UTAH STATE SALES TAX:

Add the following to the General Conditions:

1. Contractors should be exempt on purchases of material installed or converted into real property to be used by the Owner. The Contractor will furnish each vendor with a completed Exemption Certificate Form TC-721. The certificate will be prepared by the Contractor for each vendor in order to obtain the exemption.
2. The Owner's tax exempt number is 11871701-002-STC.

UTAH NOTICE OF INTENT TO OBTAIN FINAL COMPLETION:

Add the following to the General Conditions:

- A. Contractor will file with the State Construction Registry, on its own behalf and/or on behalf of Owner, a notice of intent to obtain final completion at least 45 days before the day on which the Owner or Contractor files or could file a notice of completion under Utah Code Ann. Section 38-1a-506 if:
 1. The completion of performance time under the original contract for construction work is greater than 120 days;
 2. The total original construction contract price exceeds \$500,000; and
 3. The original contractor or owner has not obtained a payment bond in accordance with Utah Code Ann. Section 14-2-1.

UTAH NOTICE OF COMPLETION:

Add the following to the General Conditions:

- A. Within five (5) calendar days of final completion of the Project and in compliance with Section 38-1a-507 Utah Code Annotated, Contractor will file with the State Construction Registry, and copy to Owner, a notice of completion which will include, without limitation, the following:
 1. The name, address, telephone number, and email address of the person filing the notice of completion;
 2. The name of the county in which the Project and/or Project site is located;
 3. The date on which final completion is alleged to have occurred;
 4. The method used to determine final completion; and
 5. One of the following:
 - a. The tax parcel identification number of each parcel included in the Project and/or Project site;

- b. The entry number of a preliminary notice on the same project that includes the tax parcel identification number of each parcel included in the Project and/or Project site; or
 - c. The entry number of the building permit issued for the Project.
- B. Notwithstanding any other provision of the Contract Documents to the contrary, Contractor and Owner agree that any breach or failure to comply with this Section by the Contractor will constitute a breach of contract and the Contractor will be liable for any direct, indirect, or consequential damages to the Owner flowing from this breach.

UTAH PROGRESS PAYMENTS AND FINAL PAYMENT:

Replace Section 9.5.A of the General Conditions with the following:

9.5 PROGRESS PAYMENTS

- A. Owner will pay Contractor progress payments within the parameters of Section 9.2 within fifteen (15) days after:
 - 1. Contractor has submitted a progress payment request;
 - 2. Contractor has obtained Conditional Waiver and Release Upon Progress Payment documents (in content complying with Utah Code § 38-1a-802) executed by each of the subcontractors performing work and/or providing materials covered by the Contractor's progress payment request; and
 - 3. Owner receives the certified payment request from Architect.

Replace Section 9.6.A.3 of the General Conditions with the following:

9.6 FINAL PAYMENT

- 3. Contractor has obtained Waiver and Release Upon Final Payment documents (in content complying with Utah Code § 38-1a-802) executed by each of the subcontractors performing work and/or providing materials covered by the Contractor's final payment request;

END OF DOCUMENT

BLANK PAGE

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 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 4000 QUALITY REQUIREMENTS
- 01 4200 REFERENCES
- 01 4301 QUALITY ASSURANCE - QUALIFICATIONS
- 01 4523 TESTING AND INSPECTION SERVICES

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

END OF TABLE OF CONTENTS

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.

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 may issue separate contracts for operations scheduled to precede and be substantially completed before beginning of The Work under this Contract.
1. Contractor will be given written notice from such contractors of any revisions to scheduled completion of their work at least 30 days in advance. Owner will reimburse Contractor for expenses incurred by Contractor by failure to be properly notified.
- B. 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. 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. Concrete. See Section 03 3111.
 - b. Drill-In Mechanical Anchors / Adhesive Anchors / Screw Anchors. See Section 03 1511 and Section 04 0519.
 - c. Structural Steel Framing. See Section 05 1200.
 - d. Wood Panel Product Sheathing. See Section 06 1636.

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

BLANK PAGE

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 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.
 3. Schedule of Allowances.
 4. Schedule of Alternates.

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. 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.
- B. Project designation for this Project is **LOGAN 1,2 501735120070101**.
- C. 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.
- B. Related Requirements:
 - 1. Section 01 7800: 'Closeout Submittals' for administrative and procedural requirements for closeout submittals.

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 allowing 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.
 - c. Electronic Submittals:
 - 1) Preferred method of transmittal for most submittals previously in paper format is via email attachment to Architect in .pdf format.
 - 2) Maintain original size of .pdf files submitted from subcontractors (24"x36" drawings shall remain original size in electronic format, for example).
 - 3) Electronic submittals shall be submitted as a single file (.pdf) per submittal item / discipline.
 - a) Do not submit multiple files, cut sheets, product information, etc.
 - b) Contractor shall compile each submittal including transmittal letter as first page of each submittal.
 - 4) Contractor shall submit each submittal item / discipline in a separate email, not multiple submittals in a single email.
 - a) Subject line of submittal email shall include project name and submittal title / category.
 - d. Physical Submittals:
 - 1) Submittals requiring hard copies or including physical product samples shall be delivered or shipped to Architect's office. Deliveries are accommodated from 8:30am to 4:30pm Monday through Friday on regular business days.
 - 2) Package each submittal appropriately for transmittal and handling. On transmittal, record relevant information and requests for data.

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 five copies of each required submittal unless otherwise required. Architect will return three copies marked with action taken and with corrections or modifications required.
 5. 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 (215 by 280 mm) but no larger than 36 by 48 inches (915 by 1 200 mm). 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.
 4. Hard Copy Submittals: Unless otherwise specified, submit to Architect six copies of shop drawings required by Contract Documents.
 5. Submit electronic files PDF: Architect will return a PDF copy marked with action taken and with corrections or modifications required.
 6. 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 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. As Built Record Drawings as defined in the Agreement.
 2. Project Manual: Complete Project Manual including Addenda and Modifications as defined in General Conditions.
 3. Maintenance Contracts: Describe submittal of the maintenance contract specific to the Section.
 4. Operations & Maintenance Data: Describe submittal of operation and maintenance data necessary for products of the Section.
 5. Warranty Documentation: Describe submittal of final executed warranty document specific to the Section.
 6. Record Documentation: Describe submittal of record documentation specific to the Section.
 7. Software: Describe submittal system software and programming software specific to the Section.
- B. All Closeout Submittals are to be compiled and submitted electronically in pdf format by the Contractor, with Items 2-7 above compiled into a single pdf file O&M Manual for Architect's review before turning over to the Owner.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. This title groups maintenance material required submittals specific to the Section. Items may be provided at completion of Work or submitted with section 01 7800 Closeout Submittals:
 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:
 - 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.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

BLANK PAGE

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 (1.80 m)** 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 4000**QUALITY REQUIREMENTS****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 administrative and procedural requirements for quality assurance and quality control.
- B. Related Requirements:
 - 1. Section 01 3100: 'Project Management and Coordination' for Pre-Installation Conferences for testing and inspection.
 - 2. Section 01 3200: 'Construction Progress Documentation' for developing a schedule of required tests and inspections.
 - 3. Section 01 3300: 'Submittal Procedures'.
 - 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 7300: 'Executions' for cutting and patching for repair and restoration of construction disturbed by testing and inspecting activities.
 - 7. Divisions 01 thru 49 establish responsibility for providing specific testing and inspections.

1.3 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. Approved: To authorize, endorse, validate, confirm, or agree to.
 - 3. Experienced: When used with an entity, "experienced" means having successfully completed a 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.
 - 4. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a construction operation, including installation, erection, application, and similar operations.
 - a. Using a 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.
 - 5. 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.

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. 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.
 8. 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.
 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. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
 12. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
 13. 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. International Code Council (IBC) (2015 or most recent edition adopted by AHJ):
 - a. IBC Chapter 17, 'Structural Tests and Special Inspections'.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Conflicting Requirements:
1. General:
 - a. If compliance with two or more standards is specified and standards establish different or conflicting requirements for minimum quantities or quality levels, comply with most stringent requirement.
 - b. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
 2. Minimum Quantity or Quality Levels:
 - a. Quantity or quality level shown or specified shall be minimum provided or performed.
 - b. Actual installation may comply exactly with minimum quantity or quality specified, or it may exceed minimum within reasonable limits.
 - c. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for context of requirements.
 - d. Refer uncertainties to Architect for decision before proceeding.
- B. Coordination:
1. Coordinate sequence of activities to accommodate required quality assurance and quality control services with minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
- C. Scheduling:
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.5 QUALITY ASSURANCE

- A. Testing and inspecting services are used to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.
1. Specific quality assurance and quality control requirements for individual construction activities are specified in Sections that specify those activities and Section 01 4523. Requirements in those Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's other quality control procedures that facilitate compliance with Contract Document requirements.
 3. Requirements for Contractor to provide quality assurance and quality control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- B. Quality Assurance Services:
1. Activities, actions, and procedures performed before and during execution of the Work to verify compliance and guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
 2. Owner or Owner's designated representative(s) will perform quality assurance to verify compliance with Contract Documents.
- C. Activities performed by Owner's Quality Assurance Testing Agency include, but are not limited to following:
1. Individual Sections in Division 01 through Division 49:
 - a. Pre-Installation Conference agenda review items for:
 - 1) Schedule requirements.
 - 2) Testing and inspection requirements:
 - 3) Requirements and frequency of testing and inspections.
 - 4) Mock-up or sample requirements.
 - 5) Submittals requirements.
 - b. Quality Assurance personal qualifications.
 - 1) Qualification documentation including certificates if required.
 - c. Non-Conforming Work:
 - 1) Prepare non-compliance log to track non-compliant testing or inspections.
 2. Weekly Activities:
 - a. Summarize and track any non-compliance issues.
 - b. Provide summary report of previous week's performed Work.
 - c. Visit contractors periodically to find out if they have any concerns with Quality Assurance inspectors and check on any schedule changes.
 - d. Visit Owner's Representatives periodically to find out if they have any concerns with how project is progressing.
- D. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with following requirements, using materials indicated for completed Work:
1. Coordinate with individual section in Division 01 through Division 49 if there are any additional requirements or modification to these requirements:
 - a. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 - b. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - c. Demonstrate proposed range of aesthetic effects and workmanship.
 - d. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - 1) Allow seven days for initial review and each re-review of each mockup.
 - e. Maintain mockups during construction in undisturbed condition as standard for judging completed Work.
 - 1) Demolish and remove mockups when directed, unless otherwise indicated.

1.6 QUALITY CONTROL

- A. Quality Control Services:
1. Quality Control will be sole responsibility of Contractor.
 - a. Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements performed by Contractor:
 - 1) They do not include inspections, tests or related actions performed by Architect, Owner, governing authorities or independent agencies hired by Owner or Architect.
 - 2) Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.

- b. Where services are indicated as Contractor's responsibility, engage a qualified Testing Agency to perform these quality control services.
 - 1) Contractor shall not employ same testing entity engaged by Owner, without Owner's written approval.

- B. Manufacturer's Field Services: Where indicated, engage factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 3300: 'Submittal Procedures'.

- C. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality control services, and provide reasonable auxiliary services as requested. Notify Testing Agency sufficiently in advance of operations to permit assignment of personnel. Provide following:
 - 1. Access to the Work.
 - 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 - 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist Testing Agency in obtaining samples.
 - 4. Facilities for storage and field curing of test samples.
 - 5. Delivery of samples to testing agencies.
 - 6. Preliminary design mix proposed for use for material mixes that require quality control by Testing Agency.
 - 7. Security and protection for samples and for testing and inspecting equipment at Project site.

- D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections:
 - 1. Civil And Structural Testing:
 - a. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services'. Quality Control is sole responsibility of Contractor:
 - 1) 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:
 - a) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.
 - 2) Contractor bears full responsible for compliance with all contract requirements and quality control on project and will be responsible for quality of asphalt mixture and asphalt installation.
 - b. Weekly Activities:
 - 1) Ensure that non-compliance log is current.
 - 2) Provide summary reports of performed Work.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
 - 2. Comply with Contract Document requirements for Section 01 7300 'Execution' for cutting and patching.

- B. Protect construction exposed by or for Quality Assurance and Quality Control activities.

- C. Repair and protection are Contractor's responsibility, regardless of assignment of responsibility for Quality Assurance and Quality Control Services.

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 may or 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, 5th 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	www.aabchq.com
AAMA	American Architectural Manufacturers Association	Schaumburg	IL	(847) 303-5664	www.aamanet.org
AASHTO	American Association of State Highway & Transportation Officials	Washington	DC	(202) 624-5800	www.aashto.org

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

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

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

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

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 E329-18, '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. Manufacturers / Distributors / Fabricator / Suppliers / Installers 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. Owner established Relationships:
 - 1) Where heading 'Category One, Two, or Three Approved' *Manufacturers / Suppliers / Distributors / Installers* is used to identify list Owner established Relationships, Owner has established relationships that extend beyond requirements of this Project.
 - 2) No other *Manufacturers / Suppliers / Distributors / Installers* will be acceptable.
 - 3) Follow specified procedures to preserve relationships between Owner and specified *Manufacturers / Suppliers / Distributors / Installers* and advantages that accrue to Owner from those relationships.
 - a) Asphalt Shingles, Section 07 3113: Category Three Approved, no other Manufacturer / Installers accepted.

- b) Polyvinyl-Chloride Roofing: PVC, Section 07 5419: Category Three Approved, 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.
- 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.
- 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 49 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 15th St., NW, Washington, DC 20005; 202-347-7474; 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. Field Quality Control: Testing, Inspections, Special Testing and Special Inspections to assure compliance to Contract Documents.
 - 4. 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.
5. 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.
 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. 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.
 8. Quality Assurance: Testing, Inspections, Special Testing and Special Inspections provided for by Owner.
 9. Quality Control: Testing, Inspections, Special Testing and Special Inspections provided for by Contractor.
 10. Special Inspection: See Inspection.
 11. Special Inspector: Certified individual or firm that implements special inspection program for project.
 12. Special Test: See Test.
 13. 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.
 14. Testing Agency: Entity engaged to perform specific tests, inspections, or both.
 15. Testing Agency Laboratory: Agency or firm qualified to perform field and laboratory tests to determine characteristics and quality of materials and workmanship.
 16. 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 A898/A898M-17, 'Standard Specification for Straight Beam Ultrasonic Examination of Rolled Steel Structural Shapes'.
 - b. ASTM C42/C42M-18, 'Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete'.
 - c. ASTM C138/C138M-17a, 'Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete'.
 - d. ASTM C597-16, 'Standard Test Method for Pulse Velocity Through Concrete'.
 - e. ASTM C803/C803M-18, 'Standard Test Method for Penetration Resistance of Hardened Concrete'.
 - f. ASTM C805/C805M-13a, 'Standard Test Method for Rebound Number of Hardened Concrete'.
 - g. ASTM C1019-18, 'Standard Test Method for Sampling and Testing Grout'.
 - h. ASTM C1021-08(2014), 'Standard Practice for Laboratories Engaged in Testing of Building Sealants'.
 - i. ASTM C1077-17, 'Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation'.
 - j. ASTM C1093-15a, 'Standard Practice for Accreditation of Testing Agencies for Masonry'.
 - k. ASTM D3666-16, 'Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials'.

- l. 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'.
 - m. ASTM E114-15, 'Standard Practice for Ultrasonic Pulse-Echo Straight-Beam Examination by the Contact Method'.
 - n. ASTM E164-13, 'Standard Practice for Contact Ultrasonic Testing of Weldments'.
 - o. ASTM E329-18: 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing'.
 - p. ASTM E488-18, 'Standard Test Methods for Strength of Anchors in Concrete Elements'.
 - q. ASTM E543-15, 'Standard Specification for Agencies Performing Nondestructive Testing'.
 - r. ASTM E587-15, 'Standard Practice for Ultrasonic Angle-Beam Examination by the Contact Method'.
 - s. ASTM E709-15, 'Standard Guide for Magnetic Particle Testing'.
 - t. ASTM E1212-17, 'Standard Practice for Quality Management Systems for Nondestructive Testing Agencies'.
 - u. ASTM F710-17, 'Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring'.
 - v. ASTM F2170-18, 'Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes'.
2. Code of Federal Regulations:
 - a. 29 CFR 1910, Subpart A, Section 1910.7, 'Definition and Requirements for a Nationally Recognized Testing Laboratory'.
 3. International Code Council Code (IBC) (2018 or most recent edition adopted by AHJ):
 - a. IBC Chapter 17, 'Special Inspections And Tests'.
 - 1) Section 1704, 'Special Inspections And Tests, Contractor Responsibility And Structural Observations'.
 - 2) Section 1705, 'Required Special Inspection And Tests'.
 - a) Section 1705.2, 'Steel Construction'.

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.
 - c. Submittal Format:
 - 1) Schedule of Tests and Inspections: Prepare in tabular form and include following:
 - a) Specification Section number and title.
 - b) Description of test and inspection.
 - c) Identification of applicable standards.
 - d) Identification of test and inspection methods.
 - e) Number of tests and inspections required.
 - f) Time schedule or time span for tests and inspections.
 - g) Entity responsible for performing tests and inspections.
 - h) Requirements for obtaining samples.
 - 2) Certified written reports of each inspection, test, or similar service will include, but not be limited:

- a) Date of issue.
 - b) Project title and number.
 - c) Name, address, and telephone number of Testing Agency.
 - d) Dates and locations of samples and tests or inspections.
 - e) Names of individuals making tests and inspections.
 - f) Description of the Work and test and inspection method.
 - g) Identification of product and Specification Section.
 - h) Complete test or inspection data.
 - i) Test and inspection results and an interpretation of test results.
 - j) Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 - k) Comments or professional opinion on whether tested or inspected Work complies with Contract Document requirements.
 - l) Name and signature of laboratory inspector.
 - m) Recommendations on retesting and re-inspecting.
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 49 indicate if Owner will provide testing and inspection of the Work of that Section.
- C. 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 49.
- D. 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.
- 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. Excavation Support and Protection:
 - 1. Anchor tie-back System:
 - a. Observe and record proof tests.
 - 2. Soil Nail Systems:
 - a. Observe and record proof tests.
 - b. Observe drilling for changes in soil type, hole diameter, length, and cleanliness.
 - c. Periodically observe placement of drainage materials, reinforcing, and shotcrete.
 - d. Review compressive strength test results of grout and shotcrete.
- D. 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.

E. 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.
 - b. Prepare non-compliance log to track non-compliant testing or inspections.
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 49.

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

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 ADMINISTRATIVE REQUIREMENTS

- 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.
- C. Proprietary Camera Services: In its absolute discretion, and with or without notice to Contractor, Owner may provide from time to time, but is not obligated to provide, one or more cameras on or about Project site and/or signage or notices of the same:
1. If provided by Owner, such camera(s) and/or signage and notices are solely for Owner's benefit and convenience and shall not be for benefit of Contractor, Subcontractor(s) or for any third person.
 2. Owner shall have no liability, obligation, or responsibility to Contractor, Subcontractors, or any third person relative to such camera(s), signage, or notices, or absence of camera(s), signage, or notices, including without limitation, installation, maintenance, operation, repair, testing, functionality, capacity, recording, monitoring, posting, etc., of the same (hereafter 'Proprietary Camera Services').
 3. Contractor, with Owner's prior consent (which shall not be unreasonably withheld), may relocate such camera(s), signage, or notices as necessary to not unreasonably, materially and physically interfere with work at Project Site.
 4. Contractor's obligations under Contract Documents, including but not limited to, Contractor's obligation for security of Project Site, are not modified by Owner's opportunity to provide, actually providing, or not providing Proprietary Camera Services and/or signage or notices regarding the same.
 5. This Specification Section does not preclude Contractor from providing its own camera(s), signage, or notices pursuant to terms and conditions of this Agreement. Neither does this Section reduce, expand or modify any other right or obligation of Owner pursuant to terms of this Agreement.

1.3 TEMPORARY AIR BARRIERS

- A. Provide air barriers as required for protection of new, stored and/or installed equipment, furnishings, finishes and other work.

1.4 TEMPORARY DUST BARRIERS

- A. Provide dust barriers as required for protection of new, stored and/or installed equipment, furnishings, finishes and other work.

1.5 TEMPORARY NOISE BARRIERS

- A. Provide noise barriers as required by local serving agencies, counties, state and cities.
- B. Construction to occur during approved working hours required by State, county and local agencies, and as agreed to with owner's representatives.

1.6 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.

1.7 TEMPORARY FENCING

- A. Before construction begins, install 6 foot high enclosure fence with lockable entrance gates. Locate where shown on Drawings. If not shown on Drawings, enclose entire site or portion sufficient to accommodate construction operations.

1.8 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.

1.9 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: \$1,500.00.
 - 2) Shrubs: \$ 150.00.
 - 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

BLANK PAGE

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.

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 ADMINISTRATIVE REQUIREMENTS

- 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. Refer to individual Specification Sections and Allowance provisions in Division 01 for allowances that control product selection, and for procedures required for processing such selections.

- I. 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.

- J. Informational Submittals:
 - 1. Sustainable Design Submittals:
 - a. 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.
 - b. Submit electronic files: PDF. Architect will return a PDF copy marked with action taken and with corrections or modifications required.

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 ADMINISTRATIVE REQUIREMENTS

- 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.
 - a. Regional materials.
- 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 / Distributors / Fabricators / Installers:
 - 1) Category One:
 - a) Owner has established 'Relationships' that extend beyond requirements of this Project. No substitutions or equal products will be allowed on this Project.
 - b) Specification Sections specify Owner Furnished and Owner Installed Manufacturers or Products.
 - c) 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 'Relationships' that contain provisions extending beyond requirements of this Project. No substitutions or equal products will be allowed on this Project.
 - b) Specification Sections specify Owner Furnished and Contractor Installed Manufacturers, Suppliers, Distributors or Products.
 - c) 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) Owner has established 'Relationships' that contain provisions extending beyond requirements of this Project. Use these products to preserve advantages that accrue to Owner from those programs. No substitutions or equal products will be allowed on this Project.
 - b) Specification Sections specify Contractor Furnished and Contractor Installed Manufacturers, Suppliers, Distributors, Fabricators or Products.
 - 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:

1.2 ADMINISTRATIVE REQUIREMENTS

- A. General:
1. Review 'Contractor Notice of Owner Furnished Materials' notice listing Owner-furnished products to be delivered for Project:
 - a. Review due (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 Notice of Owner Furnished Materials'. Contact vendors directly if changes to delivery dates become necessary during construction.
 - b. Report problems in coordinating due (delivery) dates with construction schedule to Architect and Owner's Purchasing Coordinator.
 2. Receive unload, store and protect Owner-furnished materials and products.
 - a. Provide labor and equipment necessary to receive, unload, and store materials and products.
 - b. Count number of pieces received and note any discrepancies on Delivery Receipt before driver leaves:
 - 1) Compare 'Contractor Notice of Owner Furnished Materials' notice' with packing slips.
 - 2) Note discrepancies in number, size, color, model numbers, etc. on Delivery Receipt.
 - c. Include Project Name and Project Number on Delivery Receipt.
 - d. Check for visible evidence of damage such as holes, tears, or crushed portions of cartons and note on Delivery Receipt before driver leaves:
 - 1) Include Project Name and Project Number on Delivery Receipt.
 - 2) If you are unsure if carton is damaged, take photo of cartons and share it with Owner's Purchasing Coordinator.
 - e. Properly store and protect all deliveries of Owner Furnished materials and Products.
 3. Within forty-eight (48) hours of delivery:
 - a. Open and inspect each piece of freight delivered. Take picture of any concealed damage not reported at time of delivery and report it to Owner's Purchasing Coordinator.
 - b. Compare 'Contractor Notice of Owner Furnished Materials' with packing slips. Note discrepancies in number, size, color, model numbers, etc.
 - c. Deliver copy of Delivery Receipt (bill of lading) on which you have noted any loss or damage to Owner's Purchasing Coordinator. Include in your submission any report of concealed damage, discrepancies or photos.
 4. Failure to strictly follow above procedures will result in your assumption of all financial responsibility for this shipment. All replacement and reorders must be made through Owner's Purchasing Coordinator and must allow Owner's vendor sufficient lead time to produce and ship new product.
 5. When above procedures are strictly followed, shortages and damaged items will be replaced by Owner at Owner's cost.

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 ADMINISTRATIVE REQUIREMENTS

- 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 waster 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

BLANK PAGE

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.
- B. Related Requirements:
 - 1. Section 01 3300: 'Submittal Procedures' for administrative and procedural requirements for submittal procedures.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Project Record Documents:
 - 1. Do not use record documents for construction purposes:
 - a. Protect from deterioration and loss in secure, fire-resistive location.
 - b. Provide access to record documents for Architect's reference during normal working hours.
 - 2. Maintain clean, undamaged set of Drawings:
 - a. Mark set to show actual installation where installation varies from the Work as originally shown.
 - b. Give particular attention to concealed elements that would be difficult to measure and record at a later date.
 - c. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.
 - d. Mark new information that is important to Owner, but was not shown on Drawings.
 - e. Note related Change Order numbers where applicable.
- B. As Built Record Drawings:
 - 1. As required in agreement with the Owner:
 - a. Architect will provide two full-size sets of prints of the As Built Record Drawings to the Facilities Management Office, printed from the updated AutoCAD drawing files or updated Revit model files, as specified by Owner, that have been modified to show actual dimensions and location of equipment, material, utility lines, and other work as actually constructed, based upon information provided by Contractor. Architect will submit updated As Built Record Drawings in PDF (ISO32000 format) to Owner.
 - b. Architect will submit following:
 - 1) Updated AutoCAD as built record drawing files with associated plot style tables or Revit as built record model files, as specified by Owner.
 - 2) Revit Model O&M lifecycle requirements to be tracked by Facility Manager.

1.3 CLOSEOUT SUBMITTALS

- A. Operations And Maintenance Manual:
 - 1. General:
 - a. Include closeout submittal documentation as required by Contract Documentation.
 - b. Include workmanship bonds, final certifications, equipment check-out sheets, and similar documents.
 - c. Releases enabling Owner unrestricted use of The Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - d. Include Project photographs, damage or settlement survey, and similar record information required by Contract Documents.

- e. Submittal Format:
 - 1) Digital copies unless otherwise noted, required for each individual specification section that include 'Closeout Submittals'.
 - 2) Include only closeout submittals as defined in individual specification section as required in Contract Documents.
2. Project Manual:
 - a. Copy of complete Project Manual including Addenda, Modifications as defined in General Conditions, and other interpretations issued during construction:
 - 1) Mark these documents to show variations in actual Work performed in comparison with text of specifications and Modifications.
 - 2) Show substitutions, selection of options, and similar information, particularly on elements that are concealed or cannot otherwise be readily discerned later by direct observation.
3. Maintenance Contracts:
 - a. Digital format only.
4. Operations and Maintenance Data:
 - a. Digital format only:
 - 1) Cleaning instructions.
 - 2) Maintenance instructions.
 - 3) Operations instructions.
 - 4) Equipment list.
 - 5) Parts list.
5. Warranty Documentation:
 - a. Digital format of final, executed warranties.
6. Record Documentation:
 - a. Digital format only.
 - 1) Certifications.
 - 2) Color and pattern selections.
 - 3) Design Data.
 - 4) Geotechnical Evaluation Reports (soils reports).
 - 5) Manufacture Reports.
 - 6) Manufacturer's literature or cut sheets.
 - 7) Shop Drawings.
 - 8) Source Quality Control.
 - 9) Special Procedures.
 - 10) Testing and Inspection Agency Reports.
 - 11) Testing and Inspection Reports.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Submit item(s) required by Section 01 3300 'Submittal Procedures' and as defined in individual specification section if required in Contract Documents. Items may be provided at completion of Work or with Closeout Submittals.

1.5 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.

PART 2 - PRODUCTS Not Used

PART 3 - EXECUTION Not Used

END OF SECTION

BLANK PAGE

DIVISION 03: CONCRETE

03 1000 CONCRETE FORMING AND ACCESSORIES

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

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
03 6300 EPOXY GROUT

END OF TABLE OF CONTENTS

BLANK PAGE

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 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. Reference Standards:
 - 1. American Concrete Institute:
 - a. ACI 318-14, 'Building Code Requirements for Structural Concrete and Commentary'.

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 requirements and frequency of testing and inspections.
- B. Scheduling:
 - 1. Notify Testing Agency and Architect as directed in Section 03 3111.

1.4 SUBMITTALS

- A. Informational Submittals:
 - 1. Manufacturer Instructions:
 - a. Printed application instructions for form release agents.

