

MIDWESTERN STATE UNIVERSITY
WICHITA FALLS, TEXAS

MOFFETT LIBRARY RENOVATION

PHASE I

100% CONSTRUCTION DOCUMENTS

PROJECT MANUAL

VOLUME I

MARCH 19 218



HOLZMAN MOSS BOTTINO
ARCHITECTURE



Summit
CONSULTANTS, INC.

RTP
STRUCTURAL

Phase I 100% Construction Documents

Moffett Library Renovation – Phase I

March 19, 2018

Project #: 17809.00

Project Directory

Client: **Midwestern State University** T:
3410 Taft Blvd. F:
Wichita Falls, TX 76308 W: <https://mwsu.edu/>

Library
Clara Latham, University Librarian
Andrea Williams, Curriculum Material Librarian
Cortny Bates, Associate University Librarian

Facilities Planning and Construction
Kyle Owen, Associate VP of Facilities Services
E: kyle.owen@mwsu.edu

Architect of Record: **Holzman Moss Bottino Architecture LLP**
90 Broad street T: 212.465.0808
Suite 1803 F: 212.465.2226
New York, NY 10004 W: <http://holzmanmossbottino.com/>

Doug Moss, AIA E: dmoss@holzmanmossbottino.com
Ermira Kasapi, Ass. AIA E: ekasapi@holzmanmossbottino.com

Local Architect: **Harper Perkins Architects**
4724 Jacksboro Highway T: 940.767.1421
Wichita Falls, TX 76302 F: 940.397.0273
W: <http://www.harperperkins.com/>

Glenda G. Ramsey E: gramsey@harperperkins.com
Sam K. Kenshalo E: skenshalo@harperperkins.com
CW Farris E: cwfarris@harperperkins.com

Construction Manager:

M&F Litteken

1804 East Scott
Wichita Falls, TX 76301

T: 940.766.4442

Shane Darnell
Kevin Darnell

E: shane@mflitteken.com

E: kevin@mflitteken.com

Structural Engineer:

RTP Structural

107 N. Goliad Street
Rockwall, TX 75087

T: 214.293.2503

Trent Perkins

E: trent@rtpstructural.com

MEP Engineer:

Summit Consultants INC.

1300 Summit Ave, Suite 500
Fort Worth, TX 76102

T: 817.878.4242

Brian Richards

E: bdr@summitmep.com

TABLE OF CONTENTS
VOLUME I

DIVISION 0 - PROCUREMENT AND CONTRACTING REQUIREMENTS

SECTION

000100	Notice to Subcontractors/ Materials Suppliers
000200	Instructions to Proposers
000400	Proposal Form
000613	Statutory Performance Bond - McGregor Act (Public Projects)
000614	Statutory Payment Bond - McGregor Act (Public Projects)
000805	Supplemental General Conditions
000810	Wage Determination
003132	Geotechnical Report

DIVISION 1 - GENERAL REQUIREMENTS

SECTION

011000	Summary and Bid Packages
012100	Allowances
012200	Unit Prices
012500	Substitution Procedures
012600	Contract Modification Procedures
012900	Payment Procedures
013100	Project Management and Coordination
013200	Construction Progress Documentation
013300	Submittal Procedures
014000	Quality Requirements
014200	References
015000	Temporary Facilities and Controls
016000	Product Requirements
017300	Execution Requirements
017700	Closeout Procedures
017823	Operation and Maintenance Data
017839	Project Record Documents
017900	Demonstration and Training

DIVISION 2 - EXISTING CONDITIONS

SECTION

023720	Drilled Piers
024119	Selective Structure Demolition

DIVISION 3 - CONCRETE

SECTION

030586	Vapor Barrier
031100	Concrete Forming
031106	Void Forms
032000	Concrete Reinforcement
033000	Cast-in-Place Concrete

DIVISION 4 - MASONRY

SECTION

042000	Unit Masonry
042200	Concrete Masonry Units
047200	Cast Stone

DIVISION 5 - METALS

SECTION

051200	Structural Steel Framing
052100	Steel Joists
053100	Metal Deck
053123	Metal Roof Deck
055000	Miscellaneous Metals
058100	Expansion Joint Cover Assemblies

DIVISION 6 - WOOD, PLASTICS AND COMPOSITES

SECTION

061000	Rough Carpentry
064023	Interior Architectural Woodwork
066119	Engineered Quartz Countertops

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

SECTION

071616	Crystalline Waterproofing
071900	Water Repellents
072100	Thermal Insulation
072419	Exterior Insulation and Finish System
072726	Fluid-Applied Membrane Air Barriers
073213	Clay Roof Tiles

075423	Thermoplastic Polyolefin (TPO) Membrane Roofing
076200	Sheet Metal Flashing
077100	Roof Specialties and Accessories
078413	Firestops and Smoke seals
079200	Joint Sealers

DIVISION 8 - OPENINGS

SECTION

081113	Steel Doors and Frames
081416	Wood Doors
083113	Access Doors
087100	Door Hardware

DIVISION 9 - FINISHES

SECTION

092900	Gypsum Drywall
093013	Ceramic Tiling
095113	Acoustical Panel Ceilings
096513	Resilient Base and Accessories
096519	Resilient Tile Flooring
099000	Painting and Finishing

DIVISION 10 - SPECIALTIES

SECTION

102113	Toilet Partitions
102600	Corner Guards
102813	Toilet Accessories
104413	Fire Protection Specialties

SECTION 00100

NOTICE TO SUB-CONTRACTORS AND MATERIAL SUPPLIERS

Request for Competitive Sealed Proposals

Proposals will be received by Sealed Proposal or Email until 2:00 p.m., Tuesday, April 17, 2018, at the office of the Director of Purchasing and Contract Management, 3410 Taft Blvd, Daniel Building Room 202, Wichita Falls, Texas 76308. Proposals need to be hand delivered, sent by messenger, or emailed directly to the following email address: stephen.shelley@mwsu.edu

This is a "Public Works" Project and it is subject to Labor Standards and Practices set forth in various Statutes of the State of Texas.

Drawings and Specifications may be examined without charge at the offices of Harper Perkins Architects Inc., Associate Architect, located at: 4724 Old Jacksboro Highway, Wichita Falls, Texas 76302-3599; and on line at MSU Purchasing website or M&F Litteken website.

Complete sets of Drawings, Specifications, and other Contract Documents may be obtained by qualified Contractors from the office of Harper Perkins Architects Inc., Associate Architect, 4724 Old Jacksboro Highway, Wichita Falls, Texas 76302-3599, upon payment of a refundable deposit of Two Hundred Dollars (\$200.00) as a guaranty of the safe return of the Drawings, Specifications and other Contract Documents.

A Bid Bond is required to accompany each Bid/Proposal. No Proposal may be withdrawn for a period of sixty (60) days after the deadline without the consent of the Owner.

THE OWNER RESERVES THE RIGHT TO REJECT ANY/OR ALL PROPOSALS AND TO WAIVE ANY/OR ALL INFORMALITIES.

WAIVER OF CLAIMS: BY TENDERING A RESPONSE TO THE DISTRICT'S RFP, THE CONTRACTOR ACKNOWLEDGES THAT IT HAS READ AND FULLY UNDERSTANDS THE REQUIREMENTS FOR SUBMITTING A PROPOSAL, AND THE PROCESS USED BY THE DISTRICT FOR SELECTING A CONTRACTOR. FURTHER, BY SUBMITTING A PROPOSAL, THE CONTRACTOR FULLY, VOLUNTARILY AND UNDERSTANDINGLY WAIVES AND RELEASES ANY AND ALL CLAIMS AGAINST DISTRICT AND ITS TRUSTEES, OFFICERS, AGENTS AND/OR EMPLOYEES THAT COULD ARISE OUT OF THE ADMINISTRATION, EVALUATION, OR RECOMMENDATION OF ANY PROPOSAL SUBMITTED IN RESPONSE TO THIS RFP.

INSTRUCTIONS FOR SUBMITTING BIDS: Review ALL documents in their entirety. Be sure your bid is complete, and double check your bid for accuracy.

Questions requiring only clarification of instructions or specifications will be handled through the email process. If any questions results in a change or addition to this Bid, the change(s) and Additions(s) will be addressed to all vendors involved as quickly as possible in the form of an addendum. It is the responsibility of the bidder to view the posting on the MSU purchasing web page located at <http://mwsu.edu/purchasing/>.

Sign the Vendor's Affidavit Notice and return with your bid.

BIDDER SHALL SUBMIT BID ON THE FORM PROVIDED, SIGN THE VENDOR AFFIDAVIT AND RETURN ENTIRE BID PACKET. In the event of inclement weather and the University Offices are officially closed on a bid opening day, bids will be received until 2:00 p.m. of the next business day, at which time said bids will be privately opened.

BIDS SUBMITTED AFTER THE SUBMISSION OF DEADLINE SHALL BE RETURNED UNOPENED AND WILL BE CONSIDERED VOID AND UNACCEPTABLE.

1. Each bid shall be emailed or placed in a separate envelope completely and properly identified with the name and number of bid. Bids must be in the Purchasing Office BEFORE the hour and date specified.
2. Bids MUST give full firm name and address of the bidder. Person signing bid should show TITLE or AUTHORITY TO BIND HIS FIRM IN A CONTRACT.
3. Bids CANNOT be altered or amended after opening time. Any alterations made before opening time must be initialed by bidder or his authorized agent. No bid can be withdrawn after opening without the approval by the Vice-President of Administration and Finance based on a written acceptable reason.
4. The University is exempt from State Sales Tax and Federal Excise Tax. DO NOT INCLUDE TAX IN BID.

Any questions regarding this project and the proposal process should be directed to: Holzman Moss Bottino Architecture, Architect of Record; Phone: 212-465-0808; Contact: Doug Moss, Project Architect at dmoss@holzmanmossbottino.com or Ermira Kasapi, Project Manager, at ekasapi@holzmanmossbottino.com; and Harper Perkins Architects Inc., Associate Architect; Phone: (940) 767-1421; Fax: (940) 397-0273; contact Glenda Ramsey, at gramsey@harperperkins.com or Sam Kenshalo, at skenshalo@harperperkins.com; or Kevin Darnell, M & F Litteken (CM@R) at kevin@mflitteken.com.

END OF SECTION

SECTION 00200

INSTRUCTIONS TO PROPOSERS

For Sealed Proposals For Subcontractors and Material Suppliers

Proposals, will be received from subcontractors and material supplies for the Moffett Library Renovation Project (Phase 1) on the Campus of Midwestern State University, 3410 Taft, Wichita Falls, Texas, in accordance with the Contract Documents prepared by the Architect, Holzman Moss Bottino Architecture. Proposals will be received at the office of the Steve Shelley, Purchasing Agent, Daniel Building Room 202, until 2:00 p.m. on Tuesday, April 17, 2018. A pre-bid conference will be held Thursday, March 29, 2018, from 10:00 a.m. to 12:00 p.m. and Friday, April 6, 2018 from 11:00 a.m. to 12:50 p.m., at Bolin Hall, Room 103, on the MSU Campus.

Please see specifications at the below Link under current bid opportunities listed under the RFP number: <http://mwsu.edu/purchasing/> or complete sets of Drawings, Specifications and other documents may be obtained by qualified sub-contractors and Material Suppliers from the office of Harper Perkins Architects, Inc., Associate Architect, 4724 Old Jacksboro Highway, Wichita Falls, Texas, upon payment of a refundable deposit of Two Hundred Dollars (\$200.00).

Please supply a HUB Subcontracting Plan with your bid, which can be found at the below listed link: <http://www.window.state.tx.us/procurement/prog/hub/hub-subcontracting-plan/>.

Supply an insurance certificate with your Bid.

Supply a W-9 with your Bid if new to Midwestern State University.

2010 Uniform General Conditions apply to this Bid and can be found at the below listed link: <http://mwsu.edu/purchasing/contract-management>.

A Bid Bond will be required to accompany each Bid/Proposal. If awarded the Bid, and at the direction of the CMaR, a Payment Bond will be required if your Bid is over \$25,000.00. If awarded the Bid, and at the direction of the CMaR, a Performance Bond will be required if your Bid is over \$100,000.00. Provide costs of Performance & Payment Bonds in Section 00400, PROPOSAL FORM.

PUBLIC WORKS PROJECT: This project is a "Public Works" project and the Contractor shall comply with the labor standards and practices as set forth in various annotated Civil Statutes of the State of Texas, and the Uniform General Conditions.

DRAWINGS AND SPECIFICATIONS: Drawings and Specifications may be examined without charge at the offices of Harper Perkins Architects, Inc., Associate Architect, located at 4724 Old Jacksboro Highway, Wichita Falls, Texas. All Drawings and Specifications will be issued by MSU.

QUALIFICATION OF BUILDING CONTRACTORS: Proposals will be received only from qualified Building Sub-Contractors and material suppliers. The Owner reserves the right to reject any Proposal if the evidence submitted by, or investigation of such Contractor fails to satisfy the Owner that such Contractor is properly qualified to carry out the obligations of the contract and to complete the Work contemplated herein.

EXAMINATION OF SITE: Prior to the submittal of Proposals, each Sub-Contractor and material supplier shall make and will be deemed to have made a thorough examination of the various sites of the Work and all conditions existing thereon.

EXAMINATION OF CONTRACT DOCUMENTS: Before submitting Proposals, Building Contractors shall carefully examine the complete contract documents including the Drawings and Specifications and shall bring any discrepancies to the attention of the Architect.

CONDITIONS OF THE WORK: Each Contractor shall inform himself fully of the conditions relating to construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful Contractor of his obligation to furnish all material and labor necessary to carry out the provisions of the contract.

LAWS AND REGULATIONS: The Contractors attention is directed to the fact that all applicable State laws, and the rules and regulations of all authorities having jurisdiction over the construction of the project shall apply to the contract throughout and they are deemed to be included in the contract the same as though written therein in full.

INTERPRETATION OF CONTRACT DOCUMENTS: Prospective Building Contractors desiring further information or interpretation of the contract documents (Drawings and Specifications) shall request such data in writing from the Architect/Owner.

ADDENDA: Answers to all questions, inquiries, and requests for additional information will be issued in the form of addenda and copies of each addendum will be issued to all prospective Sub-Contractors and material suppliers. Also, prospective Sub-Contractors and material suppliers may, during the proposal period, be advised by addenda of additions to, deletions from, or changes in the requirements of the contract documents. The Owner will not be responsible for the authenticity or correctness of oral interpretations or for information obtained in any other manner than through the media of addenda. Receipt of each addendum shall be acknowledged by Sub-Contractors and material suppliers in their Proposals, and each addendum shall be considered a part of the contract documents. Failure to acknowledge receipt of addenda issued may invalidate a Proposal as incomplete.

IDENTIFICATION OF PROPOSALS: Proposals shall be submitted in sealed envelopes clearly marked with the name and number of the project as it appears on the cover page of the Specification and with the name and address of the Contractors.

QUALIFICATION OF BUILDING CONTRACTORS: A Building Contractor, in submitting a Proposal, thereby represents that he is fully qualified, properly licensed, staffed, and equipped to properly perform the work in accordance with applicable laws and local ordinances having jurisdiction.

WITHDRAWAL OF PROPOSAL: A Contractor may withdraw his Proposal, either personally or by telegraphic or written requests at any time prior to the scheduled closing time for the receipt of Proposals. After the opening of Proposals, they may not be withdrawn for a period of sixty (60) days after the date scheduled for the opening of Proposals.

PROPOSAL MODIFICATION: Any Contractor may modify his Proposal by changing the amount of the Proposal, either a deductive or additive amount on the exterior of the envelope prior to the opening and prior to the published Proposal time. The modification shall be signed and dated by an authorized representative of the Contractor. The modification shall not reveal the Proposal price but shall provide

the addition or subtraction or other modification so that the final price or terms will not be known by the Owner until the sealed proposal is opened. If written confirmation is not received within two days from closing time, no consideration will be given to the modification. No telegraphic, telephone or facsimile modifications of the Proposal will be accepted.

LIQUIDATION OF DAMAGES: If the Contractor shall fail to fully complete the work within the time specified (subject however to an extension of time duly granted in a manner and for the cause specified in the GENERAL CONDITIONS), the Contractor shall be charged by the Owner as liquidated and ascertained damages the sum of Five Hundred Fifty Dollars (\$500) for each calendar day that the work remains incomplete beyond the time fixed for the completion, it being hereby expressly and mutually agreed that from the nature of the case it would be impracticable and extremely difficult to fix the actual damage which would or will be suffered in the event that the Contractor should fail to fully complete the Work within the time specified, and it being further agreed that said charge herein provided for is reasonable and proper in the premises. The amount so charged may be deducted by the Owner from any money which might otherwise be or become payable to the Contractor.

END OF SECTION

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SECTION 00400
PROPOSAL FORM

PROPOSAL OF: _____
(Proposer's Name)

REQUEST FOR PROPOSAL
FOR
MIDWESTERN STATE UNIVERSITY
MOFFETT LIBRARY RENOVATION PROJECT (PHASE 1)

Proposals are to be sent via email or hand delivered to:
Stephen Shelley, Director of Purchasing & Contract Management
3410 Taft Blvd, Daniel Building, Room 202
Wichita Falls, TX 76308
Stephen.shelley@mwsu.edu
940-397-4110

The undersigned, having examined the Drawings, Specifications and related Documents, the site of the proposed Work, being familiar with all of the conditions relating to the construction of the proposed project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, services, equipment and appliances required in connection with or incidental to the construction of each item listed below in strict accordance with the following Specifications and Drawings:

SPECIFICATION SECTIONS: Bidding Requirements, contract documents, and conditions of the Contract, Sections Div. 1, Div. 2, Div. 3, Div. 4, Div. 5, Div. 6, Div. 7, Div. 8, Div. 9, Div. 10, Div. 14, Div. 22, Div. 23, Div. 26 and Div. 31

ARCHITECTURAL	A-000, A-020, A-021, D-101, D-102, D-103, D-104, D-201, D-202, D-203, A-101, A-102, A-103, A-104, A-191, A-201, A-202, A-203, A-401, A-651, A-731, A-791, A-792, A-793, A-851, I-001, I-002, I-101, I-102, I-103	Dated 3-19-18
STRUCTURAL	S-101, S-201, S-202, S-203, S-204, S-205, S-301, S-401	Dated 3-19-18
MECHANICAL	M-101, M-102, M-201, M-202, M-001, M-103, M-203	Date 3-19-18
ELECTRICAL	E-000, E-101, E-102, E-103, E-105, E-201, E-202, E-203, E-204, ED-101	Dated 3-19-18
PLUMBING	P-001, P-100, P-101, P-102, P-103, P-201, PD-100, PD-101, PD-102, PD-103	Dated 3-19-18

Prepared by Holzman Moss Bottino Architecture, 90 Broad Street (Suite 1803), New York, New York, 10004; and Harper Perkins Architects Inc., 4724 Old Jacksboro Highway, Wichita Falls, Texas 76302-3599.

COMPLETION DATE: The Proposer acknowledges the anticipated time frame must be coordinated with the Construction Manager. Each sub-contractor must perform under construction schedule to benefit Midwestern State University. Provide total number of days required to complete your trade. Construction Manager will compile time and provide a schedule to be maintained.

Number of Days: _____

The undersigned propose to accomplish the following bid packages for the stated price:
(Bid Packages are specified in Section 011000, SUMMARY, and available thru the Construction Manager, M & F Litteken Company)

Base Proposal:

<u>Description of Scope</u>	<u>Amount Proposed</u>	<u>(Circle one)</u>
Bid Package No. _____ Amount \$ _____		(furnish, install turnkey)
Bid Package No. _____ Amount \$ _____		(furnish, install turnkey)
Bid Package No. _____ Amount \$ _____		(furnish, install turnkey)
Bid Package No. _____ Amount \$ _____		(furnish, install turnkey)
Bid Package No. _____ Amount \$ _____		(furnish, install turnkey)

Payment Bonds (required if Bids over \$25,000):

Bid Package No. _____ Amount \$ _____

Bid Package No. _____ Amount \$ _____

Bid Package No. _____ Amount \$ _____

Performance Bonds (required if Bids over \$100,000):

Bid Package No. _____ Amount \$ _____

Bid Package No. _____ Amount \$ _____

Bid Package No. _____ Amount \$ _____

LIQUIDATED DAMAGES: If the Contractor shall fail to fully complete the work within the time specified (subject however to extensions of time duly granted in the manner and for the cause specified in the GENERAL CONDITIONS) the Contractor shall be charged by the Owner as liquidated and ascertained damages the sum of Five Hundred Dollars (\$500.00) per day for each calendar day that the work remains incomplete beyond the time fixed for the completion, it being hereby expressly and mutually agreed that from the nature of the case it would be impracticable and extremely difficult to fix

the actual damage which would or will be suffered in the event that the Contractor should fail to fully complete the Work within the time specified, and it being further agreed that said charge herein provided for is reasonable and proper in the premises. The amount so charged may be deducted by the Owner from any money which might otherwise be or become payable to the Contractor.