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. Form Release / Finish Agent:
 - 1. Vertical, Exposed Surfaces or Unexposed Surfaces:
 - a. Chemically acting type.
 - b. Type Two Acceptable Products.
 - 1) Crete-Lease 727 or 20-VOC by Cresset Chemical Co, Weston, OH www.cresset.com.
 - 2) Clean Strip (J-1 or J-3 VOC) by Dayton Superior Specialty Chemicals, Kansas City, KS www.daytonsuperiorchemical.com.
 - 3) E-Z Strip or DEBOND Form Coating by L & M Construction Chemicals, Omaha, NE www.lmcc.com.
 - 4) Q-2 by Unitex, Kansas City, MO www.unitex-chemicals.com.
 - 5) U S Spec Slickote by U S Mix Products Co www.usspec.com.
 - 6) Duogard or Duogard II by W R Meadows, Elgin, IL www.wrmeadows.com.
 - 7) Equal as approved by Architect before use. See Section 01 6200.

- C. Expansion / Contraction Joints:
 - 1. **1/2 inch (13 mm)** 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.
 - 2) Sealtight by W R Meadows Inc, Hampshire, IL 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.
 - 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. Make proper form adjustments before, during, and after concreting.
 - 4. 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.
 - 5. 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. Form Release / Finish Agents:
 - a. Film thickness shall be no thicker than as recommended by Manufacturer.
 - b. Allow no release / finish agent on reinforcing steel or footings.
 - 3. Expansion Joints:

- a. Install at joints between floor slab and foundation wall where shown on Drawings.
- C. Form Removal (Slab on Grade):
1. Removal of forms can usually be accomplished in twelve (12) to twenty-four (24) hours.
 2. If temperature is below 50 deg F (10 deg C) 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. Concrete Formwork:
 - a. Inspections are not required and will be performed at discretion of Architect.

END OF SECTION

BLANK PAGE

SECTION 03 1511
CONCRETE ANCHORS

PART 1 - GENERAL**1.1 SUMMARY**

- A. Products Furnished But Not Installed Under This Section:
 - 1. Cast-in place and post-installed concrete anchors including:
 - a. Adhesive anchors for concrete.
 - b. Expansion anchors for concrete.
 - c. J-bolts and headed cast-in-place bolts.
 - d. Screw anchors for concrete.
 - e. Concrete anchors and inserts not specified elsewhere.
 - 2. Installer responsible when inspection results of concrete anchors require corrective actions.
- B. Related Requirements:
 - 1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
 - 2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 3. Section 03 3111: 'Cast-In-Place Structural Concrete' for installation and inspection of cast-in-place anchors.
 - 4. Section 06 1100: 'Wood Framing' for installation of drilled in anchors.

1.2 REFERENCES

- A. Reference Standards:
 - 1. American Concrete Institute:
 - a. ACI 355.4-11, 'Qualification of Post-Installed Adhesive Anchors in Concrete and Commentary'.
 - b. ACI 548.12-12, 'Specification for Bonding Hardened Concrete and Steel to Hardened Concrete with an Epoxy Adhesive'.
 - 2. American National Standards Institute / American Welding Society (Following are specifically referenced for Structural Steel testing):
 - a. ANSI/AWS D1.1/D1.1M:2015, 'Structural Welding Code - Steel'.
 - 3. ASTM International:
 - a. ASTM A307-14, 'Standard Specification for Carbon Steel Bolts and Studs, 60 000 psi Tensile Strength'.
 - b. ASTM A563-15, 'Standard Specification for Carbon and Alloy Steel Nuts'.
 - c. ASTM A706/A706M-16, 'Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement'.
 - d. ASTM F1554-15, 'Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength'.
 - e. ASTM F3125/F3125-15a, 'Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions'.
 - 4. International Code Council (IBC) (2015 or latest approved AHJ edition):
 - a. IBC Chapter 17, 'Structural Tests and Special Inspections'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Scheduling:
 - 1. Inspection shall be performed according IBC requirements.
 - 2. Notify Testing Agency and Architect one week before installing anchors so inspection may be scheduled.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's product literature for each item.
- B. Informational Submittals:
 - 1. Certificates:
 - a. Adhesive Anchors:
 - 1) Installer to provide current ACI/CRSI certification to Architect prior to installation of anchors.
 - 2. Test And Evaluation Reports:
 - a. Provide ESR for products used indicating conformance with current applicable ESR Acceptance Criteria.
 - 3. Manufacturer's Instructions:
 - a. Manufacturer's published installation recommendations for each item.
 - 4. Qualification Statements:
 - a. All concrete anchors except Adhesive Anchors:
 - 1) Installer to provide record of installer installation training showing dates and those trained for all installed products when required when by Architect.
- 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 all inspected anchors.

1.5 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. Adhesive Anchors:
 - 1) Adhesive Anchors installed in horizontal to vertical overhead orientation to support sustained tension loads shall be installed by Certified Adhesive Anchor Installer (AAI) as certified through ACI/CRSI:
 - a) Refer to most current version of ACI 318 for certification requirements.
 - b) Proof of current certification shall be submitted to the Architect for approval prior to commencement of installation.
 - c. All other Concrete Anchors:
 - 1) Arrange for manufacturer's field representative to provide installation training for all products to be used, prior to commencement of work:
 - a) Provide installation training when required by Architect.
- B. Field Inspection:

1. Owner is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
2. Owner will provide Inspection for post-installed concrete anchors:
 - a. Owner will employ testing agency to perform inspection for post-installed concrete 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'.

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. Concrete Anchors:
 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 hot-dipped or stainless steel anchor bolts to attach wood sill plates to foundation with **1/4 inch (6.4 mm)** by **3 inch (76 mm)** x **3 inch (76 mm)** 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.
 - d. Conform to requirements of ASTM F3125/F3125 for chemical, physical and mechanical requirements for quenched and tempered bolts manufactured from steel and alloy steel.
 2. Threaded rod for adhesive anchors and cast-in anchors:
 - a. Conform to requirements of ASTM A307, Grade A or ASTM F1554 Grade 36 unless indicated otherwise on Contract Drawings.
 3. Cast-In-Place Anchor Bolts:
 - a. J-Bolts:
 - 1) Non-headed type threaded **2 inches (50 mm)** minimum conforming to requirements of ASTM F1554, Grade A.
 - 2) Anchor hook to project **2 inches (50 mm)** minimum including bolt diameter.
 - b. Headed Bolts:
 - 1) Headed type threaded **2 inches (50 mm)** minimum conforming to requirements of ASTM F1554, Grade A.
 4. Reinforcing Bars:
 - a. Composed of deformed carbon steel meeting requirements of ASTM A615/A615M, Grade 60.
 5. Adhesive Anchors:
 - a. Products shall have current ESR conforming to current ICC Acceptance Criteria AC308 for concrete.
 - b. Rod diameter and embedment length as indicated on Contract Drawings.
 - c. Type Two Acceptable Products:
 - 1) HIT-RE 500V3 with SafeSet Epoxy Adhesive by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
 - 2) Pure 110+ by Powers Fasteners Inc., Brewster NY www.powers.com.

- 3) SET-XP Epoxy by Simpson Strong-Tie Co., Pleasanton, CA
www.simpsonanchors.com.
- 4) Equal as approved by Architect before installation. See Section 01 6200.
6. Expansion Anchors:
 - a. Products shall have current ESR conforming to current ICC 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.
 - 2) Power-Stud +SD2 by Powers Fasteners Inc., Brewster NY www.powers.com.
 - 3) Strong-Bolt by Simpson Strong-Tie Co., Pleasanton, CA www.simpsonanchors.com.
 - 4) Equal as approved by Architect before installation. See Section 01 6200.
7. Screw Anchors:
 - a. Provide anchors with length identification markings conforming to ICC Acceptance Criteria AC 193 for concrete.
 - b. Type Two Acceptable Products:
 - 1) KWIK HUS-EZ by Hilti Fastening Systems, Tulsa, OK www.us.hilti.com.
 - 2) Wedge-Bolt+ by Powers Fasteners Inc., Brewster NY www.powers.com.
 - 3) Titen HD by Simpson Strong Tie Co, Pleasanton, CA www.simpsonanchors.com.
 - 4) 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:
 - 1) Concrete has minimum age of 21 days at time of anchor installation.
 - 2) Concrete has achieved full design strength for load achievement.

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. Post-Installed Anchors:
 1. General:
 - a. Drill holes with rotary impact hammer drills using carbide-tipped bits.
 - b. Unless otherwise shown on Drawings, drill holes perpendicular to concrete surface.
 - c. 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 and threads of anchor as necessary.
 - 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. Expansion Anchors:
- a. Protect threads from damage during anchor installation and prior to use.
 - b. Set anchors to Manufacturer's recommended torque, using a torque wrench. Following attainment of ten (10) percent of specified torque, one hundred (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 and prior to use.
 - b. Set anchor flush, collared.
 - c. Do not exceed Manufacturer's maximum allowed torque when seating anchor.

3.4 FIELD QUALITY CONTROL

- A. Field And Inspections:
1. Civil and structural field inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
 - a. Quality Control is sole responsibility of Contractor.
 - 1) 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:
 - a) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.
 2. Expansion 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 most current version of ACI 318 or ACI 318M and applicable ASTM material standards that:
 - a) The correct rod/anchor is used; size and type.
 - b) The correct hole size is used and prepared per Manufacturer's instructions.
 - c) That climactic conditions, and concrete temperature, allow for the anchors' installation and use.
 - d) Proper hole cleaning equipment, per Manufacturer's instructions, is used.
 - e) Torque applied to anchors does not exceed Manufacturer's allowable limits.
 - f) Torque applied to anchors is per Manufacturer's instructions.
- B. Non-Conforming Work:
1. Contractor is to immediately notify Architect of incorrectly placed, misplaced or malfunctioning anchors and request instructions for corrective actions.

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

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 0000: 'General Requirements':
 - a. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
 - b. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
2. Section 03 1113: 'Structural Cast-In-Place Concrete Forming'.
3. Section 03 2116: 'Epoxy-Coated Reinforcement Bars'.
4. 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. American Concrete Institute:
 - a. ACI 'Detailing Manual' (2004 Edition).
2. Concrete Reinforcing Steel Institute (CRSI):
 - a. CRSI, 'Manual of Standard Practice' (2009 28th Edition).

B. Reference Standards:

1. American Concrete Institute:
 - a. ACI 117-10: 'Specifications for Tolerances for Concrete Construction and Materials and Commentary' (Reapproved 2015).
 - b. 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-16, 'Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement'.

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 requirements and 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. American Concrete Institute:
 - 1) ACI 318, 'Building Code Requirements for Structural Concrete and Commentary'.
 - b. Concrete Reinforcing Steel Institute:
 - 1) 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 is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
 - 2. Owner will provide Testing and Inspection for inspection of reinforcement bars:
 - a. Owner will employ testing agencies to perform testing and inspection for inspection of 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'.

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 (25.8 sq cm)** 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, 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 318 Class B requirements.
 - 3) No splice shall be less than **20 inches (508 mm)**.
 - 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 or ACI 318M. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations:
 - a. Concrete cast against and permanently exposed to earth:
 - 1) Interior Slabs on Grade: **1 inches (25 mm)**, clear from top of slab at **4 inches (100 mm)** slabs, **2 inches (50 mm)** clear at **6 inches (150 mm)** slabs.
 - 2) Sections other than Slabs: **3 inches (75 mm)**.
 - b. Concrete Exposed to Earth or Weather:
 - 1) No. 6 and Larger Bars: **2 inches (50 mm)**.
 - 2) No. 5 and Smaller Bars, W31 and D31 Wire: **1-1/2 inches (38 mm)**.

3.2 FIELD QUALITY CONTROL

- A. Field Tests And Inspections:
1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':
 - a. Quality Control is sole responsibility of Contractor.
 - 1) 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:
 - a) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.
 2. Reinforcement Bars:
 - a. Testing Agency shall provide inspection for Reinforcement Bars. See Section 03 3111 for Testing and Inspection requirements.

END OF SECTION

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 of 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. Detectable warning panels.
 3. Inserts, bolts, boxes, templates, and fastening devices for other work, including those for bases only for Mechanical and Electrical.
 4. Light pole base anchors.
 5. Membrane Concrete Curing.
 6. Pipe bollards.
- C. Related Requirements:
1. Section 01 1200: 'Multiple Contract Summary' for Owner Furnished Testing and Inspecting Services.
 2. Section 01 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 3. Section 03 1113: 'Structural Cast-In-Place Concrete Forming'.
 4. Section 03 1511: 'Concrete Anchors and Inserts'.
 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 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.
 9. Section 31 1123: 'Aggregate Base' for aggregate base under miscellaneous cast-in-place concrete and exterior slabs, under interior slabs-on-grade concrete, asphalt paving, and concrete paving.
 10. Section 31 2213: 'Rough Grading' for rough grading and preparation of natural soil subgrades below fill and aggregate base materials.
 11. Section 31 2216: 'Fine Grading' for grading of subgrade below aggregate base and topsoil.
 12. Section 31 2323: 'Fill' for compaction procedures and tolerances.
 13. 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.
 14. Furnishing of items to be embedded in concrete specified in Section involved.
 15. Owner will provide concrete leveling compounds and patching compounds required for carpet installation.

1.2 REFERENCES

- A. Association Publications:

1. American Concrete Institute, Farmington Hills, MI www.concrete.org. Abstracts of ACI Periodicals and Publications.
 - a. Certifications:
 - 1) ACI CP-1(16), '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(16), 'Technical Workbook for ACI Certification of Concrete Strength Testing Technician'.
- B. Definitions:
 1. Cold Weather, as referred to in this Section, is four (4) hours with ambient temperature below **40 deg F (4.4 deg C)** in twenty-four (24) hour period.
 2. Floor Flatness (F_F): Rate of change in elevation of floor over **12 inches (305 mm)** section.
 3. Floor Levelness (F_L): Measures difference in elevation between two points which are **10 feet (3.05 m)** apart.
 4. Hot Weather, as referred to in this Section, is ambient air temperature above **100 deg F (38 deg C)** or ambient air temperature above **90 deg F (32 deg C)** with wind velocity **8 mph (12.9 kph)** or greater.
- C. Reference Standards:
 1. American Association of State and Highway Transportation Officials:
 - a. AASHTO M 153-06 (2016), 'Standard Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction'.
 2. American Concrete Institute
 - a. ACI 117-10 (R2015): 'Specifications for Tolerances for Concrete Construction and Materials and Commentary'.
 - b. ACI 305.1-14, 'Specification for Hot Weather Concreting'.
 - c. ACI 306.1-90 (R2002), 'Standard Specification for Cold Weather Concreting'.
 - d. ACI 318-14, 'Building Code Requirements for Structural Concrete' (ACI 318) and 'Commentary on Building Code Requirements for Structural Concrete' (ACI 318R).
 3. ASTM International:
 - a. ASTM C31/C31M-15, 'Standard Practice for Making and Curing Concrete Test Specimens in the Field'.
 - b. ASTM C33/C33M-16, 'Standard Specification for Concrete Aggregates'.
 - c. ASTM C39/C39M-15a, 'Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens'.
 - d. ASTM C94/C94M-16, 'Standard Specification for Ready-Mixed Concrete'.
 - e. ASTM C140/C140M-16, 'Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units'.
 - f. ASTM C143/C143M-15, 'Standard Test Method for Slump of Hydraulic-Cement Concrete'.
 - g. ASTM C150/C150M-16, 'Standard Specification for Portland Cement'.
 - h. ASTM C172/C172M-14a, 'Standard Practice for Sampling Freshly Mixed Concrete'.
 - i. ASTM C173/C173M-16, 'Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method'.
 - j. ASTM C192/C192M-16a, 'Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory'.
 - k. ASTM C231/C231M-14, 'Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method'.
 - l. ASTM C260/C260M-10a, 'Standard Specification for Air-Entraining Admixtures for Concrete'.
 - m. ASTM C330/C330M-14, 'Standard Specification for Lightweight Aggregates for Structural Concrete'.
 - n. ASTM C494/C494M-15a, 'Standard Specification for Chemical Admixtures for Concrete'.
 - o. ASTM C496/C496M-11, 'Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens'.
 - p. ASTM C567/C567M-14, 'Standard Test Method for Determining Density of Structural Lightweight Concrete'.
 - q. ASTM C595/C595M-16, 'Standard Specification for Blended Hydraulic Cements'.

- r. ASTM C618-15, 'Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete'.
 - s. ASTM C1077-16, 'Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation'.
 - t. ASTM C1157/C1157M-11, 'Standard Performance Specification for Hydraulic Cement'.
 - u. ASTM D1751-04(2013), 'Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)'.
 - v. ASTM E329-14a: 'Standard Specification for Agencies Engaged in Construction Inspection and/or Testing'.
 - w. ASTM E1155-14, 'Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers'.
4. International Code Council (IBC) (2015 or latest approved edition):
- a. IBC Chapter 17, 'Special Inspections And Tests'.
 - 1) Section 1704, 'Special Inspections And Tests, Contractor Responsibility And Structural Observations'.
 - 2) Section 1705, 'Required Special Inspection And Tests'.
 - a) Section 1705.2, 'Steel Construction'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
- 1. Participate in MANDATORY 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 22 1116: 'Domestic Water Piping'.
 - e. Section 26 0526: 'Grounding And Bonding For Electrical Systems'.
 - f. Section 32 1313: 'Concrete Paving'.
 - 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. Set up concrete placement pour card system and verify that all relevant trades have signed off prior to concrete placement.
 - b. Obtaining trade sign-offs on each pour card will be responsibility of General Contactor's foreman or whoever is in charge of ordering concrete.
 - c. Pour cards will be turned in to Quality Assurance representative after the work has been completed so that they can be reviewed and filed.
 - d. Review installation scheduling, coordination, placement of building concrete, and placement of items installed in and under concrete.
 - e. Review installation scheduling, coordination and placement of site concrete and of items installed in concrete.
 - f. Review 'Verification of Conditions' requirements.
 - g. Review requirements for preparation of subgrade and aggregate base requirements.
 - h. Review formwork requirements.
 - i. Review approved mix design requirements, mix designs and use of admixtures.
 - j. Review reinforcing bar submittals.
 - k. Review installation schedule and placement of reinforcing bars.
 - l. Review placement, finishing, and curing of concrete, including cold and hot weather requirements.
 - m. 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.
 - n. Review smooth rubbed concrete finish procedures and requirements (applied immediately after removing concrete formwork while concrete is 'green').

- o. Review layout plan, scheduling, coordination, and placement requirements of detectable warning panels.
- p. Review concrete slab tolerances and corrective measures if tolerances not met.
- q. Review safety issues.
- r. 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 requirements and 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. Detectable warning panels:
 - a. Layout plan and joints location for written approval before starting work on this Section.
- 3. 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) Mix Type A:
 - a) General purpose concrete type mix used for interior footings and bond beams where acceptable per structural drawings.
 - b) 3000 psi (20.68 MPa) minimum at twenty-eight (28) days.
 - c) Water / Cementitious Material: 0.45 to 0.50 by weight.
 - 2) Mix Type E:
 - a) For exterior concrete slabs, sidewalks, aprons, foundations, exterior footings and other exterior concrete.
 - b) 4500 psi (31.03 MPa) minimum at twenty-eight (28) days.
 - c) Water / Cementitious Material: 0.40 maximum by weight.
 - d) Use twenty-five (25) percent Class F fly ash as part of cementitious material.
 - e) Mix Type F should be used for all exterior concrete exposed to freeze/thaw cycles and deicing salts, unless dictated otherwise by site conditions.
 - f) For concrete paving, use mix design based upon use of 1-1/2 inches (38 mm) coarse aggregate (about 15 percent).
 - 3) Air Entrainment: Six (6) percent, plus or minus 1-1/2 percent for exterior concrete and foundation walls exposed to freeze/thaw cycles.
 - 4) 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.
 - b. Slump:
 - 1) 4 inch (100 mm) slump maximum before addition of high range water reducer.
 - 2) 8 inch (200 mm) slump maximum with use of high range water reducer.
 - 3) Slump not required for Mix Type G.
 - c. Admixtures:
 - 1) Mix design shall show proposed admixture, amount, usage instructions, and justification for proposed use. Do not use any admixture without Architect's written approval.
 - 2) Fly ash: Amount of specified Class F (or Class C where Class F is not available) fly ash not to exceed twenty-five (25) percent of weight of cementations materials may used.
 - 3) Chemical: Specified accelerator or retarder may be used if necessary to meet environmental conditions.
 - 4) 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 is responsible for Quality Assurance. Quality assurance performed by Owner will be used to validate Quality Control performed by Contractor.
 2. 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'.

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.

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Manufacturers:
1. Manufacturer Contact List:
 - a. Aridus Admixture by US Concrete, Eules, TX www.us-concrete.com/aridus/.
 - b. BASF (Construction Chemicals Division), Cleveland, OH www.master-builders-solutions.basf.us/en-us.
 - c. Bonsal American, Charlotte, NC www.bonsal.com.
 - d. Concure Systems Admixture by Concure Systems, Phoenix, AZ www.ConcureSystems.com.
 - e. Dayton Superior Specialty Chemicals, Kansas City, KS www.daytonsuperiorchemical.com.
 - f. Euclid Chemical Company, Cleveland, OH www.euclidchemical.com.
 - g. Fritz-Pak Concrete Admixtures, Dallas, TX www.fritzpak.com.

- h. GCP Applied Technologies, Cambridge, MA www.gcpat.com/construction/en-us.
 - i. L & M Construction Chemicals, Omaha, NE www.lmcc.com.
 - j. Larsen Weldcrete by Larsen Products Corp, Rockville, MD www.larsenproducts.com.
 - k. Sika Corporation, Lyndhurst, NJ www.sikaconstruction.com and Sika Canada, Pointe Claire, QC www.sika.ca.
 - l. Unitex, Kansas City, MO www.unitex-chemicals.com.
 - m. U S Mix Products Co, Denver, CO www.usspec.com.
 - n. W R Meadows, Hampshire, IL www.wrmeadows.com.
- B. Performance:
- 1. Design Criteria: Conform to requirements of ASTM C94/C94M unless specified otherwise:
 - 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.
- C. Materials:
- 1. Hydraulic Cement: Meet requirements of ASTM C150/C150M, Type I.
 - a. Meet requirements of ASTM C595/C595M, Type IP.
 - b. Meet requirements of ASTM C1157/C1157M, Type GU.
 - 2. 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.
 - c. Fine:
 - 1) Meet requirements of ASTM C33/C33M.
 - 2) Aggregate shall be uniformly graded by weight.
 - 3. Water: Clear, apparently clean, and potable.
 - 4. Admixtures And Miscellaneous:
 - a. Fly Ash:
 - 1) 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) 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) 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) 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) 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) 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 GCP Applied Technologies.
 - (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) 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) 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) 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. 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.
 - 2) **1/2 inch (12.7 mm)** 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.
 - 2) Equal as approved by Architect before installation. See Section 01 6200.
- D. 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.
 - 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.
 2. Detectable Warning Panels:
 - a. Examine substrate and verify substrate is suitable for installation of detectable warning panels:
 - 1) Notify Architect of unsuitable conditions in writing.
 - 2) Do not install detectable warning panels over unsuitable conditions.
 - 3) Commencement of Work by installer is considered acceptance of substrate.

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:

- 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. 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.
 - 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 (2 deg C)** minimum at time of concrete placement.
 - 3) Thaw sub-grade **6 inches (150 mm)** deep minimum before beginning concrete placement. If necessary, re-compact thawed material.
 - 4) Use no frozen materials or materials containing ice.
 - 5) See ACI 306.1 'Standard Specification for Cold Weather Concreting' for additional requirements.
4. Hot Weather Concreting Procedures:
- a. General:
 - 1) Maximum concrete temperature allowed is **90 deg F (32 deg C)** in hot weather.
 - 2) Cool aggregate and subgrades by sprinkling.
 - 3) Avoid cement over **140 deg F (60 deg C)**.
 - 4) Use cold mixing water or ice.
 - 5) Use fog spray or evaporation retardant to lessen rapid evaporation from concrete surface.
 - 6) See ACI 305.1 'Specification for Hot Weather Concreting' for additional requirements.
- 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. Concrete Slab Thickness:
 - a. Increase thickness of concrete beneath detectable warning panels **one inch (25 mm)**.
 3. Inserts, bolts, boxes, templates, pipes, conduits, and other accessories required by Divisions 22, 23, and 26 shall be installed and inspected before placing concrete.
 4. 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. 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.
 - f. Form vertical surfaces full depth. Do not allow concrete to flow out from under forms in any degree into landscaped areas.
 - g. Consolidate concrete thoroughly.
 - h. Do not embed aluminum in concrete.
 - i. Do not use contaminated, deteriorated, or re-tempered concrete.
 - j. Avoid accumulation of hardened concrete.
 - k. Dusting with cement not permitted.
2. Footings:
- a. Bear **12 inches (300 mm)** 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 inches 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 (1 200 mm)** long.
3. Exterior Slabs:
- a. For continuous placing and where shown on Drawings, saw cut **one inch (25 mm)** deep control joints before shrinkage occurs (**2 inches at 6 inch slabs**) (**50 mm at 150 mm slabs**).
4. Miscellaneous Concrete Elements:
- a. 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 (50 mm)** below.
 - b) Seeded Areas: **One inch (25 mm)** below.
 - c) Ground Cover Areas: **2 inches (50 mm)** below.
 - d) Trees and Shrub Areas (not individual trees): **4 inches (100 mm)** below.
 - 4) Compact topsoil underneath mow strips and aprons to density of undisturbed earth.
 - b. Sidewalks, Exterior Stairs, And Landings:
 - 1) Slope with cross slope of **1/8 to 1/4 inch per ft (3 to 6 mm per 300 mm)** (one to two percent) in direction of intended drainage.
 - 2) Slope away from building **1/8 to 1/4 inch per ft (3 to 6 mm per 300 mm)** (one to two percent) minimum.
 - 3) 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.
5. 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) Control joints in Concrete Paving are specified in Section 32 1313.
 - 3) Depth of control joints shall be approximately one quarter of concrete slab thickness, but not less than **one inch (25 mm)**.
 - 4) Control joints to be hand tooled in sidewalks, curbs and gutters, mow strips, and aprons.
 - 5) Table One:

Concrete Control Joint On-Center Spacing (+/-)		
Sidewalks	4 feet to 6 feet	1.2 meters to 1.8 meters
Curbs and Gutters	10 feet	3.0 meters
Mow Strips	3 feet to 5 feet	0.90 meters to 1.50 meters
Flat Drainage Structures	10 feet	3 meters
Retaining Walls w/guardrails	Align with posts	
Retaining Walls w/chain link fencing	Align with posts	

b. Expansion 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 (6 mm)** 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) Table Two:

Concrete Expansion Joint (Isolation) On-Center Spacing (+/-)		
Sidewalks, Curbs and Gutters	40 feet to 100 feet	12 meters to 30 meters
Mow Strips and Aprons	20 feet to 40 feet	6 meters to 12 meters
Flat Drainage Structures	50 feet	15 meters
Retaining Walls w/guardrails	36 feet	11 meters
Retaining Walls w/chain link fencing	50 feet	15 meters

- 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.
6. 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.
7. 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. Exterior Concrete Flatwork:

- a. Curb, Gutter, Sidewalks, Mow Strips, Flat Drainage Structures, Stairs, And Miscellaneous:
 - 1) After completion of final 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 (32 mm)**.
 - b) Provide rough hair finish where grades exceed 6 percent **1-1/4 inch (32 mm)**.
 - 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 (13 mm)** radius, including edges formed by expansion joints.
 - g) Remove edger marks.
 - b. Concrete Paving Finish is specified in Section 32 1313.
- C. Curing:
- 1. Membrane Concrete Curing:
 - a. As specified in Section 09 3923 'Membrane Concrete Curing'.
 - b. Follow Manufacturer's written instructions for 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 (4.4 deg C)**.
 - 6) Apply uniformly without puddles or ponding.
 - 7) Do not apply before bleed water has dissipated.
 - 8) Do not apply over standing water.
- D. Tolerances:
- 1. General:
 - a. Tolerances shall conform to requirements of ACI 117 or CSA A23.1/A23.2, except where specified differently:
 - 1) 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.
 - b. Maximum Variation Tolerances:
 - 1) Table Three:

Maximum Variation Tolerances		
Thickness, standard	plus 3/8 inch, minus 1/4 inch	plus 9.5 mm, minus 3 mm
Thickness, footings	minus 0 inch	minus 0 mm
Plan, 0 - 20 feet	1/2 inch	12.7 mm
Plan, 40 feet or greater	3/4 inch	19 mm
Plan, footings	plus 1/2 inch	plus 12.7 mm
Eccentricity, footings	2 inch maximum standard, 1/2 inch at masonry	50 mm maximum standard, 12.7 mm at masonry
Openings, size	minus 1/4 inch, plus one inch	minus 6 mm, plus 25.4 mm
Openings, location	plus / minus 1/2 inch at center	plus / minus 12.7 mm at center
Plumb	1/2 inch maximum	12.7 mm maximum
Consecutive Steps, treads	1/4 inch	6 mm
Consecutive Steps, risers	1/8 inch	3 mm
Flight of Stairs, treads	1/4 inch in total run	6 mm in total run
Flight of Stairs, risers	1/8 inch in total height	3 mm in total height

3.4 FIELD QUALITY CONTROL

- A. Field Tests And Inspections:
 - 1. Civil and structural field tests, laboratory testing, and inspections are provided by Owner's independent Testing Agency as specified in Section 01 4523 'Testing And Inspection Services':

- a. Quality Control is sole responsibility of Contractor:
 - 1) 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:
 - a) Testing and inspections, if performed by Contractor, will be responsibility of Contractor to be performed by an independent entity.
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 and inspections, if performed, will include following:
 - 1) Periodic inspection verifying use of required design mix.
 - 2) Inspection of reinforcing bars and anchor bolts before placement of concrete for proper installation.
 - 3) Inspection at time fresh concrete is sampled to fabricate specimens for strength tests, perform slump and air content tests, and determine temperature of concrete.
 - 4) Inspection of concrete placement for proper application techniques.
 - a) Steel tools are not to be used on exterior concrete.
 - 5) Periodic inspection for maintenance of specified curing temperature and techniques:
 - a) Steel tools are not to be used on exterior concrete. Bull floating and finish floating is to be performed with magnesium or wood floats.
 - 6) 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.
 - 7) Periodic inspection of concrete finishing operations for proper finishing techniques.
 - 8) Periodic inspection for placement of specified curing compounds.
 - c. 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.
 - 2) Concrete floor flatness and floor levelness of interior slabs as per ASTM E1155.
 - 3) Concrete moisture and alkalinity testing. See Section 09 0503 Flooring Substrate Preparation.
 - d. 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.
 - e. 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 (4 cu m), but less than 50 cu. yd (38 cu m), plus one (1) set for each additional 50 cu. yd (38 cu m) or fraction thereof.

- 2) 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.
 - 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 (3.45 MPa)**.
- f. Samples:
- 1) Fresh Concrete: ASTM C172/C172M except modified for slump to comply with ASTM C94/C94M.
 - a) Slump: ASTM C143/C43M, 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.
 - 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.
- 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. General:
1. Curing:
 - a. Clean tools, equipment as directed by Manufacturer's instructions.
 2. Detectable Warning Panels:
 - a. Clean panel(s) in accordance with Manufacturer's cleaning instruction.

3.6 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 by Manufacturer.
- C. Detectable Warning Panels:
1. Protect installed panels from damage and until completion of project.
 2. Protect installed panels from traffic until desired concrete strength is achieved.

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 3111: 'Cast-In-Place Structural Concrete' for application of membrane concrete curing.
 - 2. Section 32 1313: 'Concrete Paving'.

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 (2 deg C)** and **110 deg F (43 deg C)** (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 (4.4 deg C)**.

PART 2 - PRODUCTS**2.1 MATERIALS****A. Membrane Concrete Curing:**

1. Description:
 - a. Clear water-based, ready-to use membrane curing agent that cures freshly placed concrete, forming effective barrier against moisture loss from concrete surface.
2. Design Criteria:
 - a. Exterior Concrete:
 - 1) Dissipating or non-dissipating membrane curing agent.
 - b. Interior Concrete:
 - 1) Dissipating membrane curing agent only.
 - c. VOC-compliant compound.
 - d. Meet requirements of ASTM C309 and AASHTO M 148, Type 1 or 1-D, Class B.
 - e. Interior concrete: containing no mineral spirits, naphtha, or other components detrimental to finish flooring installation.
 - f. Maintain ninety-five (95) percent of mix water present in concrete mass after application.
 - g. 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 Concrete:
 - a) Clear Cure J7WB by Dayton Superior Corporation, Miamisburg. OH www.daytonsuperior.com.
 - b) Clear Water Resin by Right Point, Dekalb, IL www.rightpointe.com.
 - c) L&M Cure R by L&M Construction Chemicals, Inc. Omaha, NE www.lmcc.com.
 - d) VOCOMP 20 (do not use when concrete sealer will be applied in areas of freeze/thaw and deicer salts) by W.R. Meadows, Inc. Hampshire, IL www.wrmeadows.com.
 - e) 1100-Clear by W. R. Meadows, Inc. Hampshire, IL www.wrmeadows.com.
 - 2) Interior Concrete:
 - a) Clear Cure J7WB by Dayton Superior Corporation, Miamisburg. OH www.daytonsuperior.com.
 - b) Clear Water Resin by Right Point, Dekalb, IL www.rightpointe.com.
 - c) L&M Cure R by L&M Construction Chemicals, Inc. Omaha, NE www.lmcc.com.
 - d) 1100-Clear by W. R. Meadows, Inc. Hampshire, IL 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 C1107/C1107M-14a, 'Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).'
 - 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 (41 MPa)** minimum.
- B. Type Two Acceptable Products:
 1. Masterflow 928 by BASF Systems, Shakopee, MN or BASF Canada, Mississauga, ON www.buildingsystems.basf.com
 2. ProSpec F77 by Bonsal American, Inc., Charlotte, NC www.bonsal.com.
 3. Advantage 1107 Grout by Dayton Superior Corporation, Oregon, IL www.daytonsuperiorchemical.com.
 4. NS Grout by Euclid Chemical Company, Cleveland, OH www.euclidchemical.com.
 5. Five Star Grout by Five Star Products Inc, Fairfield, CT www.fivestarprouducts.com.
 6. Duragrout by L&M Construction Chemicals Inc., Omaha, NE www.lmcc.com.
 7. Planigrout 712 by MAPEI Corporation, Deerfield Beach, FL www.mapei.US or Mapei Inc., Laval, QC www.mapei.com/CA.
 8. SikaGrout 212 by Sika Corporation, Lyndhurst, NJ www.usa.sika.com or Sika Canada, Inc. Pointe-Claire, QC www.can.sika.com.
 9. MP Grout by US Mix Products Company, Denver, CO www.usspec.com.
 10. Sealtight CG-86 Grout by W R Meadows, Hampshire, IL 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 (27.6 MPa) 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 (27.58 MPa) is reached.
- C. Protect placed grout from damage during construction.

END OF SECTION

SECTION 03 6300**EPOXY GROUTING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited to:
1. Furnish and install epoxy grouting as described in Contract Documents.

1.2 REFERENCES

- A. Reference Standards:
1. American Society For Testing And Materials:
 - a. ASTM D 638-00, 'Standard Test Method for Tensile Properties of Plastics.'

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Epoxy Grout:
1. Type One Acceptable Products to be used in Concrete Applications:
 - a. "HIT RE 500" by Hilti Corporation
 - b. "SET-XP" by Simpson Strong Tie
 - c. Equal as approved by Architect before bidding. See Section 01 6200.
 2. Acceptable Products to be used in Masonry Applications:
 - a. "HIT HY 150 MAX" or "HIT HY 70" by Hilti Corporation (In grouted cells)
 - b. "HIT HY 70" by Hilti Corporation (In un-reinforced masonry cells w/screen tubes)
 - c. "SET-EPOXY-TIE" by Simpson Strong Tie
 - d. "Power-Fast" by Powers Fasteners
 - e. Equal as approved by Architect before bidding. See Section 01 6200.

PART 3 - EXECUTION**3.1 PREPARATION**

- A. All drilled holes for anchor rods 1" in diameter and smaller shall be 1/8" larger than the anchor rod being installed. All drilled holes for anchor rods greater than 1" in diameter shall be 1/4" larger than the bar or anchor rod being installed.
- B. After drilling the proper size hole, clean the walls and bottom of the drilled hole of all dust and debris using a nylon brush in conjunction with oil free compressed air. The hole shall be free of dust, dirt, debris and standing water.
- C. Follow all manufacturers' recommendations for epoxy installation.

END OF SECTION

BLANK PAGE

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

END OF TABLE OF CONTENTS

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. 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(2016), '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.
 - b) ZRC Galvilite by ZRC Worldwide, Marshfield, MA 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 (270 to 275 deg C), or
 - 2) Zinc-Tin-Lead alloy with liquidus temperature range from 446 to 500 deg F (230 to 260 deg C).
 - 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 (316 deg C).
 - a) Do not overheat surface beyond 750 deg F (400 deg C) 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 (7 deg C).

- 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: 'Concrete Anchors And Inserts' for 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:2015, 'Structural Welding Code - Steel'.
 - b. ANSI/AWS D1.3/D1.3M:2018, 'Structural Welding Code - Sheet Steel'.
 - 2. ASTM International:
 - a. ASTM A307-14, 'Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi 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 (6 mm) fillet weld all around.
 - 2. Weld glu-lam connection side plates to base plates with 1/4 inch (6 mm) fillet weld all along outside edges.
 - 3. Weld stiffeners to pipe columns with 1/4 inch (6 mm) 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.
- B. Related Requirements:
 - 1. Section 05 0503: 'Shop-Applied Metal Coatings' for quality of priming.
 - 2. Section 05 0523: 'Metal Fastening' for quality of welding.

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-18, 'Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless'.
 - c. ASTM A500/A500M-18, '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) Miscellaneous structural steel.
- B. Fabrication:
 - 1. Shop prime steel provided under this Section.

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

BLANK PAGE

DIVISION 06: 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

END OF TABLE OF CONTENTS

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. AWPA P5-10. 'Standard For Waterborne Preservatives'.
 - b. AWPA P22-10. 'Standard For Ammoniacal Copper Zinc Arsenate (ACZA)'.
 - c. AWPA P51-10, 'Standard for Zinc Borate (ZB)'.
 - d. AWPA T1-12, 'Use Category System: Processing and Treatment Standard For Treated Wood'.
 - e. AWPA U1-12, 'Use Category System: User Specification For Treated Wood'.
 - 2. International Building Code (IBC) (2018 or most recent edition adopted by AHJ):
 - 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.
 - b. Hoover Treated Wood Products, Thomson, GA www.frtw.com.
 - c. Osmose Inc, Griffin, GA www.osmose.com.
 - d. U S Borax Inc, Valencia, CA www.borax.com/wood.
 - e. Viance LLC, Charlotte, NC 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 AWPA U1 and with retention of **0.25 lbs per cu ft (4 kg per cu meter)**.
 - 2) Zinc borate meeting requirements of AWPA U1 and with retention of **0.17 lbs per cu ft (2.7 kg per cu meter)**.
 - 3) CCA-C (47.5 percent chromium trioxide, 18.5 percent copper oxide and 34 percent arsenic pentoxide) by Koppers Performance Chemicals, Griffin, Georgia, <http://www.koppersperformancechemicals.com/> (0.25 lb/cu ft minimum retention).
 - 4) DURA-GUARD by Hoover Treated Wood Products, Thomson, GA www.frtw.com (.40 lb/cu ft minimum retention).
 - b. Lumber: Treat in accordance with AWPA U1.
3. Exterior Wood Continuously Exposed To Weather:
 - a. Preservatives: Waterborne preservatives meeting requirements of AWPA U1 with retention levels as required by AWPA U1 for specific application.
 - b. Lumber: Treat in accordance with AWPA U1.

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. ASTM International:
 - a. ASTM A153/A153M-16a, 'Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware'.
 - b. ASTM D3498-18, 'Standard Specification for Adhesives for Field-Gluing Plywood to Lumber Framing for Floor Systems'.
 - c. ASTM F1667-18a, '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	Length	Diameter
8d Box	2-1/2 inches	0.113 inch	63.5 mm	2.827 mm
8d Common	2-1/2 inches	0.131 inch	63.5 mm	3.389 mm
10d Box	3 inches	0.128 inch	76.2 mm	3.251 mm
10d Common	3 inches	0.148 inch	76.2 mm	3.759 mm
16d Box	3-1/2 inches	0.135 inch	88.9 mm	3.411 mm
16d Sinker	3-1/4 inches	0.148 inch	82.6 mm	3.759 mm
16d Common	3-1/2 inches	0.162 inch	88.9 mm	4.115 mm

B. Materials:

1. Wood fastener list:
 - a. Provide VMR Suppliers with wood fastener list.
2. 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.
 - 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.
 - b) Redhead Division of ITW, Wood Dale, IL www.itw-redhead.com and Markham, ON www.itwconstruction.ca.
 - c) Equals as approved by Architect through shop drawing submittal before installation. See Section 01 6200.
 3. 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.
 4. 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.
 - 2) Simpson Strong Tie Co, Dublin, CA www.strongtie.com.
 - 3) United Steel Products Co Inc (USP), Montgomery, MN 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

BLANK PAGE

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 panel product sheathing.
- 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 1636: 'Wood Panel Product Sheathing' for:
 - a. Pre-installation conference held jointly with Section 06 1100.
 - 4. Section 06 1712: 'Structural Composite Lumber - SCL'.
 - 5. Sections in Division 07: Roofing membranes for related blocking, wood nailers, and curbs.

1.2 REFERENCES

- A. Association Publications:
 - 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'.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conference:
 - 1. Participate in MANDATORY 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) Rough opening.
 - 2) Shear walls and struts.
 - 3) Nails and nailing requirements.
 - 4) Connections.

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.

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.

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 (50 mm)** 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 (38 mm by 64 mm)**: Standard and better Douglas Fir, Southern Pine, or HemFir, or StrandGuard by iLevel by Weyerhaeuser Boise, ID www.ilevel.com. (LSL 1.3 E)
 - 2) **2x6 (38 mm by 140 mm)** 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. (LSL 1.3 E).
- B. Posts, Beams, And Timbers **5 Inches by 5 Inches (125 mm by 125 mm)** 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 Contract Drawings for additional requirements.

2.2 ACCESSORIES

- A. Blocking:
 - 1. Sound lumber without splits, warps, wane, loose knots, or knots larger than **1/2 inch (13 mm)**.
- B. Furring Strips:
 - 1. Utility or better.
- C. Sill Sealer:
 - 1. Closed-cell polyethylene foam, **1/4 inch (6 mm)** 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.

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 (6 mm) in 20 feet (6 meters), non-cumulative in length of wall.
 - b. 1/8 inch (3 mm) in 10 feet (3 meters) with 1/4 inch (6 mm) maximum in height of wall.
 - c. Distances between parallel walls shall be 1/4 inch (6 mm) maximum along length and height of wall.

D. 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 (1 200 mm).
4. Stud Walls To Masonry. Use one of the following methods:
 - a. Connect with 1/2 inch (13 mm) machine bolts 6 inches (150 mm) from top, 6 inches (150 mm) from bottom, and 48 inches (1 200 mm) maximum on center. Use three bolts minimum in height of 6 foot (1 800 mm) or higher wall.
 - b. Secure wood to masonry using continuous 1/4 inch (6 mm) minimum bead of construction adhesive and powder actuated fasteners installed at 32 inches (800 mm) on center minimum.
5. Firestops:
 - a. Horizontal or vertical concealed spaces in walls, light coves, soffits, drop ceilings, and other features over 10 feet (3 000 mm) 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 (6 000 mm), length or height.
6. Sill Plates:
 - a. Shear Walls And Bearing Walls:
 - 1) Provide specified anchor 12 inches (300 mm) maximum and 4 inches (100 mm) 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 (900 mm) 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 (16 mm) diameter anchor bolts at 32 inches (800 mm) 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 (150 mm)** 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 (300 mm)** on center top and bottom, staggered on opposite sides. Nail three-ply built-up members with 16d nails at **12 inches (300 mm)** 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 (38 mm)** 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 (coordinate with Contract Drawings):

2 by 4 inch nominal	38 by 89 mm	End nail, two 16d OR toe nail, four 8d
2 by 6 inch nominal	38 by 140 mm	End nail, three 16d OR toe nail, four 8d
2 by 8 inch nominal	38 by 184 mm	End nail, four 16d OR toe nail, six 8d
2 by 10 inch nominal	38 by 235 mm	End nail, five 16d OR toe nail, six 8d
1-3/4 by 5-1/2 inch LVL	44 by 140 mm LVL	End nail, three 16d OR toe nail, four 8d
1-3/4 by 7-1/4 inch LVL	44 by 184 mm LVL	End nail, four 16d OR toe nail, six 8d
1-3/4 by 9-1/4 inch LVL	44 by 235 mm LVL	End nail, five 16d OR toe nail, six 8d
1-3/4 by 11-1/4 inch LVL	44 by 286 mm LVL	End nail, six 16d OR toe nail eight 8d

- b. Top plates: Spiked together, 16d, **16 inches (400 mm)** on center.
- c. Top plates: Laps, lap members **48 inches (1200 mm)** minimum and nail with 16d nails **4 inches (100 mm)** on center
- d. Top plates: Intersections, three 16d.
- e. Backing And Blocking: Three 8d, each end.
- f. Corner studs and angles: 16d, **16 inches (400 mm)** on center.
- E. Roof And Ceiling Framing:
1. Place with crown side up at **16 inches (400 mm)** 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 (100 mm)** 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 (64 mm)** 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. Provide construction bracing for trusses in accordance with TPI DSB-89.
- d. 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.
 - e. 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 (6.1 m)** as measured from top of brace to top of next brace.
 5. 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.
 6. Secure headers and header backing to structure as described in Contract Documents.
- F. 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 (25 mm)** minimum.
 2. On Concrete or Masonry:
 - a. Back up furring strips on exterior walls or walls in contact with earth with **15 lb (6.8 kg)** felt strip.
 - b. Nail at **12 inches (300 mm)** on center maximum.

END OF SECTION

BLANK PAGE

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 4523: 'Testing and Inspecting Services' for testing and inspection, and testing laboratory services for materials, products, and construction methods.
 - 3. Section 06 1100: 'Wood Framing' for:
 - a. Pre-installation conference held jointly with Section 06 1636.

1.2 REFERENCES

- A. Association Publications:
 - 1. 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'.
 - 2. The Engineered Wood Association (APA), Tacoma, WA 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'.
 - 3. TECO, Cottage Grove, WI www.tecotested.com.
 - a. TECO PRP-133: ('Fire Rated Assemblies – OSB substitution for plywood in UL fire-rated assemblies that specify plywood).
- B. Reference Standards:
 - 1. International Code Council (IBC) (2018 or latest AHJ approved edition):
 - a. IBC Chapter 17, 'Special Inspections And Tests'.

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.
- B. Scheduling:
 - 1. Notify Testing Agency and Architect twenty-four (24) hours minimum before placing sheathing.

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 Inspection Reports of sheathing.

1.5 QUALITY ASSURANCE

- A. Testing and Inspection:
 - 1. Owner will provide Testing and Inspection for inspection of sheathing:
 - a. Owner will employ testing agencies to perform inspection for sheathing 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. 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

2.2 MATERIALS

- A. Performance:
 - 1. Design Criteria:
 - a. Meet requirements of PS 1, PS 2, or PRP-133 (TECO). Except where plywood is specifically indicated on Contract Drawings, oriented strand board (OSB) is acceptable.
- B. Sheathing:
 - 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 (18.3 mm)** 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
3/8 inch	24 / 0
7/16 inch nominal	24 / 16
15/32 inch actual	32 / 16
1/2 inch nominal	32 / 16
19/32 inch actual	40 / 20
5/8 inch nominal	40 / 20
23/32 inch actual	48 / 24
3/4 inch nominal	48 / 24

2.3 ACCESSORIES

- A. Nails:
- As indicated on Contract Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General:
- Top of nail heads shall be flush with sheathing surface.
 - Use of edge clips to provide spacing between sheathing panels is acceptable.
- B. Wall Sheathing:
- Spacing:
 - Provide 1/8 inch (3 mm) space between sheets at end and edge joints.
 - Edge Bearing And Blocking:
 - Panel edges shall bear on framing members and butt along their center lines.
 - Back block panel edges, which do not bear on framing members, with 2 inch nominal (45 mm) framing.
 - Nail Spacing:
 - As indicated on Contract Drawings.
 - Place nails not less than 3/8 inch (9.5 mm) in from edge.
 - Thickness:
 - As indicated on Contract Drawings.
 - Do not install any piece of wall sheathing with shortest dimension of less than 12 inches (300 mm).
- C. Roof Sheathing:
- Placing:
 - Lay face grain at right angles to supports. Provide blocking for support if framing turns at roof overhang.
 - Provide 1/8 inch (3 mm) space between sheets at end and side joints.
 - Stagger panel end joints.
 - Sheathing shall be continuous of two spans minimum.
 - Edge Bearing and Blocking:
 - As indicated on Contract Drawings.
 - Nail Spacing:
 - As indicated on Contract Drawings.
 - Place nails at least 3/8 inch (9.5 mm) in from edge.
 - Thickness:
 - As indicated on Contract Drawings.

5. Do not install any piece of roof sheathing with shortest dimension of less than **24 inches (600 mm)** unless support is provided under all edges.

3.2 FIELD QUALITY CONTROL

- A. Field Inspections:
 1. 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 (100 mm)** 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. Reference Standards:
 - 1. ASTM International:
 - a. ASTM D2559-12a(2018), 'Standard Specification for Adhesives for Structural Laminated Wood Products for Use Under Exterior Exposure Conditions'.
 - b. ASTM D5456-18, '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.
 - 2. Test And Evaluation Reports: Copies of ICC or CCMC reports showing approval materials.

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.
 - 2. Georgia-Pacific Corp, Atlanta, GA www.gp.com.
 - 3. Jager Industries Inc, Calgary, AB www.jagerbuildingsystems.com.
 - 4. Louisiana Pacific Corp, Portland, OR www.lpcorp.com.
 - 5. Roseburg Forest Products, Roseburg, OR www.roseburg.com.
 - 6. Trus Joist Corp, Div Weyerhaeuser, Boise, ID www.tjm.com or Surrey, BC (604) 588-7878.
 - 7. Web Joist, Chehalis, WA www.webjoist.com.

8. Weyerhaeuser, Engineered Lumber Products, Boise, ID 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. Materials:
1. Members:
 - a. Identify materials by stamp or stamps indicating manufacturer's name, product trade name, grade, species (if applicable), evaluation report number, plant number, and name or logo of independent inspection agency.
 2. Adhesive: Meet requirements of ASTM D2559.
- D. 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

DIVISION 07: THERMAL AND MOISTURE PROTECTION

07 2000 THERMAL PROTECTION

07 2116 BLANKET INSULATION
07 2123 LOOSE-FILL INSULATION

07 3000 STEEP SLOPE ROOFING

07 3113 ASPHALT SHINGLES

07 5000 MEMBRANE ROOFING

07 5419 POLYVINYL-CHLORIDE ROOFING: PVC

07 6000 FLASHING AND SHEET METAL

07 6210 GALVANIZED STEEL FLASHING AND TRIM
07 6310 STEEP SLOPE ROOF FLASHING: ASPHALT SHINGLES

07 7000 ROOF AND WALL SPECIALTIES AND ACCESSORIES

07 7126 REGLETS

07 9000 JOINT PROTECTION

07 9213 ELASTOMERIC JOINT SEALANTS

END OF TABLE OF CONTENTS

BLANK PAGE

SECTION 07 2116**BLANKET INSULATION****PART 1 - GENERAL****1.1 SUMMARY**

A. Includes But Not Limited To:

1. Where disturbed to accommodate new work, furnish and install new unfaced thermal insulation in ceilings to match existing prior to disturbance.

1.2 REFERENCES

A. Reference Standards:

1. ASTM International:
 - a. ASTM C665-17, '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 and installed in compliance with International Building Code (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.
- 2) FiberTEK, Salt Lake City, UT www.fibertekinsulation.com.
- 3) Guardian Fiberglass, Greer, SC www.guardianbp.com.
- 4) Johns Manville, Denver, CO www.jm.com.
- 5) Knauf Fiber Glass, Shelbyville, IN www.knaufusa.com.
- 6) Owens-Corning Fiberglass Corporation, Toledo, OH www.owens-corning.com.
- 7) Thermafiber, Wabash, IL www.thermafiber.com.

b. Equal as approved by Architect before bidding. See Section 01 6200.

B. Materials:

1. Thermal And Acoustic Insulation:

- a. Order insulation by 'R' value rather than 'U' value, rating, or thickness, either 16 or 24 inches (400 or 600 mm) wide according to framing spacing.
- b. Faced Insulation:
 - 1) Kraft faced meeting requirements of ASTM C665, Type II, Class C.
- c. Unfaced Insulation: Meet requirements of ASTM C665, Type I.
- d. 'R' Value Required:
 - 1) Thermally Insulated Ceilings / Roof:
 - a) Enclosed Spaces: Fill framed cavity with batt of appropriate thickness.
 - b) Unenclosed Spaces: R38.
 - 2) Wood Wall Stud Framing:

R-11	3-1/2 inches deep	89 mm deep
R-19	5-1/2 inches deep	140 mm deep

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' value, 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. Where insulation is not enclosed by structure or drywall, support in place with wire or other suitable material as approved by Architect before bid.

END OF SECTION

SECTION 07 2123**LOOSE-FILL INSULATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Where disturbed to accommodate new work, furnish and install new loose-fill insulation in ceilings to match existing prior to disturbance.

1.2 REFERENCES

- A. 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.
- B. Reference Standards:
1. ASTM International:
 - a. ASTM C518-17, 'Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus'.
 - b. ASTM C764-17, 'Standard Specification for Mineral Fiber Loose-Fill Thermal Insulation'.
 - c. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - d. ASTM E136-19, 'Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C'.

1.3 SUBMITTALS

- A. Action Submittals:
1. Product Data:
 - a. Manufacturer's literature describing products to be used, showing compliance with specified requirements.
 - b. Manufacturer's storage and handling requirements and recommendations.
 - c. Manufacturer's installation instructions.

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.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
1. Materials shall be delivered in original, unopened packages with labels intact.
 - a. Labels to identify reference standards, type and class as applicable, minimum net weight of insulation, coverage, "R" values, and required warning statements.

B. Storage And Handling Requirements:

1. Protect from physical damage and from becoming wet, soiled, or covered with ice or snow.
2. Provide dry location with adequate ventilation for storage, not subject to open flames or sparks, and permitting easy access for inspection and handling.
3. Store materials in dry locations with adequate ventilation, free from water, and in such a manner to permit easy access for inspection and handling
4. Comply with Manufacturer's recommendations for handling, storage, and personal protection during installation.

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

- 1) Certainteed Corp, Valley Forge, PA www.certainteed.com.
- 2) FiberTEK, Salt Lake City, UT www.fibertekinsulation.com.
- 3) Guardian Fiberglass, Greer, SC www.guardianbp.com.
- 4) Johns Manville, Denver, CO www.jm.com.
- 5) Knauf Fiber Glass, Shelbyville, IN www.knaufusa.com.
- 6) Owens-Corning Fiberglass Corporation, Toledo, OH www.owens-corning.com.

b. Equal as approved by Architect before bidding. See Section 01 6200.**B. Materials:****1. Loose-Fill Insulation:****a. Blown Insulation:**

- 1) Fiber glass.
- 2) Comply with requirements of ASTM C764, Type I or II, non-combustible when tested in accordance with ASTM E136.

b. 'R' Factor Required:

- 1) Order insulation by 'R' factor rather than 'U' factor, rating, or thickness.
 - a) Unenclosed Spaces: R38 minimum.

PART 3 - EXECUTION**3.1 EXAMINATION****A. Verification Of Conditions:****1. Inspection:**

- a. Examine substrate and verify framing is suitable for installation of insulation:
- b. Verify that mechanical and electrical services have been installed and tested and, if appropriate, verify that adjacent materials are dry and ready to receive insulation.
- c. Notify Architect of unsuitable conditions in writing.
- d. Do not install insulation over unsuitable conditions:
 - 1) Commencement of Work by installer is considered acceptance of substrate.

3.2 INSTALLATION**A. General:**

1. Install in accordance with manufacturer's instructions.
2. Install in insulation in sufficient depth to provide thermal value specified after settlement of insulation.
3. Do not blow insulation into electrical devices and vents.

4. Provide minimum clearance around recessed lighting fixtures as approved by local code.

3.3 FIELD QUALITY CONTROL

- A. Field Inspections:
 1. Insulation meets required thickness requirements.
- B. Non-Conforming Work: Non-conforming work as covered in 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 Owner.

3.4 PROTECTION

- A. Protect installed products until project completion.
- B. Repair or replace damaged products.

3.5 CLEANING

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

END OF SECTION

BLANK PAGE

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 with secondary underlayment at all roof areas as described in Contract Documents.
- B. Related Requirements:
1. Section 06 2001: 'Common Finish Carpentry Requirements' for installation of wood nailers, curbs and blocking.
 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. Wall flashings.
 2. Pipe and flue roof jacks.
- D. Related Requirements:
1. Section 07 6310: 'Steep Slope Roof Flashing: Asphalt Shingles' for furnishing of roof flashing, pipe jacks, drip edge and miscellaneous flashing and sheet metal.