UNIT PRICES: The following unit prices shall be submitted by the Proposer for the purpose of establishing the sums to be added to or deducted from the contract amount on the account of an increase or decrease in quantity of the following items:

<u>Item (Unit)</u>	<u>WHEN ADDED</u>	<u>WHEN DEDUCTED</u>
A. Painting (Square Feet)	\$ _____	\$ _____
B. Drilled Piers - Drilling, Conc., & Reinf. (Linear Feet)	\$ _____	\$ _____
C. Drilled Piers – Casings (Linear Feet)	\$ _____	\$ _____

SUBSTITUTIONS: The undersigned warrants to the Owner and the Architect by submitting this proposal, that he and all his suppliers and sub-contractors have used the items specified in the Project Manual and as indicated on the Drawings and that each has read and understands the paragraph entitled SUBSTITUTIONS in SECTION 01600 – PRODUCT REQUIREMENTS, in the Project Manual.

EXTRA WORK: The undersigned agrees that, should any change in the work, or extra work, be ordered, where the unit prices set out above are not applicable, the following applicable percentage shall be added to material and labor cost to cover overhead and profit. The contractor acknowledges that these percentages will be a determinant in the award of the contract.

A. Allowance of the Contractor for overhead and profit for extra work performed by the Contractor's own forces:

_____ %

B. Allowance of the Contractor for overhead and profit for extra work performed by a Sub-Contractor and the Contractor's own forces:

_____ %

GUARANTEE: The undersigned furnish herewith guarantee total of base proposal lump sum amount and attaches same to the proposal for the period of sixty (60) days after the schedule closing time for the receipt of the proposals, and that if this proposal is accepted, the undersigned will enter into a formal contract (prepared by the Owner) and that the required performance bond and payment bond will be given. In the event of the withdrawal of this proposal within the period stipulated above, or the failure of the undersigned to enter into a contract and give the required bond within ten (10) days after the undersigned had received notice of the acceptance of this proposal, the undersigned shall be liable to the Owner for the full amount of the guarantee as liquidated damages to the Owner on account of the default of the undersigned.

WAGE SCALE: The undersigned acknowledges the Wage Scale as published in accordance with VCS 5159A and payment of wages in accordance with this scale and statutes are a condition of the contract.

ADDENDA: The undersigned hereby acknowledges receipt of the following listed Addenda to the Drawings and Specifications, all of the provisions and requirements of which Addenda have been taken into consideration in the preparation of the foregoing proposal.

FELONY CONVICTION NOTICE

Senate Bill 1 passed by the State of Texas Legislators, Section 44.034, Notification of Criminal History Subsection (a) states a person or business entity that enters into a contract with a school district must give advance notice to the district if the person or owner or operator of the business entity has been convicted of a felony. The notice must include a general description of the conduct resulting in the conviction of a felony.

Subsection (b) states “a school district may terminate a contract with a person or business entity if the district determines that the person or business entity failed to give notice as required by Subsection (a) or misrepresented the conduct resulting in the conviction. The district must compensate the person or business entity for services performed before the termination of the contract”.

This notice is not required of a publicly held corporation.

I, the undersigned agent for the firm named below, certify that the information concerning notification of felony conviction has been reviewed by me and the following information furnished is true to the best of my knowledge.

Sub-Contractor / Vendor's Name: _____

Authorized company Official's Name: (Please Print) _____

A. My firm is not owned by anyone who has been convicted of a felony nor listed as a sexual predator.

Signature of Company Official: _____

B. My firm is owned by individual(s) who has/have been convicted of a felony or listed as a sexual predator.

Signature of Company Official: _____

Felony: No _____ Yes _____ Details of Conviction: _____

Sexual Predator: No _____ Yes _____ Details of Conviction: _____

C. My firm employees the following individual(s) who has/have not been convicted of a felony or identified as a sexual predator. (Provide a complete list of all employees that will be associated with this project. Provide additional pages as required.

Signature of Company Official: _____

• Name of Employee: _____

Felony: No _____ Yes _____ Details of Conviction: _____

Sexual Predator: No _____ Yes _____ Details of Conviction: _____

• Name of Employee: _____

Felony: No _____ Yes _____ Details of Conviction: _____

Sexual Predator: No _____ Yes _____ Details of Conviction: _____

CERTIFICATION SHEET

All specifications and terms of the Proposal have been read.

Our company accepts the specifications and conditions unless otherwise accepted in writing to the Purchasing Agent, Midwestern State University, 3410 Taft Blvd, Wichita Falls, Texas.

COMPANY NAME:			
MAILING ADDRESS:			
City:	State:	Zip:	
Telephone:	Fax:	Date:	

NAME OF REPRESENTATIVE AUTHORIZED TO SIGN FOR BIDDER:

(Please Print)

(Please Sign)

In order for a proposal to be considered, the following information must be provided. **Failure to complete will result in rejection of the Proposal.**

As defined by Texas House 620, a “nonresident bidder” means a bidder whose principal place of business is not in Texas, but excludes a contractor whose ultimate parent company or majority owner has its principal place of business in Texas.

I certify that my company is a “resident bidder”:

SIGNATURE: _____ **DATE:** _____

IF YOU QUALIFY AS A “nonresident bidder”, you must furnish the following information:

What is your resident state? (The state your principal place of business is located.)

_____ City	_____ State	_____ Zip Code
_____ Name of Company		_____ Address

(a) Does your “residence state” require bidders whose principal place of business is in Texas to underbid bidders whose residence state is the same as yours by a prescribed amount or percentage to receive a comparable contract? “Residence state” means that state in which the principal place of business is located.

YES ☐ NO ☐

(b) What is that amount or percentage? _____ %

I certify that the above information is correct.

Signature Title

(Please Print Name)

This page must be completed and submitted with proposal.

Proposals are to be sent via email or hand delivered to:
Stephen Shelley, Director of Purchasing & Contract Management
3410 Taft Blvd, Daniel Building, Room 202
Wichita Falls, TX 76308
Stephen.shelley@mwsu.edu
940-397-4110

PROPOSE TO PROVIDE AND STATEMENT OF NONCOLLUSION

I / we propose to provide the merchandise and/or services proposed within this document and if awarded the proposal, do agree to abide by all conditions of the proposal. Furthermore, the undersigned affirms that they are truly authorized to execute this contract, that this company, corporation, firm, partnership or individual has not prepared this proposal in collusion with any other Proposer, and that the contents of this proposal as to prices, terms or conditions of said proposal have not been communicated by the undersigned or any employee or agent to any other person engaged in this type of business prior to the official opening of this bid.

Vendor Name

Vendor Address

Signature of Company Representative

Printed Name of Company Representative

Date

This page must be completed and submitted with proposal.

RESPECTFULLY SUBMITTED

CORPORATIONS ONLY FILL IN THE
FOLLOWING:

(Legal name of Corporation)

(State of Incorporation)

(Address)

(Typed Name of Officer)

(Signature of Officer)

(Title of Officer)

(Date)

(Typed Name of Officer)

PROPOSERS (OTHER THAN CORPORATIONS)
FILL IN THE FOLLOWING:

(Legal name of Proposing Firm)

(Address)

(Typed Name of Officer)

(Signature of Officer)

(Title Name of Officer)

(Date)

(Typed Name of Officer)

WITNESS:

(Name of Witness typed in)

(Signature of Witness)

(Address of Witness)

(Date)

(Signature of Proposer, including corporation officer, must be witnessed and proposal dated to be valid)

END OF SECTION

SECTION 00613

**STATUTORY PERFORMANCE BOND PURSUANT TO ARTICLE 5160
OF THE REVISED CIVIL STATUTES OF TEXAS AS
AMENDED BY ACTS OF THE 56TH LEGISLATURE, 1959**

(McGregor Act - Public Works)

(Penalty of this bond must be 100% of Contract amount)

KNOW ALL MEN BY THESE PRESENTS:

That,

.....
(hereinafter called the Principal), as Principal, and
a corporation organized and existing under the laws of the State of....., with its principal office in the
City of (hereinafter called the Surety), as Surety, are held and firmly bound unto

.....
(hereinafter called the Oblige) in the amount of
Dollars (\$.....), for the payment whereof, the said Principal and Surety bind themselves, and their
heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Oblige, dated the day
of, 20, to
which contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW THEREFORE THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall faith-
fully perform the work in accordance with the plans, specifications and contract documents, then this obligation shall
be void; otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Article 5160 of the Revised Civil
Statutes of Texas as amended by Acts of the 56th Legislature, 1959, and all liabilities on this bond shall be determined
in accordance with the provisions of said Article to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this
.....day of20
Witness: (Seal)
..... (Seal)
(If Individual or Firm)
Attest: (Seal)
..... (Seal)
(If Corporation) Principal
.....
Surety
By (Seal)

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**STATUTORY PAYMENT BOND PURSUANT TO ARTICLE 5160
OF THE REVISED CIVIL STATUTES OF TEXAS AS
AMENDED BY ACTS OF THE 56TH LEGISLATURE, 1959**

(McGregor Act - Public Works)

(Penalty of this bond must be 100% of Contract amount)

KNOW ALL MEN BY THESE PRESENTS:

That,
(hereinafter called the Principal), as Principal, and
a corporation organized and existing under the laws of the State of....., with its principal office in the
City of, (hereinafter called the Surety), as Surety, are held and firmly bound unto
.....
(hereinafter called the Obligee) in the amount of
Dollars (\$.....), for the payment whereof, the said Principal and Surety bind themselves, and their
heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated the day
of, 20, to
.....
which contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall
pay all claimants supplying labor and material to him or a subcontractor in the prosecution of the work provided for in
said contract, then , this obligation shall be void; otherwise to remain in full force and effect.