1.2 REFERENCES

- A. Definitions:
1. Flame Spread Classification: Categories as per ASTM E84/UL 723 or CAN/ULC-S102:
 - 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.
 2. 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-17, 'Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing'.
 - b. ASTM D1970/D1970M-18, 'Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection'.
 - c. ASTM D3018/D3018M-11(2017), 'Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules'.
 - d. ASTM D3019/D3019M-17, 'Standard, 'Standard Specification for Lap Cement Used with Asphalt Roll Roofing, Non-Fibered, Asbestos-Fibered, and Non-Asbestos-Fibered'.
 - e. ASTM D3161/D3161M-16a, 'Standard Test Method for Wind-Resistance of Asphalt Shingles (Fan-Induced Method)'.

- f. ASTM D3462/D3462M-16, 'Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules'.
- g. ASTM D4869/D4869M-16a, 'Standard Specification for Asphalt-Saturated Organic Felt Underlayment Used in Steep Slope Roofing'.
- h. ASTM D7158/D7158M-17, 'Standard Test Method for Wind Resistance of Asphalt Shingles (Uplift Force/Uplift Resistance Method)'.
- i. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
- j. ASTM E108-17, 'Standard Test Methods for Fire Tests of Roof Coverings'.
- k. ASTM F1667-18, 'Standard Specification for Driven Fasteners: Nails, Spikes, and Staples'.
2. Canadian Standards Association (CSA Group):
 - a. CSA A123.5-16, 'Asphalt Shingles Made from Organic Felt and Surfaced with Mineral Granules / Asphalt Shingles Made From Glass Felt and Surfaced With Mineral Granules'.
3. International Building Code (IBC) (2018 Edition or latest edition adopted by AHJ):
 - a. Chapter 15, 'Roof Assemblies And Rooftop Structures'.
4. National Fire Protection Association:
 - a. NFPA 101: 'Life Safety Code' (2015 Edition).
5. Standards Council of Canada:
 - a. CAN/ULC-S102:2018, 'Method of Test for Surface Burning Characteristics of Building Materials and Assemblies'.
 - b. CAN/ULC-S107:2010-R2017, 'Methods of Fire Tests of Roof Coverings'.
6. 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' (11th 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).

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.
 2. Schedule pre-installation conference at project site after completion of the installation of roof sheathing but before installation of any roofing system component.
 3. In addition to agenda items specified in Section 01 3100, review following:
 - a. Review if Project is in high wind area.
 - b. Review if Project could have ice dam problems.
 - c. Review if Project could have fungus-algae resistance problems.
 - d. Review Shingle Manufacturer's ventilation requirements.
 - e. Review Shingle Manufacturer's Ambient Conditions requirements.
 - f. Review existing roof conditions including moisture on deck, protruding deck fasteners, specified gaps between sheathing, and other items affecting issuance of roofing warranty.
 - g. Review proper valley, flashing, penetrations, secondary underlayment, sealants, and nailing requirements.
 - h. Review racking installation method is not permitted.
 - i. Review Cleaning and Disposal requirements.
 - j. Review Special Procedure Submittal for Warranty Information to be given to Manufacturer before Manufacture will issue Roof Warranty by Installer.
 - k. Review safety issues.
- B. Sequencing:
 1. Sequence of Roofing Materials (see valley flashing detail in Contract Drawings):
 - a. Apply continuous **12 inches (300 mm)** 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 (900 mm)** wide sheets of secondary underlayment in valley.
 - e. Install one (1) continuous **36 inch (300 mm)** 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 (300 mm)** wide strips of secondary underlayment lapping nailed edge of formed valley metal **3 inches (75 mm)**.
 - 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:
3. Reports:
 - a. Manufacturer's test reports.
 - b. Wind speed coverage for warranted wind speed.
 - c. High wind reports and approvals if required by AHJ.
4. 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.
5. 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.
6. 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 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, CAN/ULC-S102, or ASTM E108, for application and roof slopes indicated.
 - a) Materials shall be identified with appropriate markings of applicable testing agency.
4. Wind Resistance:
 - a. Meet ASTM D3161/D3161M for wind resistance.
 - 1) Installation shall comply with IBC Table 1507.2.7, 'Attachment'.
5. Wind Speed:
 - a. As required to meet local codes having jurisdiction.
6. 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 (43 deg C)**.
 - b) Use extra care in handling shingles when temperature is below **40 deg F (4.4 deg C)**.
 - 2) Underlayment: Store in area with temperature between **40 deg F and 100 deg F (4.4 deg C and 38 deg C)**.
 - e. Unacceptable Material:
 - 1) 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 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 The Church of Jesus Christ of Latter-day Saints 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. Malarkey (Alaska or Canada projects only):
 - 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.
 - d. 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. Standard Wind Areas:
 - a. Roofing system will resist blow-offs in winds up to **110 mph (177 kph)** for ten (10) years when installed as specified below.
 - b. Meet requirements of ASTM D3161/D3161M UL Class D.
 3. 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.
 - 1) Contact Information: Wendy Fox, (800) 404-9880 wfox@dataworksintl.com.
- b. GAF Materials Corp., Wayne, NJ www.gaf.com.
 - 1) Contact Information: John Arellano (office) (210) 896-1041 (fax) (210) 259-8050.
- c. Malarkey Roofing Products, Portland OR:
 - 1) Contact Information: Joe Russo (425) 418-3456 Joe.Malarkey@outlook.com.
- d. Owens Corning, Toledo, OH www.owenscorning.com.
 - 1) Duration Premium shingles are available in all areas of the USA and Canada including all Duration Premium colors under 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. or Robert Hill (801) 553-2417 Robert.Hill@owenscorning.com.

B. Components:**1. Shingles And Underlayment:**

- a. Fiberglass mat shingles meeting or exceeding requirements of:
 - 1) UL Class A Fire Resistance.
 - 2) ASTM D3018/D3018M, Type I (self sealing).
 - 3) Standard Wind Areas: ASTM D3161/D3161M UL Class D.
 - 4) ASTM E108 Class A.
 - 5) CSA A123.1/A123.5 (Canada).
 - 6) ASTM D3462/D3462M where required by local codes.
 - 7) Secondary Underlayment: Meet requirements of ASTM D1970/D1970M and UL 790 Class A Fire Resistance.
 - 8) Primary (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.
 - 9) Color as selected by Architect from Shingle Manufacturer's full color line.
- b. Category Three Approved Manufactures and Products. See Section 01 6200 for definitions of Categories:
 - 1) CertainTeed:
 - a) Shingles:
 - (1) Standard 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 WinterGuard Sand.
 - (2) WinterGuard High Tack/High Temperature at valleys.
 - d) Secondary Underlayment Under Shingles over Unheated Buildings:
 - (1) Not required over unheated buildings such as Storage Shed and Stake Pavilions.
 - 2) GAF:
 - a) Shingles:
 - (1) Standard 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 (High Temperature at valleys).
- d) Secondary Underlayment Under Shingles over Unheated Buildings:
 - (1) Not required over unheated buildings such as Storage Shed and Stake Pavilions.
- 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 Church contract. Request shingles through local distribution.
 - (2) Any questions, contact Manufactures Area Sales Manager.
 - b) Shingles:
 - (1) Standard Wind: Duration Premium shingles.
 - (2) Hip And Ridge Shingles: DecoRidge Hip & Ridge.
 - 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.
 - (2) Weatherlock Specialty Tile & Metal for High Temperature at valleys.
 - e) Secondary Underlayment Under Shingles over Unheated Buildings:
 - (1) Not required over unheated buildings such as Storage Shed and Stake Pavilions.

2.2 ACCESSORIES

A. Elastomeric Roofing Sealant:

- 1. Design Criteria:
 - a. Meet requirements of ASTM D3019/D3019M.
 - 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.

B. Fasteners:

- 1. Primary Underlayment:
 - a. Corrosion resistant roofing nails with **one inch (25 mm)** diameter head and **3/4 inch (19 mm)** 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 (9.5 mm)** nominal diameter.
 - d) Sufficient length to penetrate through roof sheathing **1/4 inch (6 mm)** or **3/4 inch (19 mm)** 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 (24.1 km)** 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:
 - a) Architect/Roof Consultant may approve in writing, staple gun that installs exposed fasteners with staples.

PART 3 - EXECUTION

3.1 INSTALLERS

A. Category Three Approved Manufacture's Roofing Installers: See Section 01 4301.

1. Utah Area:

a. Approved Installers:

1) CertainTeed:

- a) AMCO American Roofing Co., Salt Lake City, UT – Contact: Keith J Yorgason (801) 269-1276.
- b) Far West Roofing, Bluffdale, UT – Contact Douglas Cooper (801) 253-7799.
- c) Heritage Roofing, Bluffdale, UT – Contact: James Smith (801) 576-8447.
- d) Island Heights Construction Inc., Logan, UT – Contact: Casey Ringer (435) 753-7403.
- e) JTS Roofing Inc., Ogden, UT – Contact: Todd Shupe (801) 627-6450.
- f) Mountain Peak Builders, Inc., Logan, UT – Contact: Zane Rust (435) 787-4174.
- g) North Face Roofing, Inc., Park City, UT – Craig Peters (801) 455-8492.
- h) Perkes Roofing, Ogden, UT – Contact: Mark Perkes (801) 731-6918.
- i) Redd Roofing Co., Ogden, UT – Lance Redd (801) 621-1363.
- j) Stout Roofing Inc., St George, UT - Contact: Kelly Casey (435) 635-4288.
- k) Stuart Roofing, Ogden, UT, Forest Stuart (801) 394 1923.
- l) VIP Roofing, Centerville, UT – Contact: Max Ker (801) 631-6182.
- m) White Roofing Co., Nephi, UT – Contact: Charles Shannon White (801) 376-1088.

2) GAF:

- a) American Roofing Co. (AMCO), Salt Lake City, UT – Contact: Keith Yorgason (801) 269-1276.
- b) Aspen Roofing, Salt Lake City, UT – Contact: Jon Brady (801) 483-1660.
- c) Capital Roofing Service, Inc., Sandy, UT – Contact: Paul Hitzman (801) 562-5568.
- d) Fortress Roofing, Murray, UT – Contact: Adam Cordon (801) 509-8625.
- e) Knockout Roofing, Riverton, UT – Contact Jared Gran (801) 604-4090.
- f) Lifetime Roofing, West Point, UT - Parker Cornably (801) 200-7426.
- g) Parrish Construction, American Fork, UT – Contact: Tyler Parrish (801) 787-3633.
- h) RSW Plus, Nephi, UT – Contact: Rick White (435) 623-1719.
- i) Skyline Roofing Inc., La Verkin, UT - Contact: Adam Stout (435) 635-3172.
- j) Wesley Green Roofing, UT – Contact: Scott Horsepool (801) 486-3411.

3) Owens-Corning:

- a) American Roofing Co. (AMCO), Salt Lake City, UT – Contact: Keith J Yorgason (801) 269-1276.

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. Removal of Existing Roofing:
 1. Removal and disposal of existing roofing and flashing shall be in strict accordance with Federal, State and Local Health and Safety regulations.
 2. Remove and dispose of existing roofing and related materials, down to existing roof deck.
- C. 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. Coordinate extent with drawings for areas requiring Secondary Underlayment at entire roof area, all north-facing roof areas on this project.
 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).
 - a. Use High Temperature secondary underlayment at valleys.
 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 (1 200 mm)** 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 (150 mm)** and side laps of **3 inch (76 mm)**.
 - 3) Stop primary underlayment between **3 and 6 inches (75 and 150 mm)** 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 (25 mm)** 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 (19 mm)** 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) At all shingle roof areas: Apply Secondary Underlayment at entire roof area.
 4. Valley Underlayment:
 - a. Apply three (3) continuous **36 inch** wide sheets of secondary underlayment in valley lapped 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 (300 mm)** 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 Shingle Warranty.
 - b. Install shingles at eve 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** 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 Shingle 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 for Shingle Warranty 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 always.
 - b. Do not allow trash, waste, or debris to collect on roof. These items shall be removed from roof daily.
 - 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

BLANK PAGE

SECTION 07 5419

POLYVINYL-CHLORIDE ROOFING: PVC

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
1. Furnish and install roofing membrane with flashings and other components to comprise total roofing system as described in Contract Documents including:
 - a. 80 mil Single-ply membrane.
 - b. Gypsum Cover Board (where shown on Contract Drawings)
 - c. Poly-isocyanurate tapered insulation system with crickets (where shown on Contract Drawings) (R-30 above building areas)
 - d. 5/8" Gypsum thermal barrier
- B. Related Requirements:
1. Section 06 0573.13: 'Preservative Wood Treatment' for roof related blocking and roof nailers.
 2. Section 06 1100: 'Wood Framing' for roof related blocking, nailing and sheathing.
 3. Section 06 2001: 'Common Finish Carpentry Requirements' for wood nailers, curbs and blocking.
 4. Section 07 6120: 'Galvanized Steel Flashing And Trim' for metal work installation and requirements.
 5. Section 22 1400: 'Facility Storm Drainage' for roof drains.
- C. Products Installed But Not Furnished Under This Section:
1. Sheet metal work including caps, sleeves, umbrella hoods, pipe enclosures boxes, strapping, and scuppers.
- D. Related Requirements:
1. Division 07 for sheet metal work specialties and accessories.

1.2 REFERENCES

- A. Association Publications:
1. American National Standards Institute / Single Ply Roofing Industry:
 - a. ANSI/SPRI/FM 4435/ES-1 2003, 'Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems'.
 - b. ANSI/SPRI WD-1 'Wind Design Standard for Roofing Assemblies'.
 2. FM Global Resource Catalogue by FM Global, Norwood, MA www.fmglobal.com.
 - a. Approval Guide:
 - 1) Factory Mutual Standard 4470 - Approval Standard for Class 1 Roof Covers.
 - b. Property Loss Prevention Data Sheet 1-28, 'Wind Design' (latest edition).
 - c. Property Loss Prevention Data Sheet 1-29, 'Roof Deck Securement and Above-Deck Components' (latest edition).
 - d. Property Loss Prevention Data Sheet 1-49, 'Perimeter Flashing' (latest edition).
- B. Definitions:
1. 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.

- C. Reference Standards:
 - 1. ASTM International:
 - a. ASTM C1289-18a, 'Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board'.
 - b. ASTM C1303/C1303M-15, 'Standard Test Method for Predicting Long-Term Thermal Resistance of Closed-Cell Foam Insulation'.
 - c. ASTM D4434/D4434M-15, 'Standard Specification for Polyvinyl Chloride Sheet Roofing'.
 - d. ASTM E84-18b, 'Standard Test Method for Surface Burning Characteristics of Building Materials'.
 - e. ASTM E108-17, 'Standard Test Methods for Fire Tests of Roof Coverings'.
 - 2. International Building Code (IBC) (2018 edition or latest edition adopted by AHJ):
 - a. Chapter 15, 'Roof Assemblies And Rooftop Structures':
 - 1) Section 1507, 'Requirements for Roof Coverings':
 - a) 1507.13, 'Thermoplastic single-ply Roofing'.
 - 3. National Fire Protection Association:
 - a. NFPA 101: 'Life Safety Code' (2018 or most recent edition adopted by AHJ).
 - 4. 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' (11th Edition).
 - c. UL 790, 'Standard Test Methods for Fire Tests of Roof Coverings' (8th Edition).
 - d. UL 1897-04, 'Uplift Tests for Roof Covering Systems' (7th Edition).
 - e. UL 2218, 'Standard for Impact Resistance of Prepared Roof Coverings Materials' (2nd Edition).

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in MANDATORY pre-installation conference.
 - a. Roofing Installer's Foreman and those responsible for installation of roofing to be in attendance. Include Roofing Manufacturer's Representative if available.
 - 2. Schedule pre-installation conference at project site after installation of roof deck including pipe and flue penetrations, but before application of any roofing system component.
 - 3. In addition to agenda items specified in Section 01 3100, review following:
 - a. Review Manufacturer's written instructions.
 - b. Review if Project is in high wind area.
 - c. Review delivery, storage, and handling requirements.
 - d. Review ambient conditions requirements.
 - e. Review roofing installation requirements including flashing and penetrations.
 - f. Review roofing drainage requirements.
 - g. Review temporary protections for roofing system.
 - h. Review cleaning and disposal requirements.
 - i. Review Special Procedure Submittal for Warranty Information to be given to Manufacturer before Manufacture will issue Roof Warranty by Installer.
 - j. Review safety issues.
 - k. Review field inspections and non-conforming work requirements.
 - l. Review protection of membrane by other trades after installation of membrane.

1.4 SUBMITTALS

- A. Action Submittals:
 - 1. Product Data:
 - a. Manufacturer's literature or cut sheet for each element of system.
 - b. Manufacturer's preparation and installation instructions and recommendations.
 - 2. Shop Drawings:
 - a. Prepared by Roofing Installer and approved by Roofing Membrane Manufacturer and include following:
 - 1) Base flashings.

- 2) Location and type of penetrations.
 - 3) Membrane terminations.
 - 4) Outline of roof and roof size.
 - 5) Perimeter and penetration details.
 - 6) Roof insulation:
 - a) Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
 - b) Taper insulation, including slopes.
 - 7) Special details and materials.
 - b. Confirm that specified FM Class and UL Class assembly is appropriate for Project location.
 - c. Include approved copy of Manufacturer's Notice of Award or Assembly Letter.
3. Samples:
- a. Manufacturer's 4 inch (100 mm) square minimum sample representing actual color, membrane and thickness.
- B. Informational Submittals:
1. Certificates:
 - a. 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.
 - b. Manufacturer's signed certificate that roof system has been inspected by Technical Service Representative and stating no deviation from system specified or approved shop drawings without written approval by Owner Representative and Manufacturer.
 2. Test And Evaluation Reports: Submit evidence that roof system has been tested and approved or listed as follows:
 - a. Submit evidence that roof system has been tested and approved or listed to meet Factory Mutual Research Corporation (FM) Classification required for this Project.
 - b. Submit evidence that roof system has been tested to meet UL Class requirement required for fire-resistance rating for this Project.
 3. Manufacturer Instructions:
 - a. Two (2) copies of Roofing Manufacturer's published instructions for Architect and maintain one (1) at job-site.
 4. Special Procedure Submittals:
 - a. Installer to fill out 'Roof Manufacturer' Installer Workmanship Warranty' and 'Manufacturer System Warranty' from information provided in the Attachment 'Roofing Manufacturer's Information For Architect' from Manufacturer and from Architect. Warranties are to be included in Closeout Submittals.
 5. Qualification Statement:
 - a. Roofing Manufacturer's certification of Installer.
- C. Closeout Submittals:
1. Include following in Operations And Maintenance Manual specified in Section 01 7800:
 - a. Warranty Documentation:
 - 1) Final, executed copy of 'Roofing Manufacturer System Warranty' including wind speed coverage and required Owner mandatory information.
 - 2) Final, executed copy of 'Roof Installer Workmanship Warranty' including required Owner mandatory information.
 - 3) Verify mandatory information as specified in Special Procedure Submittal has been included in Final Warranty.
 - b. Record Documentation:
 - 1) Manufacturers Documentation:
 - a) Record Shop Drawings if requested. Record shop drawings shall be given shop drawing number by Roofing Manufacturer.
 - b) Certificate: Manufacturer Inspection report by Technical Service Representative.
 - c) Certificate: Installer statement of compliance for performance requirements.
 - d) Test And Evaluation Report: UL fire-resistance rating test report.
 - e) Test And Evaluation Report: Factory Mutual Research Classification approval.

1.5 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Requirements:
1. Roof system will meet requirements of all federal, state, and local codes having jurisdiction (AHJ).
 2. Fire Characteristics Performance Requirement:
 - a. Roof system will achieve UL Class A rating when tested in accordance with ASTM E108 or UL-790:
 - 1) Materials shall be identified with appropriate markings of applicable testing agency.
 3. Thermal Performance Requirement:
 - a. Roof system will achieve minimum R value not less than 30 at areas where tapered insulation above the roof deck is shown on Contract Drawings.
 4. Wind Criteria as per ASCE 7-10:
 - a. Basic wind speed (V): 120 mph (Risk Category III)
 - b. Wind exposure and importance factor (I_w): B
 - c. Wind Design Pressure (p):
31.1 (roof area field)
52.2 (roof area perimeter)
78.5 (roof area corners)
 5. Perimeter Edge Requirements:
 - a. Zone 2 (roof edge perimeter, vertical load direction): 52.2 pounds per square foot
 - b. Zone 3 (roof edge corners, vertical load direction): 78.5 pounds per square foot
 - c. Zone 4 (wall edge perimeter, horizontal load direction): 33.7 pounds per square foot
 - d. Zone 5 (wall edge corners, horizontal load direction): 41.6 pounds per square foot
 6. Parapet Cap / Coping Requirements:
 - a. Zone 2 (perimeter, vertical load direction): 52.2 pounds per square foot
 - b. Zone 3 (corners, vertical load direction): 78.5 pounds per square foot
 - c. Zone 4 (perimeter, horizontal load direction): 33.7 pounds per square foot
 - d. Zone 5 (corners, horizontal load direction): 41.6 pounds per square foot
- B. Qualifications:
1. Requirements of Section 01 4301 applies but not limited to the following:
 - a. Installers Qualifications:
 - 1) Provide documentation if requested by Architect:
 - a) Roofing Installer shall be approved and authorized by Roofing System Manufacturer to install Manufacturer's product and eligible to receive Manufacturer's special warranty before bid.
 - b) Roofing Installer shall be able to document roofing membrane installation for five (5) year minimum.
 - c) Roofing Installer must have current license for the city, county, and state where project is located.
 - d) Roofing Installer must have 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) Membrane and flashing installation shall be performed by personnel trained and authorized by Roofing Manufacturer.
 - g) Welding equipment shall be provided by or approved by Roofing Manufacturer. Mechanics intending to use equipment shall have successfully completed training course provided by Manufacturer's Technical Representative before welding.
 - b. Manufacturer Qualifications:
 - 1) Manufacturer shall manufacture membrane material for five (5) consecutive years.
 - a) No product with documented failure will be allowed.
 - 2) Manufacturer that is UL listed for membrane roofing system used for this Project.
 - 3) Source Limitations:
 - a) Provide roof components including roof insulation and fasteners for roofing system from same Manufacturer as membrane roofing or approved by Roofing Membrane Manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
1. Make no deliveries to Project until installation is about to commence, or until approved storage area is provided.
 2. Deliver products job site in original unopened containers or wrappings 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. General:
 - a. Follow Manufacturer's instructions and precautions for storage of materials.
 - b. Handle and store roofing materials and place equipment in manner to avoid permanent deflection of roof decking.
 - c. Material Safety Data Sheets (MSDS) must be on location always during transportation, storage and application of materials.
 2. Storage Requirements:
 - a. Protection:
 - 1) Protect roof materials from physical damage, moisture, soiling, and other sources in a clean, dry, protected location and with temperature range required by Manufacturer. Protect from direct sunlight.
 - 2) Provide continuous protection of materials against moisture absorption (Manufacturer's/Supplier's shrink wrap is not accepted waterproofing).
 - 3) Store membrane rolls lying down on pallets fully protected from weather with clean canvas tarpaulins.
 - b. Roof Insulation:
 - 1) Comply with insulation Manufacturer's written instructions for handling, storing, and protection during installation.
 - c. Safety:
 - 1) Store flammable materials in cool, dry area away from sparks, open flames, or excessive heat. Follow precautions outlined on containers or supplied by material manufacturer/supplier.
 - 2) Liquid materials such as solvents and adhesives shall be stored off site and installed away from open flames, sparks, and excessive heat.
 - 3) Site storage is acceptable if liquid materials are placed in a locked, sealed storage container.
 - 4) Situate equipment and materials so as to preclude danger, disturbance, or interference to public safety and traffic, and to not constitute fire hazard.
 - d. Temperature:
 - 1) Store adhesives at temperatures above 40 deg F (4 deg C).and below 180 deg F (82 deg C).
 - e. Unacceptable Material:
 - 1) 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) Remove all wet and damaged materials from site.
 - 3) Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
 3. Handling Requirements:
 - a. Select and Handle operating equipment so as not to damage existing construction or new roofing system, or to overload structural system.
 - b. Handle rolled goods so as to prevent damage to edge or ends.

1.7 FIELD CONDITIONS

- A. Ambient Conditions:
1. Temperature ranges shall be within tolerances allowed for material being used.
 - a. Roof surface shall be free of ponding water, ice, and snow.
 - b. Cold temperature:

- 1) Follow Manufacturer's written instructions for cold temperature requirements before applying membrane adhesive:
 - a) Follow specified precautions.
 - b) Expose only enough adhesive to be used as directed by membrane manufacturer:
 - c) Low VOC restrictions (if required by local AHJ): Temperatures to be 40 deg F (4 deg C) and rising before applying.
- c. Hot temperature:
 - 1) Do not expose membrane and accessories to constant temperature in excess of 180 deg F (82 deg C).
2. Proceed with roofing work when existing and forecasted weather conditions permit.

1.8 WARRANTY

- A. Manufacturer Warranty:
 1. Roofing Membrane Manufacturer's Special Warranty for:
 - a. Thirty (30) year no dollar limit (NDL) material and labor warranty covering roofing system, including insulation, components of membrane roofing system and flashing degradation and workmanship.
 - b. Accidental Puncture Warranty:
 - 1) Membrane Manufacturer's written Accidental Puncture Warranty for up to sixteen (16) hours of Labor to repair punctures after final inspection.
 - c. Warranty shall include wind speed coverage to 99 mph.
- B. Roof Installer Workmanship Warranty:
 1. Written five (5) year guarantee covering workmanship and repairs or replacement of work without cost to Owner, counter-signed by Installer and General Contractor from date of installation:
 - a. Roof Installer Workmanship Warranty must include information required in Attachment 'Warranty Information'.

PART 2 - PRODUCTS

2.1 SYSTEM

- A. Manufacturer:
 1. Category Three Approved Manufacturers. See Section 01 6200 for definitions of Categories:
 - a. Carlisle SynTec Incorporated, Carlisle PA www.carlisle-syntec.com. (717) 245-7000:
 - 1) Contact Information (USA, Canada and Global):
 - a) Primary Contact: Greg Petschke (Manager Strategic Accounts), office (800) 479-6832 cell (717) 215-2681 greg.petschke@carlisesyntec.com.
 - b) Secondary Contact: Kristen Morrow (Strategic Accounts Coordinator), phone (717) 245-7289 kristen.morrow@carlisleccm.com.
 - c) Secondary Contact: Horner & Associates (Utah, Idaho, Wyoming, and Montana): Tom (801) 842-8305 tom@hornerassocd7.com or Gary (801) 712-0326 gary@hornerassocd7.com.
 - b. Sika Sarnafil, Canton, MA (800) 576-2358 or (781) 828-5400. www.sikacorp.com.
 - 1) Contact Information (USA, Canada and Global):
 - a) Primary Contact: Steve Moosman, District Manager, office (801) 575-8648 x7551 cell (801) 201-6269 moosman.steve@us.sika.com.
 - b) Secondary Contact: Jim Greenwell, Mountain Region Manager: office (801) 575-8648 x7558 cell (801) 455-3838 greenwell.jim@us.sika.com.
 - c. Versico Roofing Systems (Carlisle Construction Materials, Inc., Carlisle PA) www.versico.com (800) 992-7663:
 - 1) Contact Information (USA, Canada and Global):
 - a) Primary Contact: Jeff Kelly, Corporate Accounts Manager: phone (480) 528-6923 jeff.kelly@versico.com.

- b) Secondary Contact (Utah only): Dan Barker phone (801) 668-4960
division7specialties@msn.com or Justin Spencer phone (801) 458-7207
js_division7specialties@msn.com.

B. Design Criteria:

- 1. General:
 - a. Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 - b. Membrane roofing and base flashings shall remain watertight.
- 2. Drainage Requirement:
 - a. Roof system to provide positive drainage where all standing water dissipates within forty-eight (48) hours after precipitation ends.
- 3. Material Compatibility:
 - a. Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane Roofing Membrane Manufacturer based on testing and field experience.
- 4. Metal details, fabrication practices, and installation methods shall conform to applicable requirements of following:
 - a. Factory Mutual Loss Prevention Data Sheet 1-49, 'Perimeter Flashing' (latest issue).
 - b. Sheet Metal and Air Conditioning Contractors National Association Inc, 5th edition.

C. Components:

- 1. Membrane:
 - a. Description:
 - 1) Adhered:
 - a) Meet requirements of ASTM D4434/D4434M, Type III.
 - b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Carlisle SynTec:
 - (a) Sure-Flex PVC polyester reinforced membrane.
 - (2) Sika Sarnafil:
 - (a) G410 fiberglass reinforced membrane with lacquer coating.
 - (3) Versico:
 - (a) Polyester-reinforced membrane for 30 year warranty
 - b. Thickness:
 - 1) Field membrane: Thickness: **80 mil (2.03 mm)** by optimum width and length determined by job conditions.
 - 2) Flashing membrane: Thickness: **0.60 mil (1.52 mm)** by optimum width and length determined by job conditions.
 - c. Surface Color:
 - 1) White.
- 2. Insulation:
 - a. FM and UL approved.
 - b. If required by Manufacturer for warranty, provide approved facer.
 - c. Polyisocyanurate Foam Insulation Board:
 - 1) Meet requirements of ASTM C1289.
 - 2) Insulation boards shall be Factory Mutual approved for classification selected for project.
 - 3) Facer:
 - a) Fiber reinforced paper facer or coated-glass fiber mat facer.
 - 4) Insulation panels directly under roofing membrane and roof system cover board shall not exceed **48 inches by 96 inches (1 200 mm by 2 400 mm)**.
 - 5) Insulation panels to be **2 inches (50 mm)** maximum thickness for each layer. Insulation shall be multiple layers and achieve minimum 'R' value of 30. Tapered layer shall slope at **1/4 in per ft (20 mm per meter)**.
- 3. Roof System Cover Board (Recovery/Hard Board) Over Insulation:
 - a. Non-Fire Rated:
 - 1) 'Adhered' application:

- a) Minimum thickness to be determined by roofing system Manufacturer based upon Warranty term and Wind Warranty requirements.
 - b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) **1/2 inch (12.7 mm)** thick minimum Dens-Deck Prime Roof Board by G-P Gypsum.
 - (2) **1/2 inch 1/2 inch (12.7 mm)** thick minimum Securock by USG.
 - b. Fire Rating:
 - 1) Fire Protection Board On Deck:
 - a) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) **5/8 inch (16 mm)** thick minimum Dens-Deck Fireguard Roof Board by G-P Gypsum.
- 4. Vapor Retarder / Air Barrier:
 - a. Temporary Roof Membrane:
 - 1) Self adhered retarder:
 - 2) May be used as temporary roof membrane up to ninety (90) day exposure.
 - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Carlisle SynTec and Versico:
 - (1) Systems 725 TR air and vapor barrier with primers and sealers as required.
 - b) Sika Sarnafil:
 - (1) Sarnavap air and vapor barrier with primers and sealants as required.
 - b. Wood Roof Decks:
 - 1) Self adhered retarder:
 - a) May be used as temporary roof membrane up to ninety (90) day exposure.
 - b) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Carlisle SynTec and Versico:
 - (a) Systems 725 TR air and vapor barrier with primers and sealers as required.
 - (2) Sika Sarnafil:
 - (a) Sarnavap air and vapor barrier with primers and sealants as required.

2.2 ACCESSORIES

- A. Adhesives, Sealants and Sealer:
 - 1. General:
 - a. Supplied by Roofing Membrane Manufacture Meet uplift and VOC requirements required for Project for specific application method and in compliance with all local codes and restrictions provided by Roofing Membrane Manufacture.
 - b. As accepted by Roofing Manufacturer under specified warranty.
 - 2. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when required by local codes or AHJ.
 - 3. Pourable Sealer:
 - a. Approved by Roofing Membrane Manufacturer for specified roof system.
 - 4. Membrane:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Carlisle SynTec:
 - a) Carlisle Sure Flex Low VOC membrane adhesive.
 - b) Carlisle Sure Flex Hydro Bond water based membrane adhesive.
 - 2) Sika Sarnafil:
 - a) Sarnacol 2170 VC: VOC acceptable membrane adhesive.
 - b) Sarnacol 2121: Water based membrane adhesive.
 - c) Sarnacol Stabond: VOC acceptable membrane adhesive.
 - 3) Versico:
 - a) Versiflex PVC Low VOC bonding adhesive.
 - 5. Insulation:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:

- 1) Carlisle SynTec:
 - a) Carlisle FAST or Flexible FAST low rise polyurethane foam adhesive.
 - 2) Sika Sarnafil:
 - a) Sarnacol 2163/AD/OM: Low rise polyurethane foam adhesive.
- B. Coated Metal:
1. Colors:
 - a. Not Seen From Ground: Color to match selected roof membrane.
 - b. Seen From Ground: Manufacturer's standard color as selected by Architect to match membrane surface color chosen for project.
 2. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Carlisle SynTec:
 - 1) Sure Flex coated metal **24 ga (0.6 mm)** G90 galvanized sheet metal laminated with **0.035 inch (0.9 mm)** thick PVC membrane:
 - 2) Membrane cover strips:
 - a) **0.060 inch (1.5 mm)** thick.
 - b) Color to match selected Sure Flex.
 - b. Sika Sarnafil:
 - 1) **25 ga (0.56 mm)** G90 galvanized sheet metal laminated with **0.020 inch (0.55 mm)** thick membrane:
 - 2) Sarnclad membrane cover strips:
 - a) **0.060 inch (1.5 mm)** thick.
 - b) Color to match selected Sarnaclad.
- C. Counterflashing:
1. Formed to meet design requirements and match existing metals and aesthetics, furnished by Membrane Manufacturer.
- D. Mechanical Attachment Accessories:
1. Fasteners:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Carlisle SynTec:
 - a) Carlisle Fasteners or engineered fasteners designed to anchor membrane and flashing into substrates that include steel, concrete, gypsum, and light weight concrete roof decks.
 - 2) Sika Sarnafil:
 - a) Sarnafasteners or engineered fasteners designed to anchor membrane and flashing into substrates that include steel, concrete, gypsum, and light weight concrete roof decks.
 2. Bars And Plates:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Carlisle SynTec:
 - a) Bars and plates engineered as companion assembly with Carlisle Fasteners. Used to secure membrane and/or flashing as required by Membrane Manufacturer.
 - 2) Sika Sarnafil:
 - a) Bars and plates engineered as companion assembly with Sarnafasteners. Used to secure membrane and/or flashing as required by Membrane Manufacturer.
- E. Miscellaneous Fasteners and Anchors:
1. Fasteners, anchors, nails, straps, bars, etc. shall be of post-galvanized zinc or cadmium-plated steel, aluminum, or stainless steel. Mixing metal types and methods of contact shall be in such manner as to avoid galvanic corrosion.
 2. Compatible with substrates and flashings to be anchored:
 - a. Fasteners for attachment of metal to masonry shall be expansion type fasteners with stainless steel pins.
 - b. Concrete fasteners and anchors shall have minimum embedment of **1-1/4 inch (32 mm)** and shall be approved for such use by Fastener Manufacturer.
 - c. Wood fasteners and anchors shall have embedment of **one inch (25 mm)** minimum and be approved for such use by Fastener Manufacturer.

- F. Prefabricated Flashing Accessories: Membrane corners and pipe stacks as supplied by Membrane manufacturer.
- G. Traffic Surface:
 - 1. Standard Walkway:
 - a. Description:
 - 1) Traffic surface used to protect roof membrane with limited slip surface.
 - 2) Approved for all wind load areas.
 - 3) Heat weldable walk roll.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Carlisle SynTec:
 - a) Sure Flex Walkway Roll.
 - 2) Sika Sarnafil:
 - a) SarnaTred Walkway Roll.
 - 2. Walkway Rolls:
 - a. Description:
 - 1) Traffic surface used to protect roof membrane with limited slip surface.
 - 2) Loose laid walk roll.
 - 3) Warranted for 90 mph (145 kph).
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Carlisle SynTec:
 - a) Manufacture's Walkway Roll:
 - (1) Roof slope above 1 in 12 roof pitch.
 - 2) Sika Sarnafil:
 - a) CrossGrip heavy textured walkway traffic surface:
 - (1) Roof slope above 1 in 12 roof pitch.
- H. Wood Nailers:
 - 1. Treat wood nailers as per Section 06 0573.13 for preservative wood treatment and Section 06 0573.33 for fire-retardant wood treatment. Creosote or asphaltic-treated wood is not acceptable.
 - 2. Wood nailers shall conform to Factory Mutual's Loss Prevention Data Sheet 1-49.
 - 3. Wood shall have maximum moisture content of 19 percent by weight on dry weight basis.

PART 3 - EXECUTION

3.1 INSTALLERS

- A. Category Three Approved Manufacturer's Roofing Installers: See Section 01 4301:
 - 1. Carlisle SynTec:
 - a. American Roofing, Salt Lake City, UT, Richard Yorgason, (801) 680-9652, richard@amcoroof.com
 - b. Fortress Roofing, Murray UT, Adam Cordon, (801) 205-6100, adam@fortressroofingutah.com
 - c. Island Heights Construction, Hyde Park UT, Casey Ringer, (435) 753-7403, ihccasey@gmail.com
 - d. JTS, Ogden UT, Casey, (801) 627-6450, jtsroofing@aol.com
 - e. Northface Roofing, Park City UT, Craig Peters, (801) 455-8492, craig@northfaceroofs.com
 - f. Perkes Roofing, Ogden UT, Mark Perkes, (801) 731-6918, mark@perkesroofing.com
 - 2. Sika Sarnafil:
 - a. All Weather Waterproofing, John Moon, (801) 633-7509, jmoon@allweatherwaterproofing.com
 - b. Heritage Roofing, Jim Smith, (801) 910-3712, jim@heritageroofing.com
 - c. Clark's Quality Roofing, Carl Clark, (801) 520-3700, carl@clarkroofs.com
 - d. Layton Roofing, Jeremy Searle, (385) 266-7455, jeremy@layton-roofing.com
 - e. Utah Tile & Roofing "UTR", J.C. Hill, jchill@utri.com
 - f. Wood Exterior Solutions, Brent Wood, brent@woodis.com
 - g. Redd Roofing, Kyle Redd, (801) 721-2900, kyle@reddroofing.com
 - 3. Versico:

- a. American Frontier Roofing, Greg Allen, americanfrontierroofing@gmail.com
- b. Layton Roofing, Ray Paul Greenwood, (801) 495-3434, rp@layton-roofing.com
- c. Rodac, Shawn Redd, shawn@rodacroofing.com
- d. Rooftek, Brad Lord, brad@rooftek.com
- e. Weathertech Roofing, Barry Rudd, (801) 979-0461, weathertechllc@yahoo.com

3.2 EXAMINATION

- A. Verification Of Conditions (for reroofing over existing building):
 - 1. Examine substrate and conditions. Verify substrate is suitable for installation of roofing system membrane before starting work of this Section.
 - 2. Verify that roof drain lines are functioning correctly before starting work of this Section:
 - a. Report such blockages in writing to Owner's representative, with copy to Roofing Membrane Manufacturer, for corrective action before beginning work of this Section.
 - 3. Inspect for defects such as excessive surface roughness, contamination, structural inadequacy, or any other condition that will adversely affect quality of work.
 - 4. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and nailers match thicknesses of insulation to be installed.
 - 5. Remove existing roofing, base flashing, deteriorated wood blocking and metal flashing:
 - a. Remove only that amount of existing roofing and flashing that can be made watertight with new materials during a one-day period or onset of inclement weather.
 - 6. Notify Architect of unsuitable conditions in writing:
 - a. Commencement of Work by installer is considered acceptance of substrate.
 - b. Stop work immediately if any unusual or concealed condition is discovered and immediately notify Architect in writing, with letter copy to Roofing Manufacturer.
 - c. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

- A. Removal of Existing Roofing:
 - 1. Removal and disposal of existing roofing and flashing shall be in strict accordance with Federal, State and Local Health and Safety regulations.
 - 2. Remove and dispose of existing roofing and related materials, including cover boards and insulation, down to existing roof deck.
- B. General Requirements:
 - 1. Remove existing roofing, base flashing, deteriorated wood blocking and metal flashings. Recycle materials that can be recycled.
 - 2. Remove only that amount of existing roofing and flashing that can be made watertight with new materials during a one-day period or onset of inclement weather.
 - 3. Inspect for defects such as excessive surface roughness, contamination, structural inadequacy, or any other condition that will adversely affect quality of work.
 - a. Wood Deck:
 - 1) Ensure decking is sound and able to provide support and attachment of new roofing assembly.
 - 2) Deteriorated or unsound decking that can not comply with this requirement shall be brought to attention of Project Manager.
 - 3) As directed by Project Manager, remove and replace sections of decking with like materials and in compliance with local code requirements.
 - 4. Nailers:
 - a. Install continuous treated wood nailers at perimeter of entire roof and around roof projections and penetrations as described on Project Drawings. Replace existing wood nailers shown to remain, if they contain rot or are otherwise damaged.
 - 1) Anchor nailers to resist minimum force of **300 lbs (136 kg)** per lineal **foot (300 mm)** in any direction:
 - a) Provide **1/2 inch (13 mm)** space between nailer lengths.
 - b) Individual nailer lengths shall not be less than **36 inches (900 mm)** long.

- c) Nailer fastener spacing shall be at **12 inches (300 mm)** on center, or **16 inches (400 mm)** if necessary, to match structural framing.
 - d) Stagger fasteners 1/3 nailer width and install within **6 inches (150 mm)** of each end.
 - e) Meet requirements current Factory Mutual Loss Prevention Data Sheet 1-49.
- 2) Thickness shall match substrate or insulation/hardboard height.
 - 3) Anchor existing woodwork that is to remain so as to resist minimum force of **300 lbs (136 kg)** per lineal **foot (300 mm)** in any direction. Reuse only woodwork designated to be reused in detail drawings.
5. Prevent interior leakage, materials falling into interior, and other such Occurrences.
 6. Install temporary roof membrane (Sarnavap SA as called out in Part 2 of this specification section) to prevent interior leakage and soiling/staining of new roof membrane. Temporary roofing can remain exposed for maximum of 90 days.
 7. Install temporary water cut-offs at completion of each day's work and completely remove upon resumption of work.
 - a. Waterstops shall not emit dangerous or unsafe fumes and shall not remain in contact with finished roof as installation progresses.
 - b. Replace contaminated membrane at no additional cost to Owner.
 8. Provide temporary walkways and work platforms as necessary to complete work under this section with no damage to existing surfaces, surfaces exposed during work, and to new materials applied.
 9. Coordinate application of membrane to provide protection of underlying materials from wetting or other damage by the elements on a continuous basis.
 10. Sheet metal sleeves, caps, and enclosures shall be completely installed on daily basis.

C. Surface Preparation:

1. Surfaces to receive new materials shall be clean, smooth, dry (free of moisture), free of flaws, sharp edges, loose and foreign material, dirt, oil and grease.
 - a. Mechanically scrape exposed surfaces, if necessary, to remove projections.
 - b. Roofing shall not start until defects have been corrected.
2. Verify that surfaces receiving new materials have no defects or errors which would result in poor application or cause latent defects in workmanship.
3. Inspect anchoring of wood members for conformance to specified requirements. Upgrade nonconforming fasteners to meet specified requirements.
4. Reset or replace fasteners that are loose, deformed, damaged, or corroded.
5. Fit joints of insulation tightly together.
6. Prevent interior leakage, materials falling into interior, and other such Occurrences.
7. Install temporary water cut-offs at completion of each day's work and completely remove upon resumption of work.
 - a. Waterstops shall not emit dangerous or unsafe fumes and shall not remain in contact with finished roof as installation progresses.
 - b. Replace contaminated membrane at no additional cost to Owner.
8. Provide temporary walkways and work platforms as necessary to complete work under this section with no damage to existing surfaces exposed during work, and to new materials applied.
9. Coordinate application of membrane to provide protection of underlying materials from wetting or other damage by the elements on a continuous basis.
10. Sheet metal sleeves, caps, and enclosures shall be completely installed on daily basis.
11. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
12. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast.
13. Remove and discard temporary seals before beginning work on adjoining roofing.

3.4 INSTALLATION

A. Interface With Other Work:

1. Coordinate with Installers whose work penetrates roof deck or requires men and equipment to traverse roof deck.

B. General:

1. Installation shall be in conformance with latest edition of manufacturer's specification except where Contract Documents are more restrictive.
2. Roof surfaces shall be free of water, ice and snow. Surfaces to receive new insulation, membrane, or flashings shall be dry. Should surface moisture occur, provide equipment necessary to dry surface before application.
3. Secure new and temporary construction, including equipment and accessories, so as to preclude wind blow-off and subsequent roof or equipment damage.
4. Install only as much roofing as can be made weathertight each day, including flashing and detail work. Clean seams and heat-weld before leaving jobsite.
5. Schedule and execute work without exposing interior building areas to effects of inclement weather. Protect existing building and its contents against all risks.
6. Install uninterrupted waterstops at end of each day's work and completely remove before proceeding with next day's work:
 - a. Waterstops shall not emit dangerous or unsafe fumes and shall not remain in contact with finished roof as installation progresses.
 - b. Replace contaminated membrane at no additional cost to Owner.
7. Avoid use of newly constructed roofing as walking surface or for equipment movement and storage:
 - a. Where such access is required, provide necessary protection and barriers to segregate work area and to prevent damage to adjacent areas.
 - b. Provide protection layer consisting of roof sheathing over insulation board and roofing membrane for new and existing roof areas which receive rooftop traffic during construction.
8. Before and during application, remove dirt, debris, and dust from surfaces either by vacuuming, sweeping, blowing with compressed air, or similar methods.
9. Report rooftop contamination that is anticipated or that is occurring to Roofing Manufacturer to determine corrective steps to be taken.

C. Vapor Retarder / Air Barrier Installation:

1. Wood Roof Decks:
 - a. Self adhered retarder: Apply self adhesive retarder directly over deck with overlaps and sheet edges sealed in accordance with Manufacturer's instruction.
2. Conduct moisture and adhesion tests.

D. Insulation:

1. Neatly cut insulation cut to fit around penetrations and projections.
2. Install tapered insulation in accordance with insulation manufacturer's shop drawings.
3. Install tapered insulation around drains creating a drain sump.
4. Do not install more insulation board than can be covered with roofing membrane by end of day's work or onset of inclement weather.
5. 'Mechanically Attached' Attachment:
 - a. Fasten to deck with approved fasteners and plates in accordance with Insulation Manufacturer, Factory Mutual, and Roofing Manufacturer recommendations for fastening rates and patterns.
 - b. Quantity and locations of fasteners and plates shall also result in insulation boards resting evenly on roof deck/substrate so there are no large cavities or air spaces between boards and substrate.
 - c. Install fasteners in accordance with fastener manufacturer's recommendations:
 - 1) Fasteners are to have minimum penetration into structural deck as recommended by Fastener Manufacturer and Roofing Manufacturer.

E. Roof System Cover Board:

1. Offset roof system cover board joints **24 inches (600 mm)** minimum from joints in underlying substrate or insulation.
2. Wood Roof Decks:
 - a. Non-visible installation:
 - 1) Secure roof system cover board using insulation plates and fasteners spaced as required by Membrane Manufacturer's warranty requirements.
 - b. Visible (from ground/surrounding buildings) installation.

- 1) Secure roof system cover board using low profile attachment plates and fasteners spaced as required by Membrane Manufacturer's warranty requirements.

F. Membrane:

1. Inspection:
 - a. Inspect surface of insulation or substrate before installation of roof membrane.
 - b. Substrate shall be clean, dry and smooth with no excessive surface roughness, contaminated surfaces or unsound surfaces such as broken, delaminated, or damaged insulation boards.
 - c. All sharp projections shall be removed by sweeping, blowing or vacuum cleaning.
2. Adhesive:
 - a. Follow ambient conditions as specified in Part 1 of this specification.
 - b. Follow Manufacturer's written application instructions including adhesive coverage rate requirements. Apply no adhesive in seam areas.
 - 1) Installer Option A):
 - a) Apply adhesive using solvent-resistant nap paint rollers.
 - 2) Installer Option B):
 - a) Apply adhesive using wet lay-in adhesive application.
3. Hot-Air Welding Of Lap Areas:
 - a. General:
 - 1) Seams shall be hot air welded. Seam overlaps shall be **3 inches (75 mm)** wide minimum when automatic machine welding, and **4 inches (100 mm)** wide when hand welding.
 - 2) Membrane to be welded shall be clean and dry. No adhesive shall be in seam.
 - 3) Hand Welding:
 - a) Hand welded seams shall be completed in three stages. Allow hot-air welding equipment to warm up for one (1) minute minimum before welding.
 - 4) Seam shall be tack-welded every **36 inches (900 mm)** to hold membrane in place.
 - 5) Weld back edge of seam with narrow but continuous weld to prevent loss of hot air during final welding.
 - 6) Insert nozzle into seam at 45 degree angle. Once proper welding temperature has been reached and membrane begins to 'flow', position hand roller perpendicular to nozzle and press lightly. For straight seams, use **1-1/2 inch (38 mm)** wide nozzle. Use **3/4 inch (19 mm)** wide nozzle for corners and compound connections.
 - b. Machine Welding: Follow Roofing Manufacturer's instructions and use recommended equipment.
 - c. Quality Control of Welded Seams:
 - 1) Check welded seams for continuity using rounded screwdriver. Make on-site evaluation of welded seams daily at locations directed by Owner's Representative or representative of Roofing Manufacturer.
 - 2) Take **one inch (25 mm)** wide cross-section samples of welded seams at least three times a day. Patch each test cut at no additional cost to Owner.

G. Flashings:

1. General:
 - a. Install flashings concurrently with roof membrane. No temporary flashings will be allowed without prior written approval of Owner's Representative and Roofing Manufacturer. Approval shall only be for specific locations on specific dates.
 - b. If water is allowed to enter under newly completed roofing, remove and replace affected area no additional cost to Owner.
 - c. Adhere flashings to compatible, dry, smooth, and solvent-resistant surfaces.
2. Membrane Flashings:
 - a. Adhesive Application for Flashings:
 - 1) Adhere flashing membranes to solvent resistant substrates. Cut interior and exterior corners and miters and hot-air weld into place. No bitumen shall be in contact with membrane.
 - 2) Apply adhesive using solvent-resistant **3/4 inch (19 mm)** nap paint rollers. Apply adhesive in smooth, even coatings with no holidays, globs, or similar irregularities. Coat only area that can be completely covered in same day's operations. Allow surface with adhesive coating to dry completely prior to installing flashing membrane.

- 3) When surface is dry, cut flashing membrane to workable length and evenly coat underside with adhesive apply at Manufacturer's adhesive coverage rate requirements.
- 4) When adhesive has dried sufficiently to produce strings when touched with a dry finger, roll coated membrane onto previously coated substrate being careful to avoid wrinkles. Do not allow adhesive on underside of membrane to completely dry. Overlap adjacent sheets **3 inches (75 mm)**. Flashings shall extend **4 inches (100 mm)** onto roofing membrane. Press bonded sheet firmly in place with hand roller.
- 5) Apply no adhesive in seam areas that are to be welded.
- b. Install fasteners and membrane fastenings plates at **12 inches (300 mm)** on center with acceptable fasteners into structural deck at the base of parapets, walls, and curbs. Also install Sarnastop at the base of tapered edge strips and at transitions, peaks, and valleys according to Roofing Manufacturer's details:
 - 1) Hurricane Bar:
 - a) Provide inside **4 ft (1.20 m)** perimeter peel stop (Hurricane Bar) required by Owner for all projects in all wind speed coverage areas.
 - c. Extend flashings **8 inches (200 mm)** minimum above roofing level unless otherwise accepted in writing by Owner's representative and Roofing Manufacturer.
 - d. Terminate flashings according to Roofing Manufacturer's recommended details.
 - e. Adhere flashing membranes to solvent resistant substrates. Cut interior and exterior corners and miters and hot-air weld into place. No bitumen shall be in contact with membrane.
3. Metal Flashings:
 - a. Complete metal work in conjunction with roofing and flashings so that watertight condition exists daily.
 - b. Install metal to provide adequate resistance to bending and allow for normal thermal expansion and contraction.
 - c. Metal joints shall be watertight.
 - d. Securely fasten metal flashings into solid wood blocking. Fasteners shall penetrate wood nailer **one inch (25 mm)** minimum.
 - e. Airtight and continuous metal hook strips are required behind metal fascias. Fasten hook strips **12 inches (300 mm)** on center into wood nailer or masonry wall.
 - f. Counterflashings shall overlap base flashings **4 inches (100 mm)** minimum.
 - g. Metal Base Flashings:
 - 1) Space adjacent sheets **1/4 inch (6 mm)** apart.
 - 2) Fasten ends of metal **6 inches (150 mm)** on center.
 - 3) Cover joint with **2 inch (50 mm)** wide aluminum tape.
 - 4) Hot-air weld **4 inch (100 mm)** wide strip of flashing membrane over joint.
 - h. Metal Edge Flashing:
 - 1) Install as per requirements of ANSI/SPRI/FM 4435/ES-1, 'Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems'.
 - 2) Fasten metal edge flashings with two rows of post-galvanized flat head annular ring nails, **4 inches (100 mm)** on center staggered.
 - 3) Space adjacent sheets of metal **1/4 inch (6 mm)** apart.
 - 4) Cover joint with **2 inch (50 mm)** wide aluminum tape.
 - 5) Carlisle Sure Flex PVC coated metal:
 - a) Hot air weld **6 inch (150 mm)** wide strip of non - reinforced PVC flashing over coated metal joint.
 - 6) Sika Sarnafil Sarnaclad:
 - a) Hot-air weld **4 inch (100 mm)** wide strip of flashing membrane over joint.

H. Temporary Cut-Off:

1. Construct temporary waterstops to provide one hundred (100) percent watertight seal:
 - a. Make stagger of insulation joints even by installing partial panels of insulation.
 - b. Carry new membrane into waterstop.
 - c. Seal waterstop to deck or substrate so water will not travel under new or existing roofing.
 - d. Seal edge of membrane in continuous heavy application of sealant as described above.
 - e. When work resumes, cut-out contaminated membrane and dispose of off-site.
2. If inclement weather occurs while temporary waterstop is in place, provide labor necessary to monitor situation to maintain watertight condition.
3. If water is allowed to enter under newly completed roofing, remove affected area and replace at no additional cost to Owner.

- I. Walkway Rolls:
 1. Mark lines on membrane to determine location and direction(s) of walkway network. Membrane surface shall be clean.
 2. Follow Manufacturer's written application instructions including adhesive coverage rate requirements.
 3. Cross Grip:
 - a. Trim walkway to lay on roof surface where identified on Drawings.
 - b. Use Cross Grip clips to secure sections together. Use Cross Grip ramps where identified by Architect.
 - c. Roof slope above 1 in 12 roof pitch:
 - 1) Provide Manufacturers attachment recommendations.

3.5 FIELD QUALITY CONTROL

- A. Field Inspection:
 1. Before Manufacturer's inspection for warranty, Installer must perform pre-inspection to review work and to verify flashing has been completed as well as application of caulking.
 2. Final Roof Inspection:
 - a. Arrange for Roofing Membrane Manufacturer's technical personnel to inspect roofing installation on completion.
 3. Upon completion of roof inspection, provide certification that installation has been performed in accordance with Contract Document and Roofing Manufacturer requirements.
- B. Non-Conforming Work:
 1. Correct all work not in compliance to Contract Documents at no additional cost to Owner.
 - a. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.
 - b. Replace contaminated membrane.
 2. Additional inspections will be performed to determine compliance of replaced or additional work with specified requirements at no additional cost to Owner.
 3. Repair landscaped areas damaged by construction activities at no additional cost to Owner.

3.6 CLEANING

- A. Waste Management:
 1. Perform daily clean-up to collect wrappings, empty container, paper, and other roofing waste debris from project site.
 2. Upon completion, roofing waste materials must be disposed from site to dumping area legally authorized to receive such materials.
 3. Complete site cleanup, including both interior and exterior building areas that have been affected by construction, to Owner's satisfaction.

3.7 PROTECTION

- A. General Contractor Responsibility:
 1. Protection of roofing membrane from damage and wear from other trades from damage after completion of roof membrane.
 2. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by Manufacturer of affected construction.