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Article 5160 of the Revised
Civil Statutes of Texas as amended by Acts of the 56th Legislature, 1959, and all liabilities on this bond to all such
claimants shall be determined in accordance with the provisions of said Article to the same extent as if it were copied at
length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this
..... day of20

Witness:(Seal)
.....(Seal)
(If Individual or Firm)

Attest: (Seal)
..... (Seal)
(If Corporation) Principal
.....
Surety

.....By (Seal)

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SECTION 00805

SUPPLEMENTARY GENERAL CONDITIONS

THE "GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION", "UNIFORM GENERAL CONDITIONS" 2005 EDITION AS PUBLISHED BY THE STATE OF TEXAS, INCLUSIVE ARE HEREBY MADE A PART OF THESE SPECIFICATIONS THE SAME AS IF REPRODUCED HERE IN FULL EXCEPT AS MODIFIED, RESCINDED OR SUPPLEMENTED BY THESE SUPPLEMENTARY GENERAL CONDITIONS, WHICH TAKE PRECEDENCE. THOSE PORTIONS OF THE GENERAL CONDITIONS WHICH ARE NOT ALTERED BY THESE SUPPLEMENTARY GENERAL CONDITIONS SHALL REMAINING EFFECT AS PUBLISHED.

ARTICLE 1 – DEFINITIONS:

ARCHITECT/ENGINEER: Shall refer to: Holzman Moss Bottino Architect (Architect of Record); Phone: 212-465-0808; Contact: Doug Moss, Project Architect at tdmoss@holzmanmossbottino.com or Ermira Kasapi, Project Manager, at ekasapi@holzmanmossbotlino.com; and Harper Perkins Architects Inc. (Associate Architect); Phone: (940) 767-1421; Fax: (940) 397-0273; contact Glenda Ramsey, at gramsey@harperperkins.com or Sam Kenshalo, at skenshalo@harperperkins.com;

- 1.9 CONTRACTOR: The Contractor is the CM@R, M & F Litteken Company, located at 1804 East Scott, Wichita Falls, Texas 76301; Phone Number: 940-766-4442; Email: Kevin Darnell, kevin@mflitteken.com.

ARTICLE 2 – LAWS GOVERNING CONSTRUCTION

- 2.2 WAGE RATES: The Wage Rates Determination is included in the Project Manual.

ARTICLE 3 – GENERAL RESPONSIBILITIES OF OWNERS AND CONTRACTORS

- 3.1.1.1 PRE-BID CONFERENCE: A Pre-Bid Conference will be held on Thursday, March 29, 2018 from 10:00 a.m. to 12:00 p.m. and Friday, April 6, 2018 from 11:00 a.m. to 12:50 p.m., both at Bolin Hall, Room 103 on the MSU Campus.

ARTICLE 4 – HISTORICALLY UNDERUTILIZED BUSINESS (HUB) SUBCONTRACTING PLAN

- 4.1 GENERAL DESCRIPTION: Specific attention is called to Article 4 for HUB Plan.

ARTICLE 5 – BONDS AND INSURANCE

- 5.2.2.1.6 "UMBRELLA" LIABILITY INSURANCE - The amount of Umbrella Liability Insurance shall not be less than \$2,000,000.00.

END OF SECTION

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SECTION 00810

WAGE DETERMINATION

General Decision Number: TX180326 02/09/2018 TX326

Superseded General Decision Number: TX20170326

State: Texas

Construction Type: Building

County: Wichita County in Texas.

BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

Note: Under Executive Order (EO) 13658, an hourly minimum wage of \$10.35 for calendar year 2018 applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2015. If this contract is covered by the EO, the contractor must pay all workers in any classification listed on this wage determination at least \$10.35 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in calendar year 2018. The EO minimum wage rate will be adjusted annually. Please note that this EO applies to the above-mentioned types of contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but it does not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(2)-(60). Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/05/2018
1	02/09/2018

BOIL0074-003 01/01/2017

	Rates	Fringes
BOILERMAKER.....	\$ 28.00	22.35

* ELEC0681-002 01/01/2018

	Rates	Fringes
ELECTRICIAN		
Excluding Low Voltage		
Wiring.....	\$ 20.13	4.25%+\$7.30
Low Voltage Wiring Only.....	\$ 20.13	4.25%+\$7.30

ENGI0178-005 06/01/2014

	Rates	Fringes
POWER EQUIPMENT OPERATOR		
(1) Tower Crane.....	\$ 29.00	10.60
(2) Cranes with Pile Driving or Caisson Attachment and Hydraulic Crane 60 tons and above.....	\$ 28.75	10.60
(3) Hydraulic cranes 59 Tons and under.....	\$ 27.50	10.60

IRON0084-011 06/01/2017

	Rates	Fringes
IRONWORKER, ORNAMENTAL.....	\$ 23.27	7.12

PLUM0404-001 07/01/2016

	Rates	Fringes
PLUMBER.....	\$ 25.91	9.40

SUTX2014-052 07/21/2014

	Rates	Fringes
BRICKLAYER.....	\$ 20.04	0.00
CARPENTER (Acoustical Ceiling Installation Only).....	\$ 14.00	0.00
CARPENTER, Excludes Acoustical Ceiling Installation, and Form Work.....	\$ 13.02	0.56
CEMENT MASON/CONCRETE FINISHER...	\$ 15.32	0.00
FORM WORKER.....	\$ 13.99	0.23
INSULATOR - MECHANICAL (Duct, Pipe & Mechanical System Insulation).....	\$ 19.77	7.13
IRONWORKER, REINFORCING.....	\$ 12.27	0.00
IRONWORKER, STRUCTURAL.....	\$ 22.16	5.26
LABORER: Common or General.....	\$ 10.05	0.00
LABORER: Mason Tender - Brick...	\$ 11.36	0.00
LABORER: Mason Tender - Cement/Concrete.....	\$ 10.58	0.00

LABORER: Pipelayer.....	\$ 12.49	2.13
LABORER: Roof Tearoff.....	\$ 11.28	0.00
OPERATOR:		
Backhoe/Excavator/Trackhoe.....	\$ 14.25	0.00
OPERATOR: Bobcat/Skid		
Steer/Skid Loader.....	\$ 13.93	0.00
OPERATOR: Bulldozer.....	\$ 18.29	1.31
OPERATOR: Drill.....	\$ 16.22	0.34
OPERATOR: Forklift.....	\$ 14.83	0.00
OPERATOR: Grader/Blade.....	\$ 13.37	0.00
OPERATOR: Loader.....	\$ 13.55	0.94
OPERATOR: Mechanic.....	\$ 17.52	3.33
OPERATOR: Paver (Asphalt,		
Aggregate, and Concrete).....	\$ 16.03	0.00
OPERATOR: Roller.....	\$ 12.70	0.00
PAINTER (Brush, Roller, and		
Spray).....	\$ 14.45	0.00
PIPEFITTER.....	\$ 25.80	8.55
ROOFER.....	\$ 13.75	0.00
SHEET METAL WORKER (HVAC Duct		
Installation Only).....	\$ 22.73	7.52
SHEET METAL WORKER, Excludes		
HVAC Duct Installation.....	\$ 21.13	6.53
TILE FINISHER.....	\$ 11.22	0.00
TILE SETTER.....	\$ 14.74	0.00
TRUCK DRIVER: Dump Truck.....	\$ 12.39	1.18
TRUCK DRIVER: Flatbed Truck.....	\$ 19.65	8.57
TRUCK DRIVER: Semi-Trailer		
Truck.....	\$ 12.50	0.00
TRUCK DRIVER: Water Truck.....	\$ 12.00	4.11

WELDERS - Receive rate prescribed for craft performing
operation to which welding is incidental.

=====

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is a union rate (current union negotiated rate for local), a survey rate (weighted average rate) or a union average rate (weighted union average rate).

Union Rate Identifiers

A four letter classification abbreviation identifier enclosed in dotted lines beginning with characters other than "SU" or "UAVG" denotes that the union classification and rate were prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2014. PLUM is an abbreviation identifier of the union which prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. 07/01/2014 is the effective date of the most current negotiated rate, which in this example is July 1, 2014.

Union prevailing wage rates are updated to reflect all rate

changes in the collective bargaining agreement (CBA) governing this classification and rate.

Survey Rate Identifiers

Classifications listed under the "SU" identifier indicate that no one rate prevailed for this classification in the survey and the published rate is derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As this weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SULA2012-007 5/13/2014. SU indicates the rates are survey rates based on a weighted average calculation of rates and are not majority rates. LA indicates the State of Louisiana. 2012 is the year of survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. 5/13/2014 indicates the survey completion date for the classifications and rates under that identifier.

Survey wage rates are not updated and remain in effect until a new survey is conducted.

Union Average Rate Identifiers

Classification(s) listed under the UAVG identifier indicate that no single majority rate prevailed for those classifications; however, 100% of the data reported for the classifications was union data. EXAMPLE: UAVG-OH-0010 08/29/2014. UAVG indicates that the rate is a weighted union average rate. OH indicates the state. The next number, 0010 in the example, is an internal number used in producing the wage determination. 08/29/2014 indicates the survey completion date for the classifications and rates under that identifier.

A UAVG rate will be updated once a year, usually in January of each year, to reflect a weighted average of the current negotiated/CBA rate of the union locals from which the rate is based.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests

for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF SECTION

SECTION 003132

GEOTECHNICAL REPORT

Geotechnical Evaluation Report

Midwestern State University - Moffett Library Elevator Shaft
3410 Taft Boulevard
Wichita Falls, TX

Prepared for

Midwestern State University



SHANE NANCE, P.E.

Shane Nance, P.E.
Business Unit Manager – Senior Engineer
License Number: 81519
February 28, 2018

Project B1800667

Braun Intertec Corporation
TBPE Firm Registration No. F-12228

February 28, 2018

Project B1800667

Kyle Owen
Midwestern State University
3410 Taft Boulevard
Wichita Falls, TX 76308
940.397.4110
Kyle.owen@mwsu.edu

Re: Geotechnical Evaluation
Midwestern State University (MSU) – Moffett Library Elevator Shaft
3410 Taft Boulevard
Wichita Falls, TX

Dear Mr. Owen:

We are pleased to present this Geotechnical Evaluation Report for the referenced site.

Thank you for making Braun Intertec your geotechnical consultant for this project. If you have questions about this report or if there are other services that we can provide in support of our work to date please contact Shane Nance at 806.677.0600 (snance@braunintertec.com).

Sincerely,

BRAUN INTERTEC CORPORATION
TBPE Firm Registration No. F-12228



Shane Nance, P.E.
Principal, Business Unit Manager – Senior Engineer



S. Brent McNeme, P.E.
Associate Principal – Senior Engineer

Table of Contents

Description	Page
A. Introduction	1
A.1. Project Description	1
A.2. Purpose	1
A.3. Scope of Services	2
B. Results.....	2
B.1. Geologic Overview	2
B.2. Laboratory Test Results	3
C. Recommendations	4
C.1. Design and Construction Discussion.....	4
C.1.a. Foundation-Type Building Support.....	4
C.1.b. Existing Soil Conditions	4
C.1.c. Groundwater.....	4
C.1.d. Construction Disturbance	4
C.1.e. Weather	5
C.2. Site Grading and Subgrade Preparation	5
C.2.a. Building Subgrade Preparation	5
C.2.b. Excavation Oversizing	5
C.2.c. Excavated Slopes.....	6
C.2.d. Fill Materials and Compaction	7
C.2.e. Inspections of Soils	7
C.3. Spread Footings	8
C.4. Walls Above or Below Grade	8
C.4.a. Backfill.....	8
C.4.b. Loading Considerations.....	9
C.5. Utilities	9
C.5.a. Subgrade Stabilization	9
C.6. Equipment Support.....	10
C.7. Seismic Site Classification	10
D. Procedures.....	10
D.1. Test Boring.....	10
D.2. Exploration Log	10
D.3. Material Classification and Testing.....	11
D.3.a. Visual and Manual Classification	11
D.3.b. Laboratory Testing.....	11
D.4. Groundwater Measurements	11
E. Qualifications	11
E.1. Variations in Subsurface Conditions	11
E.1.a. Material Strata	11
E.1.b. Groundwater Levels.....	12
E.2. Continuity of Professional Responsibility	12
E.2.a. Plan Review.....	12
E.2.b. Construction Observations and Testing.....	12
E.3. Use of Report	13
E.4. Standard of Care	13

Appendix

Soil Boring Location Sketch

Log of Boring Sheet ST-1

Descriptive Terminology of Soil

A. Introduction

A.1. Project Description

This Geotechnical Evaluation Report addresses the design and construction of the proposed new elevator shaft for Midwestern University – Moffett Library. The site is located on the SW corner of the intersection of Comanche Trail and Taft Boulevard in Wichita Falls, TX. Figure 1 below shows an illustration of the proposed site location.

Figure 1. Site Location

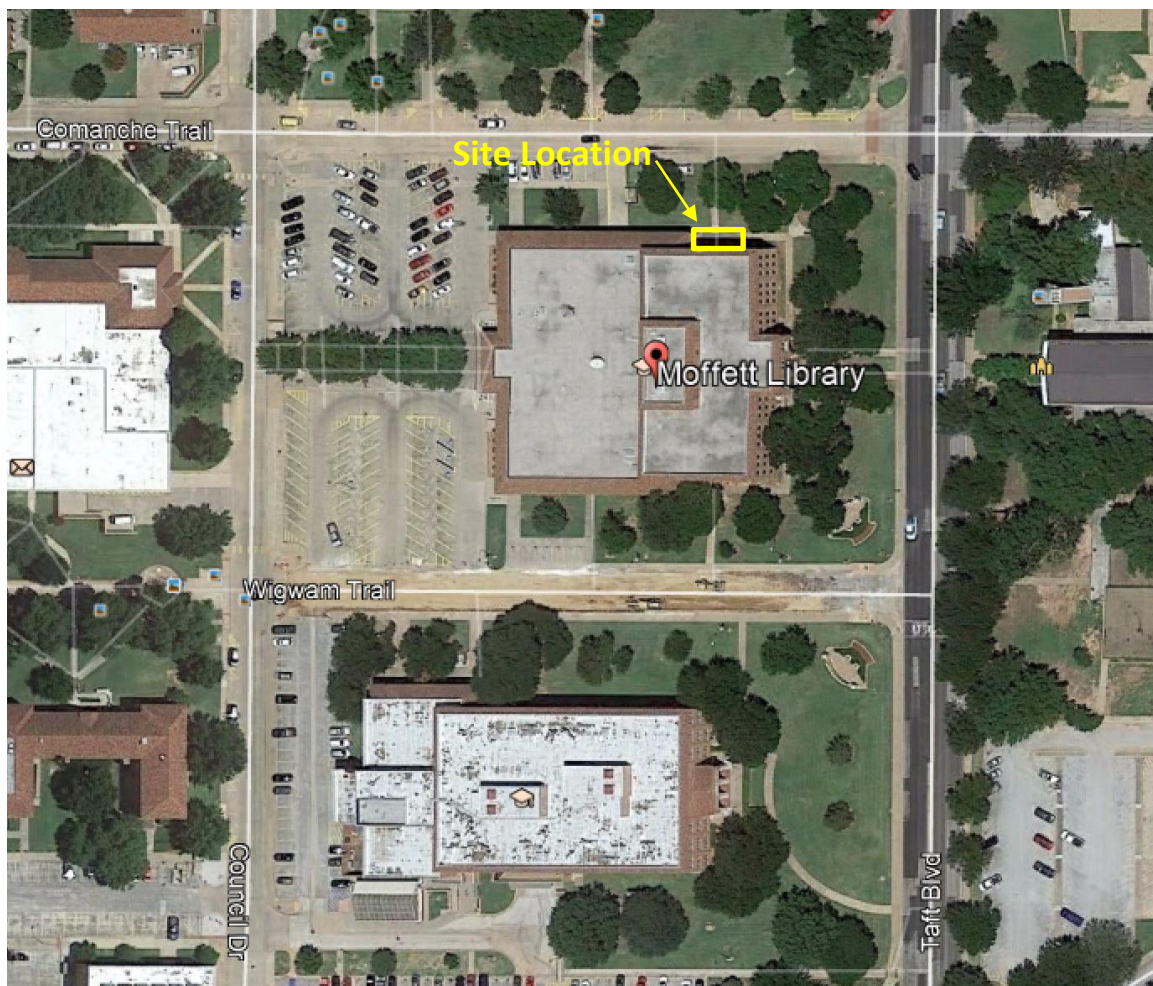


Figure provided by Google Earth.

A.2. Purpose

The purpose of our geotechnical evaluation will be to characterize the subsurface geologic conditions at this site and evaluate the impact on the design and construction of the project.

A.3. Scope of Services

We performed our scope of services for the project in accordance with our Proposal QTB072020 to Mr. Kyle Owen of Midwestern State University, dated January 19, 2018, and authorized on January 24, 2018. The following list describes the geotechnical tasks completed in accordance with our authorized scope of services.

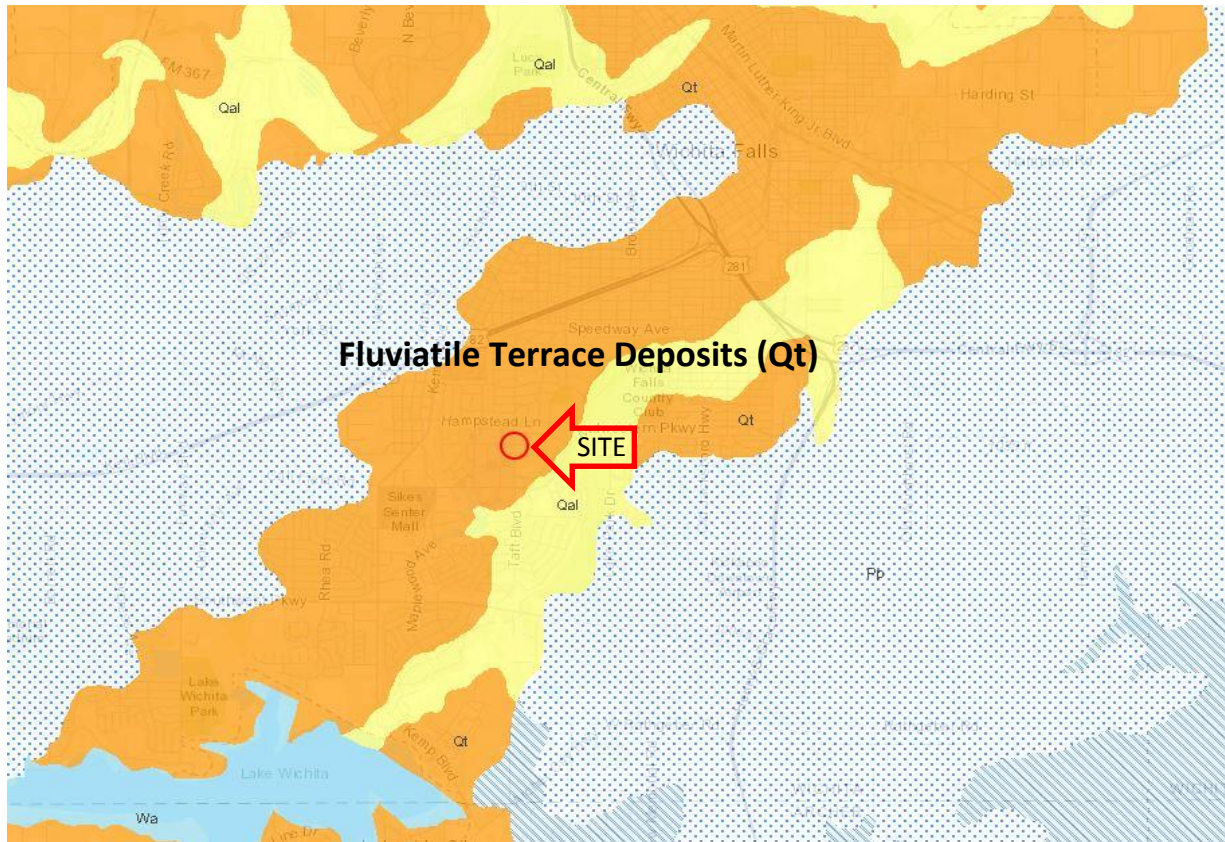
- Coordinating the staking and clearing the exploration location of underground utilities. We selected and staked the exploration location using handheld GPS technology. The Soil Boring Location Sketch included in the Appendix shows the approximate location of the boring.
- Performing 1 soil boring, denoted as ST-1, extending to a depth of 30 feet below existing grade.
- Performing semi-continuous sampling to a depth of 10 feet, and at 5-foot intervals at greater depths in general accordance with American Society for Testing and Materials (ASTM) D1586.
- Performing laboratory testing on select samples to aid in soil classification and engineering analysis.
- Perform engineering analysis including estimation of potential vertical rises and foundation bearing capacity analysis.
- Preparing this report containing the findings of our field exploration, laboratory testing and engineering recommendations.