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. Gravel stops, parapet caps, copings, scuppers, and 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. Sections under 07 5000 heading: 'Membrane Roofing' for installation of gravel stops, copings, scuppers, and miscellaneous roofing related flashing.
 - 4. Section 07 9213: 'Elastomeric Joint Sealant'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM A653/A653M-18, '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. 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.
 - b. Drexel Metals, LLC, Ivyland, PA www.drexmet.com.
 - c. Fabral, Lancaster, PA www.fabral.com.
 - d. Firestone Metal Products, Anoka, MN www.unaclad.com.
 - e. MBCI, Houston, TX www.mbc.com.
 - f. Metal Sales Manufacturing Corp, Sellersburg, IN www.mtlsales.com.
 - g. O'Neal Flat Rolled Metals (member of O'Neal Industries), Brighton, CO www.ofrmetals.com.
 - h. Petersen Aluminum Corp, Elk Grove, IL www.pac-clad.com.
 - i. Ryerson, Chicago, IL 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 (0.792 mm) for hold-down clips.
 - 2) 24 ga (0.635 mm) 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 (12.7 mm) to provide stiffness.
- D. Finish:
 1. Exposed to view:
 - a. Provide face coating of polyvinylidene Fluoride (PVF₂) Resin-base finish (Kynar 500 or Hylar 5000) containing seventy (70) percent minimum PVF₂ 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 (0.635 mm) galvanized iron or steel meeting requirements for sheet metal specified in materials above.
 - b. Size: 6 inch (150 mm) x 6 inch (150 mm) by 12 inches (300 mm) length.
- D. Step Flashing:
 1. Step flashing required for steep slope for roof to wall flashing.
 - a. 24 ga (0.635 mm) galvanized iron or steel meeting requirements for sheet metal specified in materials above.
 - b. Size: 5 inch (125 mm) x 5 inch (125 mm) by 8 inch (200 mm) or 12 inches (300 mm) 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 (100 mm) 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 (25 mm)** 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. Pipe flashing for vent piping and flues.
 - b. Roof jacks.
 - c. Saddles and curb flashings.
 - d. 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-18, '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 B117-18, '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(2016), 'Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference'.
- e. ASTM E2140-01(2017), '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:

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.
- B. Pipe Flashing For Concentric Piping Flashing Retrofitting:
 1. Manufacturer's twenty (20) warranty pipe flashing will not fail (does not allow water to leak through flashing) due to normal weather and atmospheric conditions from date of installation.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Manufacturers:
 1. Type Two Acceptable Manufacturers:
 - a. Aztec Washer Co., Poway, CA www.aztecwasher.com.
 - b. CMG – Coated Metals Group, Denver, CO www.cmgmetals.com.
 - c. Drexel Metals, LLC, Ivyland, PA www.drexmet.com.
 - d. Fabral, Lancaster, PA www.fabral.com.
 - e. Firestone Metal Products, Anoka, MN www.unaclad.com.
 - f. MBCI, Houston, TX www.mbc.com.
 - g. Metal Sales Manufacturing Corp, Sellersburg, IN www.mtlsales.com.
 - h. O'Neal Flat Rolled Metals (member of O'Neal Industries), Brighton, CO www.ofrmetals.com.
 - i. Petersen Aluminum Corp, Elk Grove, IL www.pac-clad.com.
 - j. Ryerson, Chicago, IL www.ryerson.com.
 - k. Equal as approved by Architect before installation. See Section 01 6200.
- B. Drip Edge:
 1. Metal:
 - a. Aluminum: 0.032 inch (0.81 mm) thick minimum.
- C. Fabrication:
 1. Profiles, bends, and intersections shall be even and true to line.
- D. Finishes:
 1. Face coating polyvinylidene Fluoride (PVF₂) Resin-base finish (Kynar 500 or Hylar 5000) for coil coating components containing seventy (70) percent minimum PVF₂ 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 (0.635 mm) coated galvanized steel plate.
 4. Minimum 4 inch (100 mm) flashing on each side, 6 inch (150 mm) flashing at top, 3 inch (76 mm) 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 (32 mm), 1-1/2 inch (38 mm), 2 inch (50 mm), 3 inch (76 mm), and 4 inch (100 mm).
 9. Slope: Flat to 18/12 pitch.
 10. Flashing Finish: Face coating polyvinylidene Fluoride (PVF₂) Resin-base finish (Kynar 500) for coil coating components containing seventy (70) percent minimum PVF₂ 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.
 11. Color: Brown (no other color available).
 12. 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 (877) 904-1002.
 - b. Ultimate Pipe Flashing and Easy Sleeve by Lifetime Tool & Building Products LLC, Winchester, VA 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 (12.7 mm) to 4 inch (101 mm).
 - 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 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 07 3000 heading: Surface-mounted Installation.
 - 2. 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.
 - b. Equal as acceptable to Roofing System Manufacturer and approved by Architect before installation. See Section 01 6200.

PART 3 - EXECUTION: Not Used

END OF SECTION

BLANK PAGE

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.

1.2 REFERENCES

- A. Definitions:
 - 1. 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.

2. 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) (minus 73.3 deg C to + 316 deg C).

B. Reference Standards:

1. ASTM International:
 - a. ASTM C920-14a, 'Standard Specification for Elastomeric Joint Sealants'.
 - b. ASTM C1193-16, 'Standard Guide for Use of Joint Sealants'.
 - c. ASTM C1330-18, 'Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants'.
 - d. ASTM C1481-12(2017) 'Standard Guide for Use of Joint Sealants with Exterior Insulation & Finish Systems (EIFS)'.
 - e. ASTM D5893/D5893M-16, 'Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements'.

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.
 - b. Manufacturer's installation for completing sealant intersections when different materials are joined.
 - c. 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 (4 deg C) or subjected to sustained temperatures exceeding 90 deg F (32 deg C) or as per Manufacturer's written recommendations.
 4. Do not 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.
 - b. Franklin International, Inc. Columbus, OH www.titebond.com.
 - c. GE Sealants & Adhesives (see Momentive Performance Materials Inc.).
 - d. Laticrete International Inc., Bethany, CT www.laticrete.com.
 - e. Momentive Performance Materials Inc. (formally GE Sealants & Adhesives), Huntersville, NC www.ge.com/silicones.

- f. Sherwin-Williams, Cleveland, OH www.sherwin-williams.com.
 - g. Sika Corporation, Lyndhurst, NJ www.sikaconstruction.com or Sika Canada Inc, Pointe Claire, QC www.sika.ca.
 - h. Tremco, Beachwood, OH 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 D5893/D5893M: Silicone Joint Sealant for Concrete Pavements.
 - 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 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) Columns.
 - c) Connections.
 - d) Curtainwalls.
 - e) Door frames.
 - f) EIFS to metal joints.
 - g) Joints and cracks around windows.
 - h) Louvers.
 - i) Masonry.
 - j) Parapet caps.
 - k) Wall penetrations.
 - l) 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. 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.

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 (4 deg C).
 - 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 (9.5 mm) 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 (6 mm) minimum and 1/2 inch (12.7 mm) 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 (5 mm) 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 (300 meters) of applied silicone sealant and one (1) test for each 1,000 linear feet (300 meters) 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

DIVISION 09: FINISHES

09 9000 PAINTS AND COATINGS

- 09 9001 COMMON PAINTING AND COATING REQUIREMENTS
- 09 9111 EXTERIOR PAINTED ALUMINUM
- 09 9112 EXTERIOR PAINTED FERROUS METAL
- 09 9113 EXTERIOR PAINTED GALVANIZED METAL
- 09 9114 EXTERIOR PAINTED MASONRY, CONCRETE, STUCCO
- 09 9115 EXTERIOR PAINTED WOOD

END OF TABLE OF CONTENTS

BLANK PAGE

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.

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 (1.50 m) 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 (100 mm by 150 mm) 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.

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.

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 (13 deg C)** 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.
- 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. 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 and gas piping on roof.
 - b. Mechanical flues and pipes penetrating roof.
 - c. Metal protective structures for refrigerant lines.
- C. Apply sealant in gaps **3/16 inch (5 mm)** 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. 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.
- E. 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.
- F. Touch up suction spots after application of first finish coat.
- G. Paint shall be thoroughly dry and surfaces clean before applying succeeding coats.
- H. Use fine sandpaper between coats as necessary to produce even, smooth surfaces.

- I. Make edges of paint adjoining other materials or colors clean, sharp, and without overlapping.
- J. 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

SECTION 09 9111**EXTERIOR PAINTED ALUMINUM****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing and painting new exterior unfinished aluminum surfaces as described in Contract
 - 2. Preparing and painting following existing exterior painted aluminum surfaces as described in Contract Documents:
- B. Related Requirements:
 - 1. Section 09 9001: 'Common Painting And Coating Requirements':
 - a. Pre-installation conference for Sections under 09 9000 heading 'Paints and Coatings'.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 09 9001.

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. See Section 01 6200 for definitions of Categories.
- B. Description:
 - 1. New Surfaces: Use MPI(a) EXT 5.4H Latex Finish system.
 - 2. Previously Finished Surfaces: Use MPI(r) REX 5.4G 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 finish requirements.
 - d. Gloss / Sheen Level Required: Gloss Level 6 or 7.
- D. Materials:
 - 1. Primer Coat: MPI Product 95: 'Primer, Quick Dry, for Aluminum'.
 - 2. Finish Coats: MPI Product 119: 'Latex, Exterior, Gloss (MPI Gloss Level 6)'.

PART 3 - EXECUTION

- A. General: See appropriate paragraphs of Section 09 9001.

END OF SECTION

SECTION 09 9112**EXTERIOR PAINTED FERROUS METAL****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing and painting new exterior ungalvanized iron and steel surfaces as described in Contract Documents.
 - 2. Preparing and painting following existing exterior ungalvanized iron and steel surfaces as described in Contract Documents:
- B. Related Requirements:
 - 1. Section 09 9001: 'Common Painting And Coating Requirements':
 - a. Pre-installation conference for Sections under 09 9000 heading 'Paints and Coatings'.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 09 9001.

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.
- B. Description:
 - 1. New Surfaces: Use MPI(a) EXT 5.1M Waterborne Light Industrial Coating system .
 - 2. Previously Finished Surfaces: Use MPI(r) REX 5.1K Waterborne Light Industrial Coating.
- C. Design Criteria:
 - 1. Systems specified are in addition to prime coats provided under other Sections of Project Manual.
 - 2. Finish Requirements: Use MPI Premium Grade finish requirements for work of this Section.
 - 3. Gloss / Sheen Level Required: Gloss Level 5.
- D. Materials:
 - 1. All paints and coatings.
 - a. Primer Coat: MPI Product 107, 'Primer, Rust-Inhibitive, Water Based'.
 - b. Finish Coats: MPI Product 163, 'Light Industrial Coating, Exterior, Water Based, Semi-Gloss (MPI Gloss Level 5).

PART 3 - EXECUTION**3.1 APPLICATION**

- A. General: See appropriate paragraphs of Section 09 9001.
- B. New Surfaces: Clean metal to be painted of rust, mill scale, grease, oil, and welding spatters, burrs, flux, slag, and fume. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying primer coat.
- C. Existing Painted Surfaces:
 - 1. Remove deteriorated and chalked existing paint and rust down to sound substrate by scraping or power tools.
 - 2. Clean existing sound painted surfaces as well as scraped and sanded existing painted surfaces as recommended by Paint Manufacturer. If all traces of rust cannot be removed, apply rust blocker recommended by Paint Manufacturer before applying primer coat.
 - 3. Spot prime bare metal surfaces followed by a prime coat over entire surface to be painted.
 - 4. Lightly sand entire surface.
 - 5. Clean surface as recommended by Paint Manufacturer.
 - 6. Apply specified finish coats.

END OF SECTION

SECTION 09 9113**EXTERIOR PAINTED GALVANIZED METAL****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing and painting new exterior exposed galvanized metal surfaces as Described in Contract Documents.
 - 2. Preparing and painting following existing exterior exposed galvanized metal surfaces as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 09 9001: 'Common Painting And Coating Requirements':
 - a. Pre-installation conference for Sections under 09 9000 heading 'Paints and Coatings'.

1.2 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 09 9001.

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. All Other:
 - a. New Surfaces: Use MPI(a) EXT 5.3H Latex Finish system.
 - b. Previously Finished Surfaces: Use MPI(r) REX 5.3H 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 finish requirements.
 - d. Gloss / Sheen Level Required: Gloss Level 5.
- D. Materials:
 - 1. Polyurethane:
 - a. Vinyl Wash Primer Coat: MPI Product 80: 'Primer, Vinyl Wash'.
 - b. Finish Coats:
 - 1) Epoxy MPI Product 101: 'Primer, Epoxy, Anti-Corrosive, for Metal'.
 - 2) Polyurethane MPI Product 72: 'Polyurethane, Two-Component, Pigmented, Gloss (MPI Gloss Level 6-7)'.
 - 2. Latex:
 - a. Waterborne Primer Coat: MPI Product 134: 'Primer, Galvanized, Water Based'.

- b. Finish Coats: MPI Product 11: 'Latex, Exterior 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. Clean 'passivated' or 'stabilized' galvanized steel as specified in SSPC-SP1.
 - 2. After removal of 'passivated' or 'stabilized' coating or for surfaces without coating, clean surfaces to be painted with mineral spirits or product recommended by Paint Manufacturer. Change to clean rags or wiping cloths regularly to reduce possibility of re-contamination of surface.
 - 3. Apply prime coat.
 - 4. Apply finish coats.
- C. Existing Painted Surfaces:
 - 1. Remove deteriorated and chalked existing paint and rust deposits down to sound substrate by sanding, scraping, or wire brushing.
 - 2. Clean existing sound painted surfaces as well as scraped and sanded existing painted surfaces as recommended by Paint Manufacturer.
 - 3. Apply prime coat.
 - 4. Apply finish coats.
- D. Existing Unpainted Surfaces:
 - 1. Wirebrush or power wash as necessary to remove 'white rust'.
 - 2. Apply prime coat.
 - 3. Apply finish coats.

END OF SECTION

SECTION 09 9114**EXTERIOR PAINTED MASONRY, CONCRETE, STUCCO****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing and painting new exterior masonry, concrete, and stucco surfaces as described in Contract Documents.
- B. Related Requirements:
 - 1. 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 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 09 9001.

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. Concrete:
 - a. New Surfaces: Use MPI(a) EXT 3.1A Latex Finish system.
 - b. Previously Finished Surfaces: Use MPI(r) REX 3.1A Latex Finish system.
 - 2. Stucco:
 - a. New Surfaces: Use MPI(a) EXT 3.1A Latex Finish system.
 - b. Previously Finished Surfaces: Use MPI(r) REX 3.1A Latex Finish system.
 - 3. CMU:
 - a. New Surfaces: Use MPI(a) EXT 4.2A Latex Finish system.
 - b. Previously Finished Surfaces: Use MPI(r) REX 4.2A Latex Finish system.
- C. Performance:
 - 1. Finish 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 1.
- D. Materials:
 - 1. Block Filler, New CMU Only: MPI Product 4: 'Block Filler, Latex, Interior/Exterior'.
 - 2. Finish Coats: MPI Product 10: 'Latex, Exterior Flat (MPI Gloss Level 1-2)'.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Except for steam cured products, cure cement type surfaces from 60 to 90 days in accordance with Paint Manufacturer's recommendations before painting.

3.2 APPLICATION

- A. General: See appropriate paragraphs of Section 09 9001.
- B. New Surfaces:
 - 1. On highly porous surfaces when weather is exceptionally hot and dry, it may be desirable to dampen surface before applying first coat of an emulsion paint.
 - 2. Completely cover voids in masonry block.
 - 3. Roll after spraying if necessary to eliminate pinholing.
- C. Existing Painted Surfaces:
 - 1. Remove deteriorated and chalked existing paint down to sound substrate by scraping and or high-pressure spray. Feather edges of existing paint by sanding to be smooth with adjacent surfaces.
 - 2. Clean existing sound painted surfaces as well as scraped and sanded existing painted surfaces as recommended by Paint Manufacturer.
 - 3. Fill cracks with masonry crack filler.
 - 4. Prime scraped and sanded areas.
 - 5. Apply finish coat as required for new work.
- D. Existing Unpainted Surfaces:
 - 1. Power wash surfaces to be painted.
 - 2. Fill cracks with masonry crack filler.
 - 3. Apply block filler and finish coat as required for new work.

END OF SECTION

SECTION 09 9115**EXTERIOR PAINTED WOOD****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Preparing and painting new exterior wood surfaces as described in Contract Documents.
- B. Related Requirements:
 - 1. 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 ADMINISTRATIVE REQUIREMENTS

- A. Pre-Installation Conferences:
 - 1. Participate in pre-installation conference as specified in Section 09 9001.

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. New Surfaces: Use MPI(a) EXT 6.3A or 6.3L Latex Finish systems.
 - 2. Previously Finished Surfaces: Use MPI(r) REX 6.3A or 6.3L 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 finish requirements.
 - d. Gloss / Sheen Level Required: Gloss Level 5.
- D. Materials:
 - 1. Primers:
 - a. Alkyd Primer: MPI Product 5: 'Primer, Alkyd/Oil for Exterior Wood'.
 - b. Latex Primer: MPI Product 6: 'Primer, Latex for Exterior Wood'.
 - 2. Finish Coats: MPI Product 11: 'Latex, Exterior Semi-Gloss (MPI Gloss Level 5)'.

EXECUTION**2.2 APPLICATION**

- A. General: See appropriate paragraphs of Section 09 9001.
- B. New Surfaces: Prime and finish coat exterior woodwork within two weeks of installation, or prime exterior woodwork before installation if application of complete paint system cannot be accomplished within two weeks of installation of woodwork.
- C. Existing Painted Surfaces:
 - 1. Remove deteriorated and chalked 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 wood areas.
 - 2. Remove loose and split existing caulking and putty. Spot prime these areas and replace caulking and putty.
 - 3. Clean existing sound painted surfaces as well as scraped and sanded existing painted surfaces as recommended by Paint Manufacturer.
 - 4. Prime scraped and sanded areas.
 - 5. Apply specified finish coats.

END OF SECTION

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 1000 PLUMBING PIPES AND PUMPS

- 22 1400 FACILITY STORM DRAINAGE

END OF TABLE OF CONTENTS

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. Furnish and install sealants relating to installation of systems installed under this Division.
 - 3. 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 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. Section 07 9213: 'Elastomeric Joint Sealant' for quality at building exterior.
 - 4. Sections Under 09 9000 Heading: 'Paints And Coatings' for painting of plumbing items requiring field painting.
 - 5. Division 33: 'Utilities' for piped utilities.
 - 6. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.

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. 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.

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.
 - b. Cooper B-Line, Highland, IL www.b-line.com.
 - c. Unistrut, Wayne, MI 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		
3/8 inch	2 inches and smaller		
- 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
2	3/8 Inch	Two	0	0	0	0	0	0
2	1/2 Inch	Three	Three	Two	0	0	0	0

 - 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.

END OF SECTION

BLANK PAGE

SECTION 22 1400**FACILITY STORM DRAINAGE****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install modifications to roof drainage system as described in Contract Documents.
- B. Related Requirements:
 - 1. Sections under 07 5000 heading: Membrane Roofing.
 - 2. Section 22 0501: 'Common Plumbing Requirements'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. ASTM International:
 - a. ASTM D2564-12, 'Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Piping Systems'.
 - b. ASTM D3034-14, 'Standard Specification for Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings'.
 - c. ASTM F656-10, 'Standard Specification for Primers for Use in Solvent Cement Joints of Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings'.
 - d. ASTM F891-10, 'Standard Specification for Coextruded Poly (Vinyl Chloride) (PVC) Plastic Pipe with a Cellular Core'.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Jay R. Smith Manufacturing Co, Montgomery, AL www.jrsmith.com.
 - b. Josam, Michigan City, IN www.josam.com.
 - c. Mifab Manufacturing Inc, Chicago, IL www.mifab.com.
 - d. Sioux Chief Mfg. Co. Inc. Peculiar, MO www.siouxchief.com.
 - e. Wade Div Tyler Pipe, Tyler, TX www.wadedrains.com.
 - f. Watts Drainage, Spindale, NC www.watts.com or Watts Industries, Burlington, ON, Canada www.wattscda.com.
 - g. Zurn Cast Metals, Erie, PA or Zurn Industries Limited, Mississauga, ON www.zurn.com.
- 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.
 - 2. Roof Drains:
 - a. Roof Drains **RD-1**:
 - 1) Size: As scheduled on Drawings.
 - 2) Duco cast-iron body, with adjustable extension, reversible collar flashing clamp, gravel stop, underdeck clamp, sump receiver, and cast iron dome.
 - 3) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) J R Smith: 1015.

- b) Josam: 21500-AE-3-22-66.
 - c) Mifab: R-1200-EU-M-B-U-90.
 - d) Watts: RD-300-F.
 - e) Zurn: Z 100 EA.
- b. Overflow Roof Drains **OD-1**:
- 1) Size: As shown on Drawings.
 - 2) Side outlet type.
 - 3) Duco cast-iron body, with 2 inch water dam collar, gravel stop, underdeck clamp, sump receiver, and cast iron dome.
 - 4) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) J R Smith: 1080 with 2" water damn.
 - b) Josam: 21500-AE-3-17-Z.
 - c) Mifab: R-1200-EU-M-B-U-R.
 - d) Watts: RD-100-SO-B-D-K-R.
 - e) Zurn: Z 100 EA-89-90.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Grade roof drain piping 1/8 inch in one foot minimum in direction of flow.
- B. Seal joints at roof drains.
- C. Thermoplastic Pipe And Fittings:
 - 1. General:
 - a. Piping and joints shall be clean and installed according to Manufacturer's recommendations.
 - b. Break down contaminated joints, clean seats and gaskets and reinstall.
 - 2. Above Grade:
 - a. Locate pipe hangers every 4 feet on center maximum and at elbows.

3.2 FIELD QUALITY CONTROL

- A. Field Tests:
 - 1. Subject roof drain piping system, in sections or in entirety, to water pressure of 5 psig and prove tight for period of two hours.
 - 2. Verify all roof drain lines and over flow drain lines are clear of any blockage and are not plugged by debris. Run tests in presence of Architect.

END OF SECTION

DIVISION 23: HEATING, VENTILATING, AND AIR-CONDITIONING

23 0500 COMMON WORK RESULTS FOR HVAC

- 23 0501 COMMON HVAC REQUIREMENTS
- 23 0529 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
- 23 0553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
- 23 0713 DUCT INSULATION
- 23 0719 HVAC PIPING 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 3000 HVAC AIR DISTRIBUTION

- 23 3001 COMMON DUCT REQUIREMENTS
- 23 3114 LOW-PRESSURE METAL DUCTS
- 23 3300 AIR DUCT ACCESSORIES
- 23 3401 HVAC FANS
- 23 3723 HVAC GRAVITY VENTILATORS

23 4000 HVAC AIR CLEANING DEVICES

- 23 4100 AIR FILTERS

23 6000 CENTRAL COOLING EQUIPMENT

- 23 6215 COMPRESSOR UNITS: AIR CONDITIONING (6 TON OR MORE)

23 7000 CENTRAL HVAC EQUIPMENT

- 23 7413 PACKAGED, OUTDOOR, CENTRAL-STATION UNITS

END OF TABLE OF CONTENTS

BLANK PAGE

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 07 9213: Quality of sealants used at building exterior.
 - 2. Section 07 9219: Quality of acoustical sealants.
 - 3. Sections Under 09 9000 Heading: Painting of mechanical items requiring field painting.
 - 4. Section 26 2913: Magnetic starters and thermal protective devices (heaters) not factory mounted integral part of mechanical equipment.
 - 5. Division 26: Raceway and conduit, unless specified otherwise, line voltage wiring, outlets, and disconnect switches.
 - 6. Slots and openings through floors, walls, ceilings, and roofs provided under other Divisions in their respective materials.

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 LCBS controls 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.
 - d. Equipment Start-Ups:
 - 1) Include copies of equipment start-up checklists required in individual Sections of Division 23.

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 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 suits 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 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.

C. Unforeseen Conditions:

1. Relocate/or remove and reinstall ducts, piping, grilles, dampers, louvers, fixtures or any other mechanical equipment or devices which are encountered during demolition which conflict with the new construction or which are to accommodate the new construction. Any equipment, piping, grilles, dampers, louvers or fixtures to remain shall be reinstalled at the completion of this work.

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: Four hours.
 - 2) Temperature Control: Four hours. (refer to Section 23 0933 for Training Requirements)
 - 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.

3.11 SEISMIC RESTRAINT

- A. Restrain all equipment, piping, and ductwork in compliance with the Authority Having Jurisdiction and the Building Code.

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. 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.

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. Class Two Quality Standard Approved Manufacturers. See Section 01 6200:
 - a. Anvil International, Portsmouth, NH www.anvilintl.com.
 - b. Cooper B-Line, Highland, IL www.cooperbline.com.
 - c. Erico International, Solon, OH www.erico.com.
 - d. Hilti Inc, Tulsa, OK www.hilti.com.
 - e. Minerallac, Hampshire, IL www.minerallac.com.
 - f. Thomas & Betts, Memphis, TN www.superstrut.com.
 - g. Unistrut, Wayne, MI 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

- b. Support rods for multiple pipes supported on steel 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

- 1) Size trapeze angles so bending stress is less than 10,000 psi.

C. Materials:

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 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.
 - e. Equipment Support Channel:
 - 1) Class One Quality Standard: Unistrut P1000.
 - 2) Acceptable Manufacturers: Hilti, Thomas & Betts.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.
 - f. Swivel Attachment:
 - 1) Class One Quality Standard: Unistrut EM3127.
 - 2) Acceptable Manufacturers: Hilti, Thomas & Betts.
 - 3) Equal as approved by Architect before installation. See Section 01 6200.

EXECUTION**2.2 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 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) 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.

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 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. 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. Unitary Controllers.
 - b. New RTU.
 - c. New Condensing Units.
 - d. Existing zone heating valves (provide chain to hang from valve).
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. Armacell LLC
 - 2. Certainteed St Gobain, Valley Forge, PA www.certainteed.com.
 - 3. Johns-Manville, Denver, CO www.jm.com.
 - 4. K-Flex USA
 - 5. Knauf Fiber Glass, Shelbyville, IN www.knauffiberglass.com or Toronto, ON (416) 593-4322.
 - 6. Manson Insulation Inc, Brossard, QB www.isolationmanson.com.
 - 7. Owens-Corning, Toledo, OH or Owens-Corning Canada Inc, Willowdale, ON www.owenscorning.com.

2.2 MATERIALS

- A. Thermal Wrap Duct Insulation:
 - 1. 1-1/2 inch (38 mm) or 3 inch (76 mm) thick fiberglass with factory-laminated, reinforced aluminum foil scrim kraft facing and density of 0.75 lb / per cu ft (12 kg / per cu m).
 - 2. Thermal Conductivity: 0.27 BTU in/HR SF deg F at 75 deg F (24 deg C) maximum.
 - 3. 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.
- B. Exterior Thermal Duct Insulation:
 - 1. Description:
 - a. Extruded polystyrene foam insulation.
 - 2. Design Criteria:
 - a. Meet requirements of ASTM C578, Type IV.
 - b. Duct Insulation:
 - 1) Butt type, R-5.0, 50 mm inch thick by 600 mm 24 inches by standard length.
 - 3. Acceptable Products:
 - a. Foamular 250 by Owens Corning.
 - b. GreenGuard 25 PSI by Pactiv Building Products.
 - c. Styrofoam Square Edge by Dow Chemical.

- d. Equal as approved by Architect before bidding. See Section 01 6200.
- C. Adhesive For Exterior Duct Insulation:
- 1. Acceptable Products:
 - a. Pro Series QB-300 by OSI Sealants.
 - b. Equal as approved by Architect before use. See Section 01 6200.
- D. Self-Adhesive Outdoor Jacket:
- 1. Laminated vapor barrier and waterproofing membrane.
 - a. Rubberized bituminous resin on a crosslaminated polyethylene film covered with aluminum foil facing. Self-healing.
 - b. Thickness: Minimum 45 mil thick.
 - c. Spray adhesive: as recommended by Manufacturer.
 - d. Color: reflective or as directed by Owner.
 - 2. Acceptable Products:
 - a. MFM Building Products; FlexClad 400.
 - b. Polyguard Products; Alumaguard All-Weather.

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 (38 mm) thick on rectangular outside air ducts and combustion air ducts.
 - 2) 1-1/2 inches (38 mm) thick on all round ducts.
 - b. Outside Building Insulation Envelope:
 - 1) 3 inch (76 mm) thick on round supply and return air ducts.
 - 2) 1-1/2 inch (38 mm) 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 (50 mm).
 - a. Do not compress insulation except in areas of structural interference. Minimum thickness at corners shall be one inch (25 mm) thick.
 - b. Remove insulation from lap before stapling.
 - c. Staple seams at approximately 16 inches (400 mm) 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. Exterior Thermal Duct Insulation:
- 1. Install one inch thick extruded polystyrene board insulation to all sides of exterior duct systems. Provide slope at top side of duct for water drainage.
 - 2. Install insulation with tight longitudinal seams and end joints.
 - 3. Install insulation continuously through building penetrations.
 - 4. Seal longitudinal seams and end joints with manufacturers recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Exterior Duct Field Applied Jacket Installation:
- 1. Install per manufacturer's recommendations.
 - 2. Install with 6-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water.
 - 3. Seal jacket to wall flashing with flashing sealant.

END OF SECTION

SECTION 23 0719**HVAC PIPING INSULATION****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
1. Furnish and install insulation on above ground refrigerant piping and fittings as described in Contract Documents.
- B. Related Requirements:
1. Section 23 0501: 'General HVAC Requirements'.
 2. Section 23 2300: 'Refrigerant Piping'.

1.2 DELIVERY, STORAGE, AND HANDLING

- A. Storage And Handling Requirements:
1. Keep materials and work dry and free from damage.
 2. Replace wet or damaged materials at no additional cost to Owner.