B. Results

B.1. Geologic Overview

Based upon our review of available geologic resources, Figure 2 shows the site is underlain by Fluvatile Terrace Deposits (Qt). Fluvatile Terrace Deposits consists of mainly clay, gravel, sand and silt in various proportions with gravel being more predominant in older, higher terrace deposits. These deposits are locally indurated with calcium carbonate (caliche) in terraces along streams.

Figure 2. Geologic Map



<http://txpub.usgs.gov/DSS/texasgeology>

We based the geologic origins used in this report on the soil types and available common knowledge of the geological history of the site. We did not perform a detailed investigation of the geologic history for the site.

B.2. Laboratory Test Results

The boring log shows the results of Moisture Content (ASTM D2216), Atterberg Limits (ASTM D4318), and Percent Finer than No. 200 sieve (ASTM D1140) tests we performed, next to the tested sample depth. We performed the tests in general accordance with ASTM procedures. The Appendix contains the results of these tests.

The moisture content of the tested samples varied from approximately 13 to 21 percent. Liquid limits determined for the soils ranged from 22 to 42; plasticity index values ranged from 8 to 26 indicating a wide range of materials located on the site. Atterberg limit testing is necessary to confirm the classification of the subsoils encountered at various depths in the boring and provide an indication of

the relative strength, the potential for volumetric expansion and contraction with respect to changes in moisture content, and compressibility of the subsoils. These results of Atterberg Limit testing within the scope of this project indicate that the soils tested have a low to high expansive potential.

C. Recommendations

C.1. Design and Construction Discussion

C.1.a. Foundation-Type Building Support

Based on the results of our subsurface exploration and evaluation, a spread footing foundation should provide adequate support for the loads associated with the elevator shaft. Refer to the following text for site grading and subgrade preparations, and foundation design recommendations.

C.1.b. Existing Soil Conditions

The current site stratigraphy consists of lean clays over sand. These soils typically have good strength properties when maintained in a dry condition. A free swell test performed on the soil from a depth of 12 feet indicates the existing soils exhibit the potential to swell as much as 0.3 percent (in-situ condition).

C.1.c. Groundwater

While drilling, groundwater was encountered at 19 feet in the boring. The on-site soils will collect water from precipitation or if water drains to the site. We recommend the contractor remove any water that collects in work areas before performing further work. Groundwater conditions may be different at the time of construction. Groundwater conditions may vary because of seasonal variations in rainfall, landscape irrigation and runoff.

C.1.d. Construction Disturbance

The contractor should note the on-site soils are highly susceptible to disturbance, due to repeated construction traffic. Disturbance of these soils may cause areas that were previously prepared, or that were suitable for structure support, to become unstable and require compaction. Subcutting and replacing the disturbed material with crushed, coarse gravel, free of fines is also an alternative. The contractor should use means and methods to limit disturbance of the soils.

C.1.e. Weather

To account for potential rainfall during construction, we recommend maintaining construction grades to intercept surface water flow into the area and drain water from the area to an appropriate collection point. After grading, the contractor should compact the soil surface with a smooth drum roller to

attempt to lower infiltration. After rain events, the contractor should limit construction traffic until the surface is dry enough that traffic will not mix accumulated surface water into lower portions of the soil.

C.2. Site Grading and Subgrade Preparation

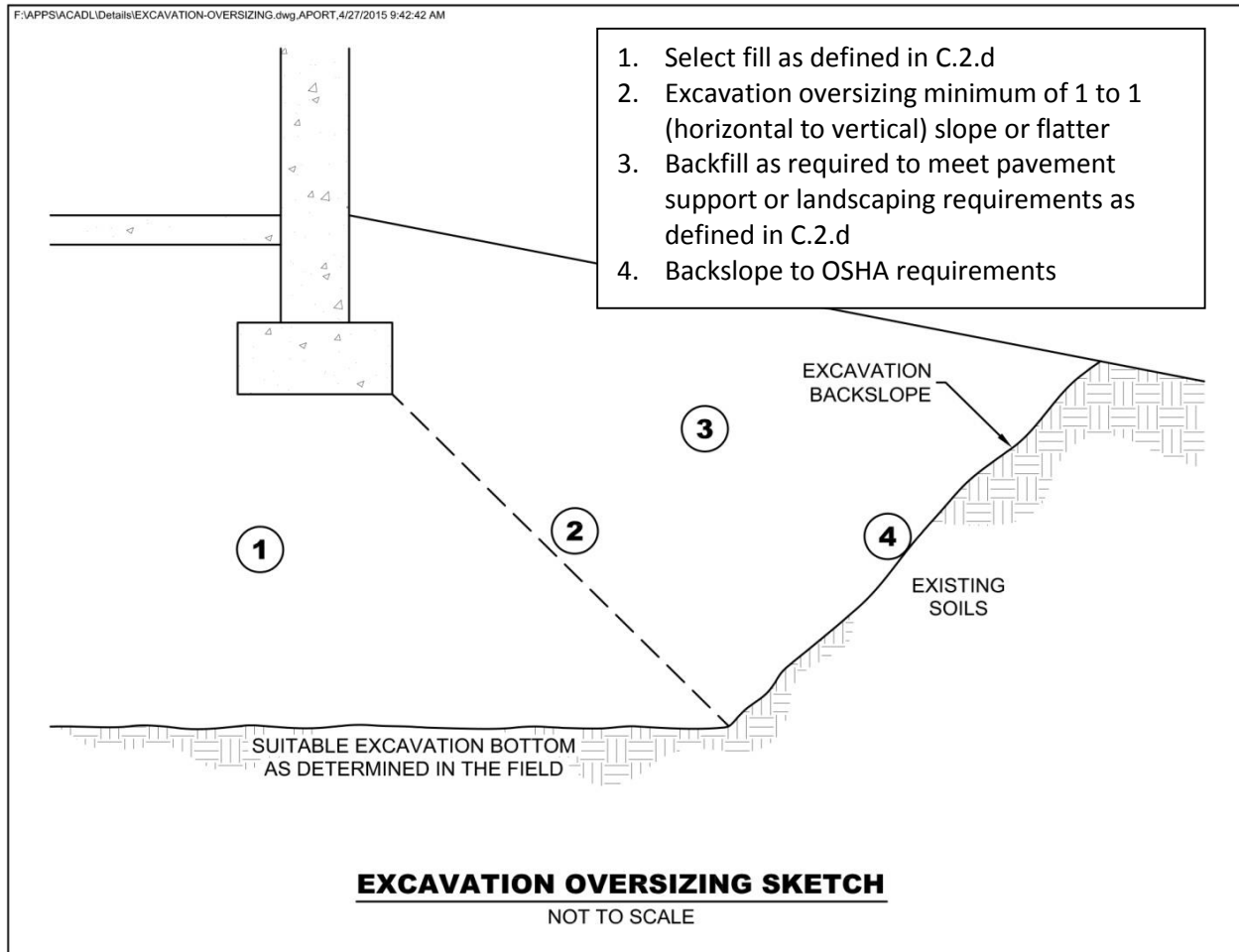
C.2.a. Building Subgrade Preparation

We recommend removing vegetation, loose topsoil, construction debris and other deleterious material from the elevator shaft area. The existing soils, under the proposed elevator shaft footprint, should be removed to the bottom of the proposed footings. After removal of existing soils, we recommend compacting the exposed subgrade to 95% Standard Proctor Density (ASTM D698), at -1% to +3% of optimum moisture.

C.2.b. Excavation Oversizing

When removing materials below structures, we recommend the excavation extend outward and downward at a slope of 1H:1V (horizontal:vertical) or flatter. See Figure 3 for an illustration of excavation oversizing.

Figure 3. Generalized Illustration of Oversizing



C.2.c. Excavated Slopes

Based on the boring, we anticipate on-site soils in excavations will consist of clay. These soils are typically considered Type B Soil under OSHA (Occupational Safety and Health Administration) guidelines. OSHA guidelines indicate unsupported excavations in Type B soils should have a gradient no steeper than 1H:1V (45°). Slopes constructed in this manner may still exhibit surface sloughing. OSHA requires an engineer to evaluate slopes or excavations over 20 feet in depth.

An OSHA-approved qualified person should review the soil classification in the field. Excavations must comply with the requirements of OSHA 29 CFR, Part 1926, Subpart P, "Excavations and Trenches". This document states excavation safety is the responsibility of the contractor. The project specifications should reference these OSHA requirements.

C.2.d. Fill Materials and Compaction

Table 1 below contains our recommendations for fill materials.

Table 1. Fill Materials

Locations To Be Used	Fill Classification	Possible Soil Type Descriptions	Gradation	Additional Requirements
Below Structures and Pavement	Select fill	SC, CL	1. 100% passing 3-inch sieve 2. 65% maximum passing No. 200 sieve	1. Liquid Limit <35 2. Plasticity Index between 7 and 15 3. < 2% Organic Content
Below landscaped surfaces, where subsidence is not a concern	Non-select fill	—	100% passing 6-inch sieve	< 10% OC

We recommend spreading fill/existing soil in loose lifts of approximately 8 inches thick and compacting the soils in accordance with the criteria presented below in Table 2. The project documents should specify compaction specification of fill, based on the structure located above the fill, and vertical proximity to that structure.

Table 2. Compaction Recommendations Summary

Reference	Recommended Compaction, percent (ASTM D698 – Standard Proctor)	Moisture Content Variance from Optimum, percentage points
Native soils below structures, pavement and oversizing zones	95	-1 to +3
Select fill soils below structures, pavement and oversizing zones	95	-1 to +3
Below landscaped surfaces	90	-1 to +3

We recommend performing density tests in fill to evaluate if the contractors are effectively compacting the soil and meeting project requirements.

C.2.e. Inspections of Soils

We recommend including the site grading and placement of soil within the building pad under the direction of a licensed Geotechnical Engineer. Inspection requires observation of soil conditions below fill or footings, evaluations to determine if excavations extend to the anticipated soils, and if fill materials meet requirements for type of fill and compaction condition of fill. A licensed geotechnical engineer should direct the inspections of site grading and fill placement. The purpose of these

inspections is to evaluate whether the work is in accordance with the approved Geotechnical Report for the project. Special inspections should include evaluation of the subgrade, observing preparation of the

subgrade (surface compaction or dewatering, excavation oversizing, placement procedures and materials used for fill, etc.) and compaction testing of the fill.

C.3. Spread Footings

Table 3 contains our recommended parameters for a spread footing foundation design. The spread footing should be placed at least 5 feet below existing grade.

Table 3. Recommended Spread Footing Design Parameters

Item	Description
Maximum net allowable bearing pressure (psf) Spread footings (minimum depth of 5 feet)	2,500
Minimum factor of safety for bearing capacity failure	3.0
Total estimated settlement (inches)	Less than 1 inch
Differential settlement	Typically about 2/3 of total settlement*

* Actual differential settlement amounts will depend on final loads and foundation layout.

For existing soils, the recommended allowable passive resistance is 165 psf/ft (triangular earth pressure distribution) and an allowable coefficient of friction equal to 0.30 is recommended for evaluating sliding resistance.

C.4. Walls Above or Below Grade

C.4.a. Backfill

Generally, a free-draining backfill is preferable to one that is relatively impervious, as the free-draining material will allow a less rigid wall design. Surface water should be precluded from entering the free-draining backfill, to prevent backfill erosion, piping, and development of “undrained” conditions. Stem walls should be designed for “at-rest” conditions, as these features will be restrained at the top and bottom. Retaining walls should be designed for “active” conditions.

Washed, granular backfill (with lower lateral pressures) should certainly be considered. This decision should be based upon a cost comparison of combinations of backfill and structural rigidity of walls, which should require evaluation by the structural engineer. Table 4 provides equivalent fluid pressure

values for several soil types and loading cases. Lean clay (CL) and fat clay (CH) soils should not be placed and compacted for backfill.

Regardless of whether on-site soils are used, the active zone behind the wall should be backfilled with a free-draining material, and designed for that condition. In this case, backfill should be protected from entry of runoff through aggressive, positive grading design, and with back-wall drainage. Positive drainage of walls is recommended to prevent development of additional hydrostatic pressure behind the wall. Special handling of irrigation runoff to avoid “water-logging” the backfill is also advised. To prevent the development of excess lateral stresses, the backfill placed against the walls should be placed in thin lifts compacted with hand-operated equipment.

Table 4. Recommended Equivalent Fluid Pressure

Strata	Equivalent Fluid Pressure (Drained)	
	At-rest (rigid), pcf	Active (flexible), pcf
Low Swell Potential Select Fill	70	50
Granular Backfill Material	55	35

C.4.b. Loading Considerations

For walls subjected entirely to soil loading (no water in the backfill), the normal earth pressure diagram is triangular. Surcharge loads such as vehicular traffic, construction equipment, or other anticipated requirements should be added to the pressure diagram.

C.5. Utilities

C.5.a. Subgrade Stabilization

Earthwork activities associated with utility installations located inside the building footprint should adhere to the recommendations in Section C.1.

For exterior utilities, we anticipate the soils at typical invert elevations will be suitable for utility support. However, if construction encounters unfavorable conditions, the unsuitable soils may require some

additional subcutting and replacement with sand or crushed rock to prepare a proper subgrade for pipe support. Project design and construction should not place utilities within the 1H:1V oversizing of foundations.

C.6. Equipment Support

The recommendations included in the report may not be applicable to equipment used for the construction and maintenance of this project. We recommend evaluating subgrade conditions in areas of shoring, scaffolding, cranes, pumps, lifts and other construction equipment prior to mobilization to determine if the exposed materials are suitable for equipment support, or require some form of subgrade improvement. We also recommend project planning consider the effect that loads applied by such equipment may have on structures they bear on or surcharge – including pavements, buried utilities, below-grade walls, etc. We can assist you in this evaluation.

C.7. Seismic Site Classification

Due to project budget limitation, we did not perform a 100-foot deep boring recommended in the International Building Code (IBC) for seismic site classification. We conservatively assumed the overburden soil consistency continues below the bottom of the boring. Based on the soil boring data and pertinent reference materials, this site meets the criteria for Site Class D as defined in Table 1613.5.2 of Chapter 16 of the 2015 IBC.

D. Procedures

D.1. Test Boring

We drilled the boring with a truck-mounted auger drill. We performed the boring in general accordance with ASTM D1586 taking samples semi-continuously to a depth of 10 feet and then 5-foot intervals thereafter. The boring log shows the actual sample intervals and corresponding depths.

D.2. Exploration Log

The Appendix includes a Log of Boring sheet for our test boring. The log identifies and describes the penetrated geologic materials, and presents the results of penetration resistance and other in-situ tests

performed. The log also presents the results of laboratory tests performed on test samples, and groundwater measurements.

We inferred strata boundaries from changes in the test samples and the auger cuttings. Because we did not perform continuous sampling, the strata boundary depths are only approximate. The boundary

depths likely vary away from the boring location, and the boundaries themselves may occur as gradual rather than abrupt transitions.

D.3. Material Classification and Testing

D.3.a. Visual and Manual Classification

We visually and manually classified the geologic materials encountered in accordance with ASTM D2488. The Appendix includes a chart explaining the classification system.

D.3.b. Laboratory Testing

The exploration log in the Appendix note most of the results of the laboratory tests performed on geologic material samples. We performed the tests in general accordance with ASTM or AASHTO procedures.

D.4. Groundwater Measurements

The drillers checked for groundwater while advancing the test boring, and again after auger withdrawal. We then filled the borehole as noted on the boring log.

E. Qualifications

E.1. Variations in Subsurface Conditions

E.1.a. Material Strata

We developed our evaluation, analyses and recommendations from a limited amount of site and subsurface information. It is not standard engineering practice to retrieve material samples from exploration locations continuously with depth. Therefore, we must infer strata boundaries and thicknesses to some extent. Strata boundaries may also be gradual transitions, and project planning should expect the strata to vary in depth, elevation and thickness, away from the exploration locations.

Variations in subsurface conditions present between exploration locations may not be revealed until performing additional exploration work, or starting construction. If future activity for this project reveals any such variations, you should notify us so that we may reevaluate our recommendations. Such variations could increase construction costs, and we recommend including a contingency to accommodate them.

E.1.b. Groundwater Levels

We made groundwater measurements under the conditions reported herein and shown on the exploration log, and interpreted in the text of this report. Note that the observation periods were

relatively short, and project planning can expect groundwater levels to fluctuate in response to rainfall, flooding, irrigation, seasonal freezing and thawing, surface drainage modifications and other seasonal and annual factors.

E.2. Continuity of Professional Responsibility

E.2.a. Plan Review

We based this report on a limited amount of information, and we made a number of assumptions to help us develop our recommendations. We should be retained to review the geotechnical aspects of the designs and specifications. This review will allow us to evaluate whether we anticipated the design correctly, if any design changes affect the validity of our recommendations, and if the design and specifications correctly interpret and implement our recommendations.

E.2.b. Construction Observations and Testing

We recommend retaining us to perform the required observations and testing during construction as part of the ongoing geotechnical evaluation. This will allow us to correlate the subsurface conditions exposed during construction with those encountered by the boring and provide professional continuity from the design phase to the construction phase. If we do not perform observations and testing during construction, it becomes the responsibility of others to validate the assumption made during the preparation of this report and to accept the construction-related geotechnical engineer-of-record responsibilities.

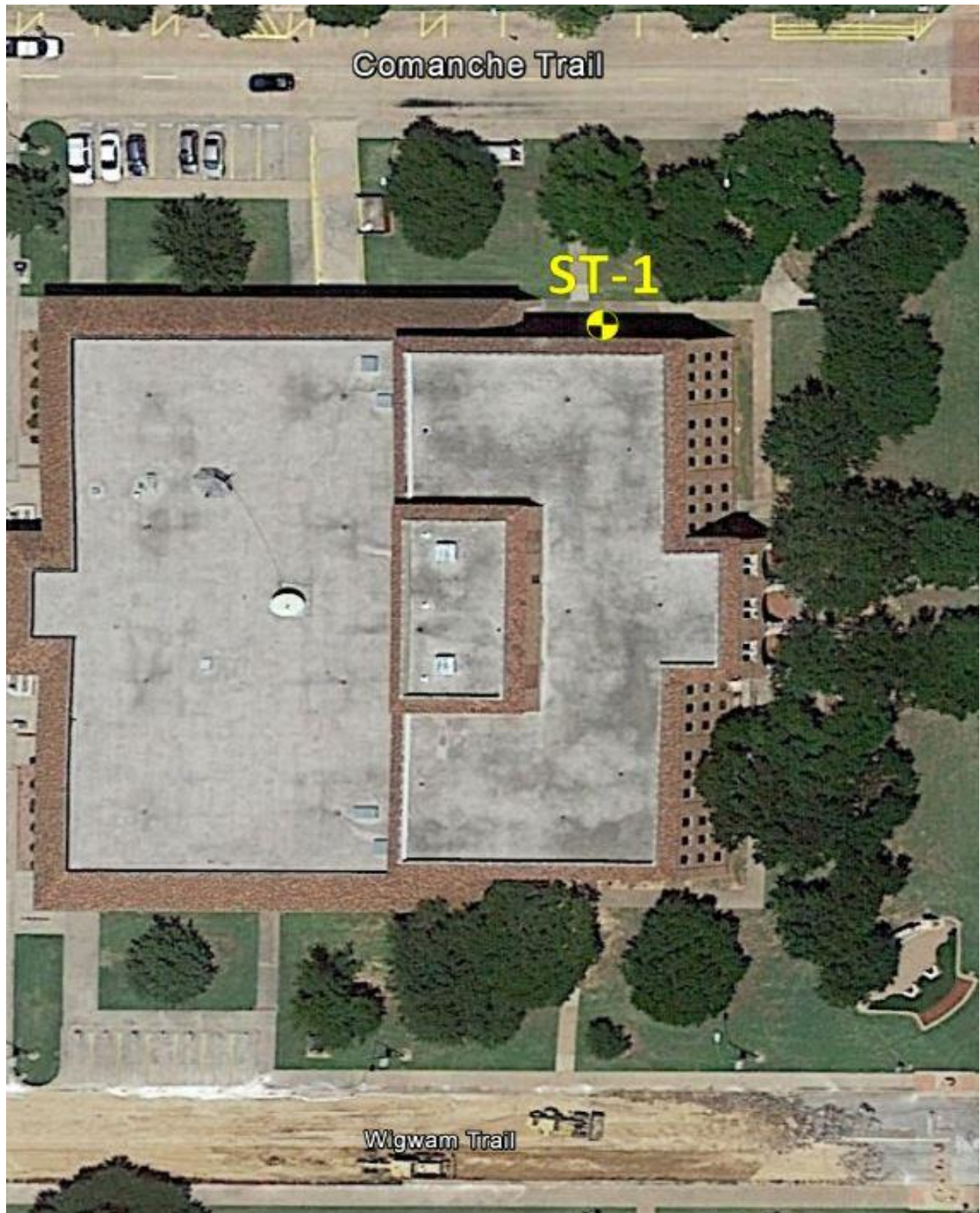
E.3. Use of Report

This report is for the exclusive use of the addressed parties. Without written approval, we assume no responsibility to other parties regarding this report. Our evaluation, analyses and recommendations may not be appropriate for other parties or projects.