PART 2 - PRODUCTS**2.1 ASSEMBLIES**

- A. Manufacturers:
1. Manufacturer Contact List:
 - a. Armacell, Mebane, NC www.armacell.com.
 - b. Nitron Industries, Thousand Oaks, CA www.nitronindustries.com.
 - c. Nomac, Zebulon, NC www.nomaco.com.
- B. Materials:
1. Refrigeration Piping System:
 - a. Thickness:

Pipe Size, Outside Diameter	Insulation Thickness
One inch and smaller	1/2 Inch
1-1/8 to 2 inch	3/4 Inch

- 1) One inch sheet for fittings as recommended by Manufacturer.
- 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) AP Armaflex 25/50 by Armacell.
 - b) Nitrolite by Nitron Industries. White only for exterior.
 - c) Nomaco K-Flex.
- b. Joint Sealer:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Armacell 520 by Armacell.
 - b) Namaco K-Flex R-373.
- c. Insulation Tape:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Armaflex AP Insul Tape by Armacell.
 - b) FT182 Tape by Nitron Industries.

- c) Elastomeric Foamtape by Nomac K-Flex.
- d. Exterior Finish:
 - 1) For application to non-white, exterior insulation.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) WB Armaflex Finish by Armacell.
 - b) R-374 Protective Coating by Nomaco K-Flex.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before application of insulating materials, brush clean surfaces to be insulated and make free from rust, scale, grease, dirt, moisture, and any other deleterious materials.
- B. Use drop cloths over equipment and structure to prevent adhesives and other materials spotting the work.

3.2 INSTALLATION

- A. Refrigeration System Piping System:
 - 1. General:
 - a. Install insulation in snug contact with pipe.
 - 1) Insulate flexible pipe connectors.
 - 2) Insulate liquid line upstream of thermal expansion valves with insulating tape.
 - 3) Insulate fittings with sheet insulation and as recommended by Manufacturer.
 - b. Slip insulation on tubing before tubing sections and fittings are assembled keeping slitting of insulation to a minimum.
 - c. Do not install insulation on lines through clamp assembly of pipe support. Butt insulation up against sides of clamp assembly.
 - d. Stagger joints on layered insulation. Seal joints in insulation.
 - e. Install insulation exposed outside building so 'slit' joint seams are placed on bottom of pipe.
 - f. Paint exterior exposed, non-white insulation with two coats of specified exterior finish.
 - 2. System Requirements:
 - a. Condensing Units: Install insulation on above ground refrigerant suction piping and fittings, including thermal bulb and liquid line upstream of thermal expansion valve.

3.3 FIELD QUALITY CONTROL

- A. Non-Conforming Work:
 - 1. Method of installing insulation shall be subject to approval of Architect. Sloppy or unworkmanlike installations are not acceptable.

3.4 CLEANING

- A. Leave premises thoroughly clean and free from insulating debris.

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.
 - b. Record Documentation:
 - 1) 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) Receive LCBS Connect product training from Approved Distributor.
 - 2) 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. Honeywell Inc, Minneapolis, MN www.honeywell.com.
 - b. Insul_Guard, Salt Lake City, UT:
 - 1) Primary Contact: Dan Craner, (801) 518-3733, insul_guard@comcast.net.
 - c. System Sensor, St Charles, IL www.systemsensor.com.
 - d. Zimmerman Technologies, Renton, WA:
 - 1) Primary Contact: Tracy Zimmerman, (425) 255-1906, zimmtech@yahoo.com.

B. Distributors: Obtain LCBS Connect control devices, RP panels, sensors, actuators and other control equipment from following Sponsoring Approved Distributors. See Section 01 4301:

1. Utah:
 - a. Control Equipment Co: (800) 452-1457.
 - b. Building Controls and Solutions LLC: (801) 214-3316; Dan.Craner@building-controls.com; Dan Craner.

C. Performance:

1. Design Criteria:
 - a. Honeywell LCBS Connect control system with cloud based gateway:
 - 1) General Requirements:
 - a) Controls multistage equipment, dehumidification and ventilation with 2 wire connection to controller interface location in occupied space.
 - b) Adjustable backlight to controller interface module from 15%-100%en after 30 seconds of setting adjustments.
 - c) System controllers can be programmed from the interface module or from the cloud service.
 - d) LCBS Connect controller utilizes echelon communication network with the controller located near the mechanical equipment and the system interface located in the occupied space.
 - e) System shall control outdoor ventilation air based upon system occupancy of electric / electronic actuation of dampers.
 - f) CO2 (Carbon Dioxide) sensors will open ventilation dampers only when CO2 exceeds 1000 ppm.
 - g) LCBS Connect devices access via internet Chrome browser via gateway.
 - h) Wired room temperature sensors may be added as specified.
 - 2) System Requirements:
 - a) Up to 3 Heat/2 Cool Heat Pumps; Up to 3 Heat/2 Cool Conventional Systems.
 - b) Tri-Lingual display (Selectable for English, Spanish, or French).
 - c) 18 to 30 Vac.
 - d) 50 Hz; 60 Hz.
 - e) System switch to include Auto changeover for Heat-Cool.
 - f) 7-Day Programming.
 - g) 365-Day Event Scheduling.
 - h) Display Security Lockout options.
 - i) Minimum/ Maximum Temperature Range Stops.
 - j) Configurable over-ride option.
 - k) Remote Access via internet.
 - l) Dehumidification setting range 40 to 80% RH.

D. Components:

1. Controller, Wall Module:
 - a. Controller and Display Kit:
 - 1) Approved Product:
 - a) Part Number Honeywell YCRL6438SR1000 consisting of following:
 - (1) Unitary Controller: Honeywell CRL6438SR1000

- (2) Wall Module: Honeywell TS120
 - b) Wall Cover Plate: Honeywell. 50002883-001.
 - c) Discharge Air / Return Air Sensors: Honeywell C7041B2005 20k ohms.
 - d) Outdoor Air Sensor: Honeywell C7041F2006.
 - e) Indoor Air Sensor: Sylk bus network; Honeywell TR40
 - f) Averaging sensor: Sylk bus network; Honeywell TR40
 - b. Internet Gateway Module(s): One (1) module per thirty (30) controllers.
 - 1) Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - a) LCBS Connect Gateway Module: Honeywell LGW1000.
 2. Sealant Compound:
 - a. Description:
 - 1) Non hardening waterproof, vapor proof, self-adhesive for hot or cold application for sealing conduit openings against drafts, dust moisture and noise.
 - b. Category Four Approved Product. See Section 01 6200 for definitions of Categories:
 - 1) Duct Seal Compound No. DS-130 by Gardner Bender, Menomonee Falls , WI.
www.gardnerbender.com.
 - 2) Thumb-Tite Sealing Compound No. 4216-92 by Nu-Calgon, St. Louis, MO
www.nucalgon.com.
 3. Transformer:
 - a. 120 / 24 V, 50VA Honeywell AT150F.
 - b. 120 / 24 V, 75VA Honeywell AT175F.
 4. 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.
 5. 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. Echelon Network Ebus Communicating Cable:
 - 1) Class Two Quality Standard. See Section 01 6200:
 - a) CAT 4, 22 gauge (0.025 in), twisted pair, non-plenum and non-shielded cable.
- E. Operation Sequences:
1. Programmable controller shall control Unoccupied and Occupied status of fan system based on adjustable seven-day program. 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. Controller provides optional override by allowing timed override of program by pushing override on controller touch screen. This shall activate controller to Occupied Mode and system shall control to Occupied set point.
 4. Minimum outdoor ventilation air damper, spring return type, shall open in controller Occupied Mode and remain closed in Unoccupied Mode.
 5. Sensor Averaging:
 - a. Controller shall control zone HVAC equipment by averaging temperature in spaces containing wall module and averaging sensors.

PART 3 - EXECUTION

3.1 INSTALLERS

- A. Acceptable Installers. See Section 01 4301:
1. Meet Quality Assurance Qualifications as specified in Part 1 of this specification.

3.2 INSTALLATION

- A. Interface With Other Work:
1. Calibrate room controllers 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. Echelon Communication: Ebus
1. Ebus cable needs to be installed at least 12 inches from lighting, motors, or low voltage switching cables.
- C. Safety Controls:
1. Interlock main return air duct smoke detectors to keep heating, cooling, and system fan from operating when detector is energized.
 2. Fresh air dampers shall close on fan shut-down, power failure, open fan motor disconnect switch, and when thermostat is in Unoccupied Mode.
 3. Gas burner safety controls furnished with furnace units shall be incorporated in control circuits for all modes of operation.
- 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 LCBS Controller.
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 available ports on network switch for LCBS gateway.
 2. Contractor is responsible configuring all controllers 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.
 3. Set Heating / Cooling to proper stages
 4. Set heat cycle rates to 9 cph and cooling to 4 cph.
 5. Set DO1 relay to "Occupancy".
 6. Set System switch operation to "Automatic" changeover.

- 2) First Sunday in April: Unoccupied all other zones for all day / every year.
 - 3) First Sunday in October: Occupied Chapel from 10:30 am – 5:00 pm / every year.
 - 4) First Sunday in October: Unoccupied all other zones for all day / every year.
- c. Mountain Time Zone:
- 1) First Sunday in April: Unoccupied all zones for all day / every year.
 - 2) First Sunday in April: Unoccupied all zones for all day / every year.
 - 3) First Sunday in October: Unoccupied all zones for all day / every year.
 - 4) First Sunday in October: Unoccupied all zones for all day / every year.
- d. Pacific Time Zone
- 1) First Sunday in April: Occupied Chapel from 8:30 am – 3:00 pm / every year.
 - 2) First Sunday in April: Unoccupied all other zones for all day / every year.
 - 3) First Sunday in October: Occupied Chapel from 8:30 am – 3:00 pm / every year.
 - 4) First Sunday in October: Unoccupied all other zones for all day / every year.

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 LCBS Connect sight & smart Apps for up to six (6) 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 controllers and Internet browser and how network works. Scheduling building at minimum for Stake and General Conference, special events.
 - 2) Controller Programming from Keypad: Instructions on developing setpoints and schedules and adjusting local zone temperatures.
 - 3) Web Internet training with local Facilities Manager during two (2) sessions.
 - a) Review all features accessible from the 'Settings' tab including Alarm points, user access, scheduling and humidity setpoints (where applied).

END OF SECTION

ATTACHMENTS

<p>CERTIFICATE OF SPONSORSHIP Electric and Electronic Control System for HVAC Installer</p>
--

<p>PROJECT INFORMATION (To be filled out by Installer - available from project specification):</p>

Project Name: _____

Project Number: _____

Project Address: _____

<p>INSTALLER INFORMATION (To be filled out by Installer):</p>
--

Installer Name: _____

Installer Firm: _____

Installer Address: _____

I acknowledge and confirm the above listed Installer has received training and exhibit LCBSConnect 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: _____

SECTION 23 1123**FACILITY NATURAL-GAS PIPING****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install gas piping and fittings within building as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 0501: 'Common HVAC Requirements'.
 - 2. Section 23 0553: 'Identification for HVAC Piping and Equipment'.

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'.
 - 2. International Code Council (ICC):
 - a. ICC IFGC-2015: 'International Fuel Gas Code'.

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Conform to requirements of IFGC International Fuel Gas Code.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. BrassCraft, Novi, MI www.brasscraft.com.
 - b. Cimberio Valve Co Inc, Malvern, PA www.cimberio.com.
 - c. ConBraCo Industries, Inc, Matthews, NC www.conbraco.com or ConBraCo / Honeywell Ltd, Scarborough, ON (416) 293-8111.
 - d. Dormont Manufacturing Company, Export, PA www.dormont.com.
 - e. Jenkins-NH-Canada, Brantford, ON www.jenkins-nh-canada.com.
 - f. Jomar International, Madison Heights, MI www.jomar.com.
 - g. Viega MegaPressG, Wichita, KS www.viega-na.com.
 - h. Watts Regulator Co, North Andover, MA 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 or all MegaPressG fittings.

2. Valves:
 - a. 125 psi (862 kPa) bronze body ball valve, UL listed.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) CIM 102.1 by Cimbrio 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.
3. 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 (64 mm) and larger shall have welded fittings and joints. Other steel pipe may have screwed, MegaPressG, or welded fittings.
 1. Install MegaPressG fittings according to Manufacturer's recommendations and with Manufacturer's recommended tools.
- B. On lines serving gas-fired equipment, install gas valves adjacent to equipment outside of equipment cabinet and easily accessible.
- C. Install 6 inch (150 mm) long minimum dirt leg, with pipe cap, on vertical gas drop serving each gas-fired equipment unit.
- D. Use fittings for changes of direction in pipe and for branch runouts.
- E. Visible gas piping inside building shall be painted yellow and labeled.

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 (0.52 MPa) and prove airtight for four (4) hours.
 2. Disconnect equipment not suitable for 75 psig (0.52 MPa) pressure from piping system during test period.

END OF SECTION

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. Related Requirements:
 - 1. Section 23 0501: 'Common HVAC Requirements'.
 - 2. Section 23 0719: 'Refrigerant Piping Insulation'.
 - 3. Section 23 6214: 'Compressor Units: Air Conditioning (6 Tons or more)'.

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 15-2016 and 34-2016, '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 B280-18, '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: 'Installation of Air-Conditioning and Ventilating Systems' (2018 or most recent edition adopted by AHJ).
 - 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.
 - 2. Test Reports: Submit to Architect within seven days of testing.

1.4 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Refrigerants:
 - a. Underwriters Laboratories:
 - 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.
 - b. Cush-A-Clamp by ZSI Manufacturing, Canton, MI www.cushaclamp.com.
 - c. Elkhart Products Corp, Elkhart, IN www.elkhartproducts.com.
 - d. Emerson Climate Technologies, St Louis, MO www.emersonflowcontrols.com.
 - e. Handy & Harman Products Division, Fairfield, CT www.handy-1.com.
 - f. Harris Products Group, Cincinnati, OH www.harrisproductsgroup.com.
 - g. Henry Valve Co, Melrose Park, IL www.henrytech.com.
 - h. Hilti Inc, Tulsa, OK www.hilti.com.
 - i. Hydra-Zorb Co, Auburn Hills, MI www.hydra-zorb.com.
 - j. JB Industries, Aurora, IL www.jbind.com.
 - k. Mueller Steam Specialty, St Pauls, NC www.muellersteam.com.
 - l. Nibco Inc, Elkhart, IN www.nibco.com.
 - m. Packless Industries, Waco, TX www.packless.com.
 - n. Parker Corp, Cleveland, OH www.parker.com.
 - o. Sporlan Valve Co, Washington, MO www.sporlan.com.
 - p. Sherwood Valves, Washington, PA www.sherwoodvalve.com.
 - q. Thomas & Betts, Memphis, TN www.superstrut.com.
 - r. Unistrut, Div of Atkore International, Inc., Harvey, IL www.unistrut.com.
 - s. Universal Metal Hose, Chicago, IL www.universalmetalhose.com.
 - t. Vibration Mountings & Controls, Bloomingdale, NJ www.vmc-kdc.com.
 - u. Virginia KMP Corp, Dallas, TX 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.
 - 4) Sporlan - ZoomLock [Flame-Free Refrigerant Fittings]
3. 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.
4. Connection Material:
- a. Sporlan - ZoomLock Flame-Free Refrigerant Fittings with factory approved tools.
 - b. 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.
 - c. 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.
5. Valves:
- a. 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.
6. 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.
7. 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.
8. 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.
9. Liquid Line Solenoid Valve:
 - a. As recommended by equipment manufacturer for long line applications.
10. Refrigerant Piping Supports:
 - a. Base, Angles, And Uprights: Steel meeting requirements of ASTM A36.
 - b. Securing Channels:
 - 1) At Low-Slope Roof Base Support:
 - a) Class One Quality Standard: Dura-Blok DBE or DB-DS by Cooper B-Line.
 - b) Acceptable Manufacturers: Unistrut, Mirror, & Mifab.
 - c) Equal as approved by Architect before installation. See Section 01 6200.
 - 2) 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.
 - 3) 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.
 - 4) 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.
 - 5) 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.
 3. Comply with condensing unit manufacturer's installation instructions.
- 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.
 5. Provide liquid line solenoid valve when required for long line applications.
- 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. Support entire cover utilizing exterior supports as detailed.
 4. Provide opening through exterior cover with removable plug or cover to observe site glass.

3.2 FIELD QUALITY CONTROL

- A. Field Tests:
1. Make evacuation and leak tests after completing refrigeration piping systems. Positive pressure test will not suffice for procedure outlined below. Submit test reports.
 - 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 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).

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 (25 mm) by 18 ga (1.27 mm) galvanized steel straps or steel rods as shown on Drawings, and spaced not more than 96 inches (2 400 mm) apart. Do not use wire hangers.
 - b. Attaching screws at trusses shall be 2 inch (50 mm) 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.
- 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 3001: 'Common Duct Requirements'.

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-18, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
 - b. ASTM E84-18b, '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'; (11th Edition - 2018).

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 (1.7 deg C) or subjected to sustained temperatures exceeding 110 deg F (43 deg C) or 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 (1.7 deg C) or subjected to sustained temperatures exceeding 110 deg F (43 deg C) or 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.
 - 2) DP 1010 by Design Polymerics, Fountain Valley, CA www.designpoly.com.
 - 3) PROseal, FIBERseal, EVERseal, or EZ-seal by Ductmate Industries, Inc., Charleroi, PA www.ductmate.com.
 - 4) SAS by Duro Dyne, Bay Shore, NY or Duro Dyne Canada, Lachine, QB www.durodyne.com.
 - 5) Iron Grip 601 by Hardcast Inc, Wylie, TX www.hardcast.com.
 - 6) MTS100 or MTS 200 by Hercules Mighty Tough, Denver CO, www.herculesindustries.com.
 - 7) 15-325 by Miracle / Kingco, Div ITW TACC, Rockland, MA www.taccint.com.
 - 8) 44-39 by Mon-Eco Industries Inc, East Brunswick, NJ www.mon-ecoindustries.com.
 - 9) Airseal Zero by Polymer Adhesive Sealant Systems Inc, Weatherford, TX www.polymeradhesives.com.
 - 10) Airseal #22 Water Base Duct Sealer by Polymer Adhesive Sealant Systems Inc, Weatherford, TX www.polymeradhesives.com.
3. Duct Sealer For Exterior Ducts:
 - a. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Hardcast DT Tape and RTA-50 liquid adhesive by Hardcast Inc, Wylie, TX www.hardcast.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 (1 200 mm) dimension having acoustic duct liner need not be cross-broken or beaded. Cross-break unlined ducts, duct panels larger than 48 inch

- (1 200 mm) vertical and horizontal sheet metal barriers, duct offsets, and elbows, or bead 12 inches (300 mm) 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.
- 2) Duct with height or width over 36 inches (900 mm) shall be fabricated using SMACNA T-24 flange joints or of pre-fabricated systems as follows:
- a) Ducts with sides over 36 inches (900 mm) up to 48 inches (1 200 mm): Transverse duct joint system by Ductmate / 25, Elgen, Ward, or WDCI (SMACNA Class 'F' joint).
 - b) Ducts 48 inch (1 200 mm) And Larger: Ductmate / 35, Elgen, or WDCI (SMACNA Class 'J' transverse joint).
 - c) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - (1) Ductmate Industries Inc, Charleroi, PA www.ductmate.com or Ductmate Canada Ltd, Burlington, ON (905) 332-7678.
 - (2) Ward Industries Inc, Bensonville, IL www.wardind.com.
 - (3) Elgen Manufacturing Company, Inc., East Rutherford, NJ www.elgenmfg.com.
- c. Round Duct:
- 1) Spiral Seam: 28 ga (0.4 mm) minimum for ducts up to and including 14 inches (355 mm) in diameter.
 - 2) Longitudinal Seam:
 - a) 28 ga (0.4 mm) minimum for ducts up to and including 8 inches (200 mm) in diameter.
 - b) 26 ga 0.48 mm minimum for ducts over 8 inches (200 mm) and up to 14 inches (355 mm) 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 (50 by 50 by 6 mm) 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

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-18, 'Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process'.
 - b. ASTM C1071-16, '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.
 - b. Air Balance Inc, Holland, OH www.airbalance.com.
 - c. Air-Rite Manufacturing, Bountiful, UT (801) 295-2529.
 - d. American Warming & Ventilating, Holland, OH www.american-warming.com.
 - e. Arrow United Industries, Wyalusing, PA www.arrowunited.com.
 - f. Cain Manufacturing Company Inc, Pelham, AL www.cainmfg.com.
 - g. C & S Air Products, Fort Worth, TX www.csairproducts.com.
 - h. CertainTeed Corp, Valley Forge, PA www.certainteed.com.
 - i. Cesco Products, Florence, KY www.cescoproducts.com.
 - j. Design Polymerics, Fountain Valley, CA www.designpoly.com.
 - k. Ductmate Industries Inc, East Charleroi, PA www.ductmate.com.
 - l. Duro Dyne, Bay Shore, NY www.durodyne.com.
 - m. Dyn Air Inc. Lachine, QB www.dynair.ca
 - n. Elgen Manufacturing Company, Inc. East Rutherford, NJ www.elgenmfg.com
 - o. Flexmaster USA Inc, Houston, TX www.flexmasterusa.com.
 - p. Greenheck Corp, Schofield, WI www.greenheck.com.
 - q. Gripnail Corp, East Providence, RI www.gripnail.com.
 - r. Hardcast Inc, Wylie, TX www.hardcast.com.
 - s. Hercules Industries, Denver, CO, www.herculesindustries.com.
 - t. Honeywell Inc, Minneapolis, MN www.honeywell.com.
 - u. Johns-Manville, Denver, CO www.jm.com.

- v. Kees Inc, Elkhart Lake, WI www.kees.com.
- w. Knauf Fiber Glass, Shelbyville, IN www.knauffiberglass.com.
- x. Manson Insulation Inc, Brossard, QB www.isolationmanson.com.
- y. Metco Inc, Salt Lake City, UT (801) 467-1572 www.metcospiral.com.
- z. Miracle / Kingco, Rockland, MA www.taccint.com.
- aa. Mon-Eco Industries Inc, East Brunswick, NJ www.mon-ecoindustries.com.
- bb. Nailor Industries Inc, Houston, TX www.nailor.com.
- cc. Owens Corning, Toledo, OH www.owenscorning.com.
- dd. Polymer Adhesive Sealant Systems Inc, Irving, TX www.polymeradhesives.com.
- ee. Pottorff Company, Fort Worth, TX www.pottorff.com.
- ff. Ruskin Manufacturing, Kansas City, MO www.ruskin.com.
- gg. Sheet Metal Connectors Inc, Minneapolis, MN www.smconnectors.com.
- hh. Tamco, Stittsville, ON www.tamco.ca.
- ii. Techno Adhesive, Cincinnati, OH www.technoadhesives.com.
- jj. McGill AirSeal, Columbus, OH www.mcgillairseal.com.
- kk. United Enertech Corp, Chattanooga, TN www.unitedenertech.com.
- ll. Utemp Inc, Salt Lake City, UT (801) 978-9265.
- mm. Ventfabrics Inc, Chicago, IL www.ventfabrics.com.
- nn. Ward Industries, Grand Rapids MI www.wardind.com.
- oo. Young Regulator Co, Cleveland, OH 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 Polymeric: 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: 0890.
 - 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-8.
 - (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.
 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. Elbows, fittings, and diffuser drops greater than 12 inches in length.
 - 2. Do not install acoustic lining in round ducts.
- B. Flexible Connections: Install flexible inlet and outlet duct connections to each fan coil unit.
- C. Access Doors In Ducts:
 - 1. Install between manual and motorized outside air damper at each system. 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 3401**EXHAUST FANS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install exhaust fans as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 3001: 'Common Duct Requirements'.
 - 2. Division 26: Control device and electrical connection.

1.2 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Bear AMCA seal and UL label.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturer Contact List:
 - 1. Acme Engineering & Manufacturing Corp, Muskogee, OK www.acmefan.com.
 - 2. Broan-Nu Tone LLC, Harford, WI www.broan.com.
 - 3. Carnes Co., Verona, MI www.carnes.com.
 - 4. Loren Cook Co., Springfield, MO www.lorencook.com.

2.2 MANUFACTURED UNITS

- A. Ceiling Mounted Exhaust Fans:
 - 1. Acoustically insulated housings. Sound level rating of 5.0 sones maximum for CFM and static pressure listed on Contract Drawings.
 - 2. Include chatterproof integral back-draft damper with no metal-to-metal contact.
 - 3. True centrifugal wheels.
 - 4. Entire fan, motor, and wheel assembly shall be easily removable without disturbing housing.
 - 5. Suitably ground motors and mount on rubber-in shear vibration isolators.
 - 6. Provide roof cap for flat roof installation.
 - 7. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Acme: VQ.
 - b. Broan: LoSone.
 - c. Carnes: VCD.
 - d. Cook: Gemini.

PART 3 - EXECUTION**3.1 INSTALLATION**

- A. Anchor fan units securely to structure.

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.
 - 3. Carnes Company, Verona, WI www.carnes.com.
 - 4. Greenheck Fan Corporation, Schofield, WI www.greenheck.com.
 - 5. Loren Cook Co, Springfield, MO www.lorencook.com.
 - 6. United Enertech Corporation, Chattanooga, TN www.unitedenertech.com.
 - 7. Vent Products Co, Inc, Chicago, IL 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. United Enertech: Model PFL-D-4.
 - f. Vent Products: Model 7100.

- B. Gravity Ventilators:
1. Fabricated from 16 ga marine alloy spun aluminum.
 - a. All welded construction.
 - b. Screws or rivets will not be allowed.
 2. Baffle:
 - a. Spun aluminum baffle with rolled bead for added strength.
 - b. Rigid aluminum support structure.
 3. Aluminum base: continuously welded curb cap corners.
 4. Penthouse Finish: Clear anodized aluminum.
 5. Curbs:
 - a. Field built.
 - b. Refer to Architectural plans.
 6. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. Carnes: GS.
 - b. Cook: PR.

PART 3 - EXECUTION: Not Used

END OF SECTION

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 52.2-2017, 'Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size'.

PART 2 - PRODUCTS**2.1 MANUFACTURED UNITS**

- A. Air Handling Unit Filters:
 - 1. 2 inch thick, MERV 8, disposable type pre-formed pleated design, having at least 4.5 sq ft of filtering media per sq ft (of face area.
 - 2. Media shall be reinforced non-woven cotton fabric, treated with adhesive similar to 'Vyclad B' and continuously laminated to supporting steel wire grid conforming to configuration of pleats.
 - 3. Media pack shall be sealed in a chipboard frame or beverage board.
 - 4. Filters shall have rated average efficiency of 25 to 30 percent on ASHRAE Test Standard 52-76 and be capable of operating with variable face velocities up to 500 FPM without impairing efficiency.
 - 5. Initial resistance shall not exceed 0.30 inchwg at 500 FPM or 0.14 inchwg at 300 FPM. Filter shall be listed Class 2 by UL.
 - 6. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a. DP-40 by Airguard Industries Inc, Louisville, KY www.airguard.com.
 - b. Aerostar Series 400 by Filtration Group, Santa Rosa, CA www.filtrationgroup.com.
 - c. PrePleat 40 by Flanders, St Petersburg, FL www.flanderscorp.com.
 - d. Type 30/30 by Camfil Farr Co, Riverdale, NJ www.camfilfarr.com or Farr Inc, Laval, QB (519) 629-3030.

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

SECTION 23 6215**COMPRESSOR UNITS: Air Conditioning (6 Ton or more)****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 Requirements:
 - 1. Section 23 0501: 'Common HVAC Requirements'.
 - 2. Section 23 2300: 'Refrigerant Piping'.
 - 3. Section 23 8216: 'Air Coils – DX'.

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 an air conditioner, the coil dissipates heat from the refrigerant, changing the refrigerant from vapor to liquid. In a heat pump system, it absorbs heat from the outdoors.
 - 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.
- B. Reference Standards:
 - 1. Air-Conditioning, Heating, and Refrigeration Institute:
 - a. AHRI Standard 210/240-2017, '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. Requirements 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:
 - a. Refrigerant piping shall be installed by refrigeration contractor licensed by State and by technicians certified for use in HFC and HCFC refrigerants.

1.5 WARRANTY

- A. Manufacturer Warranty:
 1. Five (5) year warranty on compressors from date of 'start-up.'
 2. Record 'start-up' date on warranty certificate for each unit.

PART 2 - PRODUCTS

2.1 ASSEMBLIES

- A. Manufacturers:
 1. Manufacturer Contact List:
 - a. Carrier Corporation:
 - 1) Carrier National: Bradley Brunner (270) 282-1241 Bradley.M.Brunner@Carrier.utc.com.
 - 2) Carrier Utah: Bret Adams (Contractors HVAC Supply) (801) 224-1020 ext. 2527 bret.adams@chcsut.com.
 - b. 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.
 - c. Trane Company:
 - 1) Salt Lake Trane, attention: Jason Bradford (801) 486-0500 www.Jason.Bradford@trane.com.
 - d. York International:
 - 1) Brian Michael (405) 419-6230 brian.k.michael@jci.com.
- B. Performance:
 1. Capacities: SEER rating as defined by AHRI shall be:
 - a. Units 6 Tons or more: 10.0 or greater.
- C. Manufactured Units:
 1. Compressor Units (6 Tons or more):
 - a. General:
 - 1) Use R-410a refrigerant.
 - 2) Make one liquid line, one suction line, and one power connection to each unit for each compressor in condensing unit. Provide charging valves.
 - 3) Units shall be operable down to 0 deg F (minus 18 deg C) outdoor temperature.
 - b. Condenser Coils:
 - 1) Aluminum plate fins mechanically bonded to seamless copper tubes.
 - 2) Units having side inlets shall have coil guards.

- 3) Coil shall be circuited for sub-cooling.
- c. Fans:
 - 1) Direct driven propeller upflow type.
 - 2) Fan motors shall have inherent overload protection, be permanently lubricated, and resiliently mounted.
 - 3) Each fan shall have a safety guard.
 - 4) Cycle fans or use solid-state fan speed control for low ambient operation.
- d. Compressors:
 - 1) Hermetic or semi-hermetic design with following features:
 - a) Spring isolators.
 - b) Crankcase heater.
 - c) Compressor motor-overload protection.
 - d) Ring, reed or disc type valves.
 - e) Service valves, back-seating type with Schraeder charging valves.
 - 2) Semi-hermetic type shall have following additional features:
 - a) Automatically reversible oil pump.
 - b) Oil sight glass.
 - c) Oil pressure switch.
 - 3) Condensing units ten (ten) tons or smaller shall have only one (1) compressor. Condensing units larger than ten (10) tons shall have two (2) compressors minimum, each serving separate cooling circuit and coils.
- e. Controls:
 - 1) Factory wired and located in separate enclosure.
 - 2) Factory installed safety devices:
 - a) High and low pressure cutouts.
 - b) Internal or plug type relief valves.
 - 3) Integral magnetic starters.
 - 4) Anti-cycle timers to prevent units from starting up again for five (5) minutes after any power interruption.
 - 5) Low ambient kit.
- f. Casing:
 - 1) Fully weatherproof for outdoor installation. Finish shall be weather resistant.
 - 2) Panels shall be removable for servicing.
 - 3) Provide openings for power and refrigerant connections.
- g. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Condensing Units:
 - a) Carrier. 38AUZ
 - b) Lennox:
 - c) Trane: TTA
 - d) York. YC

2.2 ACCESSORIES

A. Vibration Isolators:

1. 4 inches (100 mm) square by 3/4 inch (19 mm) thick minimum neoprene type vibration isolation pads.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Set condensing units level on architectural roof curb with vibration isolation pads located at each corner of unit.
- B. Do not use capillary tube and piston type refrigerant metering devices.

3.2 FIELD QUALITY CONTROL

A. Manufacturer Services:

1. Compressor units shall be started up, checked out, and adjusted by Condensing Unit Manufacturer's authorized factory trained service mechanic.
2. Use equipment checkout sheet provided by Manufacturer:
 - a. Complete and sign all items on sheet.

END OF SECTION

SECTION 23 7413**PACKAGED, OUTDOOR, CENTRAL-STATION AIR HANDLING UNITS****PART 1 - GENERAL****1.1 SUMMARY**

- A. Includes But Not Limited To:
 - 1. Furnish and install packaged air conditioning units as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 23 0501: 'Common HVAC Requirements'.

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. Condenser: Device used to condense refrigerant in a cooling system.
 - 3. Condenser Coils: In an air conditioner, the coil dissipates heat from the refrigerant, changing the refrigerant from vapor to liquid.
 - 4. Condensing 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.
 - 5. EER (Energy Efficiency Rating): Rating that lists how many BTU's per hour are used for each watt of power it draws.
 - 6. 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.
 - 7. 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.

1.3 QUALITY ASSURANCE

- A. Regulatory Agency Sustainability Approvals:
 - 1. Air-Cooled Condensing Unit Section shall be UL approved and rated according to ARI Standards.
 - 2. Air delivery of units certified in accordance with standard test code for centrifugal fans adopted by AMCA.
 - 3. Furnace sections shall be AGA approved.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery And Acceptance Requirements:
 - 1. Ship units with lifting angles and fully charged with refrigerant R-410a.

1.5 WARRANTY

- A. Manufacturer Warranty:
 - 1. 5 year warranty on compressors.

PART 2 - PRODUCTS

2.1 PERFORMANCE

- A. Capacities:
1. SEER rating, as defined by ARI, shall be not less than 14.0 for units 5 tons and smaller.
 2. EER rating, as defined by ARI, shall be not less than 12.0 for units larger than 5 tons.

2.2 MANUFACTURED UNITS

- A. Manufacturers:
1. Manufacturer Contact List:
 - a. Carrier Corporation:
 - 1) Carrier National: Bradley Brunner (270) 282-1241 Bradley.M.Brunner@Carrier.utc.com.
 - 2) Carrier Utah: Rich Carpenter (Contractors HVAC Supply) (801) 410-6077 e-mail rcarpent@mtncom.net.
 - b. Lennox Industries:
 - 1) For pricing and information call: Lennox National Account at 1-800-367-6285.
 - 2) Lennox National Contact: Cody Jackson (801) 736-8904 Cody.Jackson@LennoxInd.com.
 - c. Honeywell Minneapolis, MN www.honeywell.com.
 - d. Trane Company:
 - 1) Salt Lake Trane, attention: Jason Bradford (801) 486-0500 www.Jason.Bradford@trane.com.
- B. Air Conditioning Units:
1. Units shall be completely factory assembled and tested. Units shall include following components and features:
 - a. Condenser coils.
 - b. Condenser fans and motors.
 - c. Interconnected wiring.
 - d. Pre-wired control panel.
 - e. Filter section.
 - f. Factory installed 100 percent modulating economizer cycle including motorized dampers and controls with barometric exhaust.
 - g. Corrosion-resistant all-weather cabinet.
 2. Air-Cooled Condensing Unit Section:
 - a. Strainer-dryer.
 - b. Time delay or cycle protection to prevent short cycling.
 - c. Condenser Coil: 1/2 inch (13 mm) outside diameter copper tube with aluminum fins. Include condenser coil hail guard assembly.
 - d. Compressors:
 - 1) Equip with crankcase heater.
 - 2) Fully hermetic, two-stage, scroll type internally protected. Independent circuits for units 7-1/2 tons and larger.
 - 3) On units 3 tons and larger, mount on factory rubber-shock, internal spring vibration isolators.
 - e. Condenser Fan: Direct driven type propeller fan.
 - f. Refrigerant Coils: Constructed of copper tubes with mechanically bonded aluminum plate fins.
 - g. Refrigerant lines shall have:
 - 1) Flexible connections.
 - 2) Suction and liquid line service valves.
 - 3) Charging valves.
 - 4) Receiver valve.
 3. Furnace Section:

- 1) Tubular section type of 20 ga (0.95 mm) steel minimum with 1.2 mil (0.03 mm) nominal aluminum-silicone alloy coating.
- 2) Factory-installed induced draft blower.
- b. Gas shut-off valve.
- c. High limit switches.
- d. Fan switch safety pilot and control transformer.
- e. Automatic electric ignition.
4. Fan Section:
 - a. Indoor Blower (evaporator fan):
 - 1) Vane Axial fan design with slow ramp up to speed capabilities.
 - 2) ECM motor with permanently lubricated bearings.
 - 3) Automatic-reset thermal overload protection.
 - b. Condenser fan shall be direct-driven propeller type and discharge upward. Condenser fan shall have high impact composite blades formed into one piece without blade fasteners or connectors and be dynamically balanced. Condenser motor shall be totally enclosed.
 - c. Constructed and tested in accordance with AMCA requirements.
 - d. Furnish with flexible connections with weather protection on supply and return air take-offs.
 - e. Evaporator-fan cabinet interior shall be insulated with 1/2 inch (13 mm) thick minimum fiber glass insulation coated on air side. Use Aluminum foil-faced insulation in heating compartment.
5. Controls:
 - a. Low ambient and dual pressure.
 - b. Pre-wired.
 - c. Low voltage control circuit with fuse protection on 24 V transformer side.
 - d. Solid state compressor protection for following factory-supplied safeties:
 - 1) Compressor over-temperature, over-current.
 - 2) Loss of charge / low-pressure switch.
 - 3) Freeze protection thermostat, evaporator coil.
 - 4) High-pressure switch.
 - e. Following minimum protection for heating section:
 - 1) High temperature limit switch.
 - 2) Flame rollout switch.
 - 3) Flame proving controls on units 3 tons and larger.
6. Safety Controls:
 - a. Factory Supplied Duct Smoke Detectors mounted in Supply Air Section of Roof top Cabinet:
 - 1) Description:
 - a) Intelligent low-flow photoelectric duct smoke detector with flashscan. Photo electric smoke detector mounted in systems with airflow greater than 2000 CFM.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Model FSD-751 RP by Notifier by Honeywell.
7. Cabinets:
 - a. 3 Ton And Larger Units: Galvanized and weatherproof, with baked enamel finish on externally exposed surfaces and primed interior panel surfaces. Evaporator fan, compressor, and filter panels shall be hinged.
8. Type Two Acceptable Manufacturers:
 - a. Class One Quality Standard: Carrier 48FC.
 - 1) Carrier.
 - 2) Lennox.
 - 3) York.
 - 4) Equal as approved by Architect before installation. See Section 01 6200.

2.3 ACCESSORIES

- A. Roof Curbs: (roof curb for horizontal discharge unit by Architect)

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units on new roof curb.
- B. Set minimum outside air set point.
- C. Do not install electrical disconnect so it interferes with access to unit or accessories.

3.2 FIELD QUALITY CONTROL

- A. Manufacturer Services:
 - 1. Equipment Manufacturer to provide factory start-up service. This includes package roof top unit and economizer with power or barometric exhaust.

END OF SECTION

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 SCHEDULE
- 26 0613 ELECTRICAL EQUIPMENT MOUNTING HEIGHT SCHEDULE

26 2000 LOW-VOLTAGE ELECTRICAL TRANSMISSION

- 26 2417 CIRCUIT-BREAKER PANELBOARDS
- 26 2726 WIRING DEVICES
- 26 2816 ENCLOSED SWITCHES AND CIRCUIT BREAKERS

END OF TABLE OF CONTENTS

BLANK PAGE

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.

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.
 2. Coordinate with Mechanical Drawings for schematic wiring diagrams under Division 26 installation requirements.

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 2816: Enclosed switches and circuit breakers.
 - 2) Motor starters
 - c. Do not purchase equipment before approval of product data.
 2. Shop Drawings:
 - a. Indicate precise equipment to be used, including all options specified. Indicate wording and format of nameplates where applicable. Submit in three-ring binder with hard cover.
- B. Informational Submittals:
1. Test And Evaluation Reports:
 - a. Report of site tests, before Substantial Completion.
- 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.

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.

1.6 TEMPORARY POWER:

- A. Provide temporary power, including and wiring for lighting and power outlets so that scheduled use of the building is not interrupted. Verify requirements with General Conditions. Comply with NEC for temporary power requirements.

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 2816: Enclosed Switches And Circuit Breakers.
 - 2) Motor starters

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. Locating hidden items such as conduit, rebar etc. in concrete, walls and ceilings shall be done by non-destructive methods such as X-ray before any work begins.
- D. Remove concealed wiring and conduit 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.

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 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: 'Electric and Electronic Control System for HVAC' for 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.
- B. Reference Standards:
 - 1. National Fire Protection Association:
 - a. NFPA (Fire) 70, 'National Electric Code (NEC)' (2014 Edition or most recent edition adopted by AHJ including all applicable amendments and supplements).

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.
 - 4) Not exposed.
- 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.
- D. Terminal blocks for tapping conductors:
1. Terminals shall be suitable for use with 75 deg C copper conductors.
 2. Acceptable Products:
 - a. 16323 by Cooper Bussmann, Ellisville, MO www.bussmann.com
 - b. LBA363106 by Square D Co, Palatine, IL www.us.squared.com.
 - c. Equal as approved by Architect before bidding. See Section 01 6200.

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:
 - 1) Provide breaker tie so that all circuits that share common neutral are simultaneously disconnected.
 - 2) 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 (600 mm) 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 (150 mm) 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: Cables for Temperature Control System.
 - 2. Section 26 0501: Common Electrical Requirements.

1.2 REFERENCES

- A. Definitions:
 - 1. Control Voltage: 70 Volts and under.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Category Four Approved Manufacturers. See Section 01 6200 for definitions of Categories.
 - a. Alpha Wire Co, Elizabeth, NJ www.alphawire.com.
 - b. Belden Wire & Cable Co, Richmond, IN www.belden.com.
 - c. Liberty Wire & Cable, Colorado Springs, CO www.libertycable.com.
 - d. West Penn Wire Corp, Washington, PA www.westpenn-cdt.com.

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. 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.
4. 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

BLANK PAGE

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 26 0501: Common Electrical Requirements.

1.2 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.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Type One Acceptable Products:
 - a. 'Cadweld' by Erico International, Solon, OH www.erico.com.
 - b. 'ThermOweld' by Continental Industries, Tulsa, NE 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 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. Grounding conductors and bonding jumper conductors shall be continuous from terminal to terminal without splice. Provide grounding for following.
 - 1. Conduits and other conductor enclosures.
 - 2. Neutral or identified conductor of interior wiring system.
 - 3. Non-current-carrying metal parts of fixed equipment such as motors, starter and controller cabinets, instrument cases, and lighting fixtures.
- C. Pull grounding conductors in non-metallic raceways, in flexible steel conduit exceeding **72 inches** in length, and in flexible conduit connecting to mechanical equipment.
- D. Provide grounding bushings on all feeder conduit entrances into panelboards and equipment enclosures.
- E. Bond conduit grounding bushings to enclosures with minimum #10 AWG conductor.
- F. 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 250.122 for others unless noted otherwise in Drawings.
- G. Run separate insulated grounding cable from each equipment cabinet to electrical panel. Do not use intermediate connections or splices. Affix directly to cabinet.
- H. On motors, connect ground conductors to conduit with approved grounding bushing and to metal frame with bolted solderless lug.
- I. Ground cabinet of transformers to conduit and ground wires, if installed. Bond transformer secondary neutral conductor to cabinet.

3.2 FIELD QUALITY CONTROL

- A. Field Inspections:
 - 1. Notify Architect for inspection two days minimum before placing concrete over grounding conductor.

END OF SECTION

BLANK PAGE

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.
- B. Related Requirements:
 - 1. Section 26 0501: General Electrical Requirements.

PART 2 - PRODUCTS**2.1 SYSTEM**

- A. Manufacturers:
 - 1. Manufacturer Contact List:
 - a. Cooper B-Line, Highland, IL www.b-line.com.
 - b. Hubbell Incorporated, Milford, CT www.hubbell-wiring.com or Hubbell Canada Inc, Pickering, ON (905) 839-4332.

- c. Square D, Palatine, IL www.squared.com.
- d. Thomas & Betts, Memphis, TN 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.

B. Performance:

- 1. Design Criteria: All aspects of design of sound system have been included as requirements of Owner. Do not make changes to any aspects of installation, design, or equipment pertaining to sound system without Owner's approval through Architect and Sound Consultant.

C. Materials:

1. Raceway And Conduit:

a. Sizes:

- 1) Minimum 3/4 inch (19 mm) above ground unless indicated otherwise.
- 2) Minimum 1" underground or under slab 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)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. Minimum underground PVC conduit size shall be One inch.
- 4) Listed, Liquid-Tight Flexible Metal Conduit:
 - a) Use in outdoor final connections to mechanical equipment, length not to exceed 36 inches (900 mm).
- c. Prohibited Raceway Materials:
 - 1) Aluminum conduit.
 - 2) Armored cable type AC (BX) cable.
 - 3) MC (metal clad) cable (except for connections less than 4ft)
 - 4) Romex cable
2. Raceway And Conduit Fittings:
 - a. Rigid Steel Conduit And IMC: Threaded and designed for conduit use.
 - b. EMT:
 - 1) 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. Seal Devices: OZ Type WSK.
4. 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. HVAC Instrumentation And Control:
 - 1) Junction boxes in mechanical equipment areas shall be 4 inches (100 mm) square.
 - 2) Boxes for remote temperature sensor devices shall be recessed single device.
 - 3) Boxes for thermostats shall be 4 inches (100 mm) square with raised single device cover.
5. 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.

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.
- B. 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 (150 mm) 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. Installation in Concrete:
 - a. Install no conduit in concrete unless outside diameter is less than 1/3 of slab, wall, or beam thickness in which it is embedded.
 - b. Position conduits in center of concrete below reinforcing steel, and separated by minimum lateral spacing of three diameters.
 - c. Elbows embedded in concrete shall be rigid steel or IMC and stubouts from concrete slabs shall extend 3 inches (75 mm) minimum before making connection to EMT.
 - d. Separate conduits penetrating structural slabs in buildings by 2 inches (50 mm) minimum.
 - e. Install seal device where underground raceways penetrate concrete building wall.
 6. Installation In Framing:
 - a. Do not bore holes in joists or beams outside center 1/3 of member depth or within 24 inches (600 mm) of bearing points. Do not bore holes in vertical framing members outside center 1/3 of member width.
 - b. Holes shall be one inch (25 mm) diameter maximum.
 7. Underground Raceway And Conduit:
 - a. Bury underground raceway installed outside building 24 inches (600 mm) deep minimum.
 - b. Bury underground conduit in planting areas 18 inches (450 mm) deep minimum. It is permissible to install conduit directly below concrete sidewalks, however, conduit must be buried 18 inches (450 mm) deep at point of exit from planting areas.
 8. Conduit And Raceway Support:
 - a. Securely support raceway with approved straps, clamps, or hangers, spaced as required.
 - b. Do not support from mechanical ducts or duct supports without Architect's written approval. Securely mount raceway supports, boxes, and cabinets in an approved manner by:
 - 1) Expansion shields in concrete or solid masonry.
 - 2) Toggle bolts on hollow masonry units.
 - 3) Wood screws on wood.
 - 4) Metal screws on metal.
 9. 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.

C. 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.

END OF SECTION

BLANK PAGE

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 (1 270 mm) to top.
 - d. Indoor Motor Disconnects: 60 inches (1 525 mm).
 - e. Outdoor Motor Disconnects: As indicated on Drawings.
 - f. Motor Controls: 60 inches (1 525 mm).
 2. Plumbing:
 - a. Electric Water Cooler Outlets: Mount so outlet and cord are hidden by water cooler and outlet is accessible for

3. Electrical:
- a. Distribution Panels: 72 inches (1 830 mm) to top.
 - b. Receptacles: 18 inches (450 mm).
 - c. Wall Switches: 42 inches (1 065 mm).
- resetting for GFCI trip.

END OF SECTION

SECTION 26 2417
CIRCUIT-BREAKER PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

- A. Includes But Not Limited To:
 - 1. Furnish and install circuit-breaker panelboards as described in Contract Documents.
- B. Related Requirements:
 - 1. Section 26 0501: 'Common Electrical Requirements'.

1.2 REFERENCES

- A. Reference Standards:
 - 1. National Fire Protection Association:
 - a. NFPA 70E: 'Standard for Electrical Safety in the Workplace' (2018 or most recent edition adopted by AHJ).

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Manufacturers:

1. Manufacturer Contact List:
 - a. Cutler-Hammer Inc, Pittsburgh, PA www.eatonelectric.com.
 - b. General Electric Industrial Systems, Charlotte, NC www.geindustrial.com.
 - c. Siemens Energy & Automation, Alphrata, GA www.sea.siemens.com.
 - d. Square D Co, Palatine, IL www.us.squared.com.

B. Performance:

1. Capacities:
 - a. Panelboard:
 - 1) Minimum integrated equipment short circuit rating of 22,000 amperes for 120 / 208 Volts.
 - 2) Minimum integrated equipment short circuit rating of 50,000 amperes for 277 / 280 Volts.
 - 3) Rated for use as service entrance equipment.
 - b. Lighting And Appliance Panelboards:
 - 1) Minimum integrated equipment short circuit rating of 10,000 amperes for 120 / 208 Volts.
 - 2) Minimum integrated equipment short circuit rating of 14,000 amperes for 277 / 480 Volts.
 - c. Load Centers:
 - 1) 250 Amp main lugs, 120 / 208 Volt, three-phase.
 - 2) Minimum integrated equipment short circuit rating of 10,000 Amps.

C. Material:

1. Circuit-breaker type.
2. Galvanized steel cabinets
3. Bussing and lugs arranged as required.
4. Multi-pole circuit-breakers shall be common trip.

5. Circuit-breakers shall be molded case thermal magnetic type with inverse time characteristics.
6. Main Panelboard:
 - a. Surface-mounted and front accessible.
 - b. Enclosures:
 - 1) Exterior of Building:
 - a) NEMA / CEMA Type 3R with locking door.
 - 2) Interior of Building:
 - a) NEMA / CEMA Type 1.
 - c. Minimum dimensions of 32 inches (800 mm) wide by 8 inches (200 mm) deep.
 - d. Space designation on Drawings indicates bus hardware and panelboard capacity for future acceptance of one 100 Amp, three-pole circuit-breaker.
 - e. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Type PRL4B by Cutler-Hammer.
 - 2) Spectra Series by General Electric.
 - 3) Type P4 by Siemens.
 - 4) I-Line by Square D.
7. Lighting And Appliance Panelboards:
 - a. Plug-on or bolt-on breakers. Multi-pole breakers shall be common trip.
 - b. Factory installed or provided circuit number identification for each breaker and space.
 - c. Cabinets shall be locking type with no exposed latches or screws when door is closed. Key panels alike and provide minimum of three keys.
 - d. Minimum dimensions of 20 inches (500 mm) wide by 5-3/4 inches (146 mm) deep.
 - e. Space designation on Drawings indicates bus hardware and panelboard capacity for future acceptance of one 20 Amp, single-pole circuit-breaker.
 - f. Breakers specified to be shunt trip and shall include shunt trip accessories to remotely trip breaker using separate 120 V power source. Trip coil shall include coil-clearing contact to break coil current when breaker opens.
 - g. Use equipment from same manufacturer as main panelboard.
 - h. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Type PRL1a by Cutler-Hammer.
 - 2) Type AL or AQ by General Electric.
 - 3) Type P1 by Siemens.
 - 4) Type NQOD by Square D.
8. Load Centers:
 - a. Surface-mounted, outdoor NEMA Type 3R enclosure with padlocking provisions. 12-1/2 inches (318 mm) wide by 4-1/2 inch (115 mm) deep minimum.
 - b. HACR type circuit breakers.
 - c. Use equipment from same manufacturer as main panelboard.
 - d. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Type CH by Eaton.
 - 2) Type PowerMark Plus by General Electric.
 - 3) Type PL by Siemens.
 - 4) Type QO by Square D.
9. Labels:
 - a. All Switchboards shall be labeled with Arc-Flash Hazard Information per NFPA 70E 130.5 including:
 - 1) Nominal system voltage.
 - 2) Arc flash boundary.
 - 3) Available incident energy.
 - 4) Working distance.
 - 5) Minimum arc rating of clothing.
 - 6) Level of PPE.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification Of Conditions:

1. Examine wall framing and verify framing for proper spacing for installation of panelboard(s).
 - a. Notify Architect of improper spacing in writing.
- B. Contractor shall be responsible for performing required calculations to determine ARC Flash Hazards and providing all appropriate labeling per NFPA 70E.

3.2 INSTALLATION

- A. Label panelboards, load centers, and each breaker in main panelboard with **1/16 inch (1.6 mm)** thick laminated plastic composition material with contrasting color core. Engraved letters shall be **1/4 inch (6 mm)** high.
- B. Provide typewritten circuit schedules in lighting and distribution panelboards and load centers to identify panelboard and load served by each branch breaker.
- C. Arrange conductors neatly within panelboards and load centers.
- D. Secure to structure in accordance with requirements of Project seismic design category.

3.3 PROTECTION

- A. Protect panelboards, load centers, and interior components from paint, gypsum board compound, dirt, dust, and other foreign matter during construction.

END OF SECTION

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.
 - b. General Electric Industrial Systems, Charlotte, NC www.geindustrial.com.
 - c. Hubbell Building Automation, Austin, TX www.hubbell-automation.com.
 - d. Hubbell Inc, Milford, CT www.hubbell-wiring.com or Hubbell Canada Inc, Pickering, ON (800) 263-4622 or (905) 839-4332.
 - e. Hunt Control Systems Inc, Fort Collins, CO www.huntdimming.com.
 - f. Intermatic Inc, Spring Grove, IL www.intermatic.com.
 - g. IR-TEC America, Inc., Brea, CA www.irtec.com/en-ira/.
 - h. Leviton Manufacturing Co, Little Neck, NY www.leviton.com or Leviton Manufacturing of Canada Ltd, Pointe-Claire, QB (800) 461-2002 or (514) 954-1840.
 - i. Legrand, West Hartford, CT www.legrand.us.com or Vaughan, ON www.legrand.ca.com.
 - j. Lutron Electronics Co Inc, Coopersburg, PA www.lutron.com.
 - k. Ortronics, New London, CT www.ortronics.com.
 - l. Paragon Electric Co Inc, Carol Stream, IL www.icca.invensys.com/paragon or Paragon Electric, Mississauga, ON (800) 951-5526 or (905) 890-5956.

- m. Pass & Seymour, Syracuse, NY www.passandseymour.com or Pass & Seymour Canada Inc, Concord, ON (905) 738-9195.
 - n. Philips Lighting Co, Somerset, NJ www.lighting.philips.com/nam or Philips Lighting Canada, Scarborough, ON (416) 292-3000.
 - o. Red Dot div of Thomas & Betts, Memphis, TN www.tnbcom.
 - p. Schneider Electric North America, Palatine, IL www.schneider-electric.com (847) 397-2600.
 - q. Sensorswitch, Wallingford, CT www.sensorswitch.com.
 - r. Siemon Company, Watertown, CT www.siemon.com.
 - s. Square D Co, Palatine, IL www.squared.com.
 - t. Suttle, Hector, MN www.suttleonline.com.
 - u. Tork Inc, Mount Vernon, NY www.tork.com.
 - v. Watt Stopper Inc, Santa Clara, CA 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. 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.
 - 4) Four Way:
 - a) Cooper: 2224V.
 - b) Hubbell: HBL1224-I.
 - c) Pass & Seymour: 20AC4-I.
 - d) Leviton: 1224-2I.
 - 5) Pilot Switch:
 - a) Hubbell: HBL1221-PL.
 - b) Pass & Seymour: 20AC1-RPL.
 - c) Leviton: 1221-PLR.
 - 6) Lighted Toggle Switch:
 - a) Single Pole:
 - (1) Cooper: 2221-LTV.
 - (2) Hubbell: HBL1221-IL.
 - (3) Pass & Seymour: 20AC1-ISL.
 - (4) Leviton: 1221-LHI.
 - b) Three Way:
 - (1) Cooper: 2223-LTV.
 - (2) Hubbell: HBL1223-IL.
 - (3) Pass & Seymour: 20AC3-ISL.
 - (4) Leviton: 1223-7LC.
- b. Custodian Room:
 - 1) 24-hour, in-wall, multiple automatic ON-OFF settings.
 - 2) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Intermatic: E1020.

- b) Tork: 701A.
 - 2. Digital Time/Timer Switch:
 - a. As shown in small Storage, Mechanical and Electrical Rooms.
 - b. Automatic countdown type:
 - 1) Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - a) Leviton: LTT60-1L.
 - b) Hubbell: TD200.
 - c) Pass & Seymour: RT1W.
 - d) Tork: SSA100.
 - e) Watt Stopper: TS-400-W.
 - 3. Momentary Switches:
 - a. 15 AMP, specification grade.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Cooper: 1895W.
 - 2) Hubbell: HBL1556W.
 - 3) Legrand: 1250W.
- 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. 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. 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.
- E. 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.
2. Ceiling, dual technology type.
- a. Complete with sensor and relay / transformer.
 - b. Category Four Approved Products. See Section 01 6200 for definitions of Categories:
 - 1) Cooper Controls:
 - a) Sensor: OAC-DT-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-RMW.
 - b) Relay / Transformer: OPP20-D2.
 - 4) Sensorswitch:
 - a) Sensor: CMPDT9.
 - b) Relay / Transformer: MP-20-SP0DM.
 - 5) Watt Stopper:
 - a) Sensor: DT-305.
 - b) Relay / Transformer: BZ-150.
- c. Provide manual ON and OFF momentary override switches. Refer to Contract Drawings for number of switches.

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.
 - 2) Edison Fuse, Ellisville, IL (314) 391-3443.
 - 3) Ferraz Shawmut, Newburyport, MA www.ferrazshawmut.com.
 - 4) Littelfuse Inc, Des Plaines, IL 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. Labeling shall include panel and circuit number used to feed power to motors or device. Use **1/16 inch (1.6 mm)** thick laminated plastic composition material with contrasting color core. Engraved letters shall be **1/4 inch (6 mm)** high. Attach labels with screws.