E.4. Standard of Care

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

Appendix



BRAUN
INTERTEC

PLAN OF BORING
MSU-Moffett Library Elevator Shaft
3410 Taft Boulevard
Wichita Falls, TX

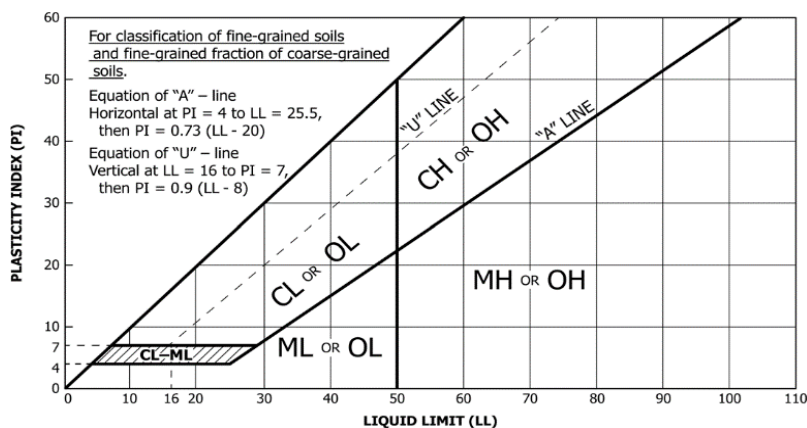
INT	DATE	SHEET
DRAWN BY: JG	2/26/2018	1
APP'D BY: SN	2/26/2018	OF
JOB NO. B1800667		1
DWG. NO.	FIGURE NO.	
SCALE No Scale	1	

(See Descriptive Terminology sheet for explanation of abbreviations)

Braun Project B1800667 GEOTECHNICAL EVALUATION Moffett Library Elevator Shaft 3410 Taft Blvd. Wichita Falls, Texas						BORING: ST-1 LOCATION: See Attached Sketch									
DRILLER: B. Faulkner			METHOD: Solid Stem Auger			DATE: 1/25/18			SCALE: 1" = 5'						
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	DD pcf	LL	PL	PI	P200 %	Tests or Notes			
100.0	0.0	CL	LEAN CLAY, dark brown, stiff												
			- very stiff below 3.5 ft	11		14									
94.5	5.5	CL	SANDY LEAN CLAY, reddish yellow, very stiff	19				40	14	26	89				
			- reddish brown, stiff below 8.5 ft	27		13									
				14				29	15	14	68				
81.5	18.5	SW-SC	WELL-GRADED SAND with CLAY, brown, medium dense	9		16									
				17	▽			22	14	8	11				
				17		21									
70.0	30.0		- dense below 28.5 ft	37				42	23	19	11				
END OF BORING. Water was observed at a depth of 19 feet while drilling. Boring immediately backfilled. Elevations not provided. A datum of 100 was set as the existing ground surface at each boring															

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^A					Soil Classification	
					Group Symbol	Group Name ^B
Coarse-grained Soils (more than 50% retained on No. 200 sieve)	Gravels (More than 50% of coarse fraction retained on No. 4 sieve)	Clean Gravels (Less than 5% fines ^C)	$C_u \geq 4$ and $1 \leq C_c \leq 3^D$	GW	Well-graded gravel ^E	
			$C_u < 4$ and/or ($C_c < 1$ or $C_c > 3$) ^D	GP	Poorly graded gravel ^E	
		Gravels with Fines (More than 12% fines ^C)	Fines classify as ML or MH	GM	Silty gravel ^{EFG}	
			Fines Classify as CL or CH	GC	Clayey gravel ^{EFG}	
	Sands (50% or more coarse fraction passes No. 4 sieve)	Clean Sands (Less than 5% fines ^H)	$C_u \geq 6$ and $1 \leq C_c \leq 3^D$	SW	Well-graded sand ^I	
			$C_u < 6$ and/or ($C_c < 1$ or $C_c > 3$) ^D	SP	Poorly graded sand ^I	
		Sands with Fines (More than 12% fines ^H)	Fines classify as ML or MH	SM	Silty sand ^{FGI}	
			Fines classify as CL or CH	SC	Clayey sand ^{FGI}	
Fine-grained Soils (50% or more passes the No. 200 sieve)	Silts and Clays (Liquid limit less than 50)	Inorganic	PI > 7 and plots on or above "A" line ^J	CL	Lean clay ^{KLM}	
			PI < 4 or plots below "A" line ^J	ML	Silt ^{KLM}	
		Organic	Liquid Limit – oven dried Liquid Limit – not dried < 0.75	OL	Organic clay ^{KLMN} Organic silt ^{KLMQ}	
	Silts and Clays (Liquid limit 50 or more)	Inorganic	PI plots on or above "A" line	CH	Fat clay ^{KLM}	
			PI plots below "A" line	MH	Elastic silt ^{KLM}	
		Organic	Liquid Limit – oven dried Liquid Limit – not dried < 0.75	OH	Organic clay ^{KLMP} Organic silt ^{KLMQ}	
Highly Organic Soils		Primarily organic matter, dark in color, and organic odor			PT	Peat

- A. Based on the material passing the 3-inch (75-mm) sieve.
B. If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
C. Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay
D. $C_u = D_{60} / D_{10}$ $C_c = (D_{30})^2 / (D_{10} \times D_{60})$
E. If soil contains $\geq 15\%$ sand, add "with sand" to group name.
F. If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.
G. If fines are organic, add "with organic fines" to group name.
H. Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay
I. If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.
J. If Atterberg limits plot in hatched area, soil is CL-ML, silty clay.
K. If soil contains 15 to < 30% plus No. 200, add "with sand" or "with gravel", whichever is predominant.
L. If soil contains $\geq 30\%$ plus No. 200, predominantly sand, add "sandy" to group name.
M. If soil contains $\geq 30\%$ plus No. 200 predominantly gravel, add "gravelly" to group name.
N. $PI \geq 4$ and plots on or above "A" line.
O. $PI < 4$ or plots below "A" line.
P. PI plots on or above "A" line.
Q. PI plots below "A" line



Laboratory Tests			
DD	Dry Density, pcf	OC	Organic content, %
WD	Wet Density, pcf	q_p	Pocket penetrometer strength
P200	% Passing #200 sieve	MC	Moisture content, %

Particle Size Identification

Boulders..... over 12"
Cobbles..... 3" to 12"
Gravel
Coarse..... 3/4" to 3" (19.00 mm to 75.00 mm)
Fine..... No. 4 to 3/4" (4.75 mm to 19.00 mm)
Sand
Coarse..... No. 10 to No. 4 (2.00 mm to 4.75 mm)
Medium..... No. 40 to No. 10 (0.425 mm to 2.00 mm)
Fine..... No. 200 to No. 40
(0.075 mm to 0.425 mm)
Silt..... No. 200 (0.075 mm) to .005 mm
Clay..... < .005 mm

Relative Proportions^{L, M}

trace..... 0 to 5%
little..... 6 to 14%
with..... $\geq 15\%$

Inclusion Thicknesses

lens..... 0 to 1/8"
seam..... 1/8" to 1"
layer..... over 1"

Apparent Relative Density of Cohesionless Soils

Very loose 0 to 4 BPF
Loose 5 to 10 BPF
Medium dense..... 11 to 30 BPF
Dense..... 31 to 50 BPF
Very dense..... over 50 BPF

Consistency of Cohesive Soils	Blows Per Foot	Approximate Unconfined Compressive Strength
Very soft.....	0 to 1 BPF.....	< 1/4 tsf
Soft.....	2 to 4 BPF.....	1/4 to 1/2 tsf
Medium.....	5 to 8 BPF.....	1/2 to 1 tsf
Stiff.....	9 to 15 BPF.....	1 to 2 tsf
Very Stiff.....	16 to 30 BPF.....	2 to 4 tsf
Hard.....	over 30 BPF.....	> 4 tsf

Moisture Content:

Dry: Absence of moisture, dusty, dry to the touch.
Moist: Damp but no visible water.
Wet: Visible free water, usually soil is below water table.

Drilling Notes:

BPF: Numbers indicate blows per foot recorded in standard penetration test, also known as "N" value. The sampler was set 6 inches into undisturbed soil below the hollow-stem auger. Driving resistances were then counted for second and third 6-inch increments, and added to get BPF.

Partial Penetration: If the sampler cannot be driven the full 12 inches beyond the initial 6-inch set, the number of blows for that partial penetration is shown as "No./X" (i.e., 50/2"). If the sampler cannot be advanced beyond the initial 6-inch set, the depth of penetration will be recorded in the Notes column as "No. to set X" (i.e., 50 to set 4").

WH: WH indicates the sampler penetrated soil under weight of hammer and rods alone; driving not required.

WR: WR indicates the sampler penetrated soil under weight of rods alone; hammer weight and driving not required.

WL: WL indicates the water level measured by the drillers either while drilling or following drilling.

SECTION 011000

SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Project Information.
 - 2. Work covered by the Contract Documents.
 - 3. Owner-furnished products.
 - 4. Access to Site.
 - 5. Coordination with occupants.
 - 6. Work restrictions.
 - 7. Specification and drawing conventions.
- B. Related Sections include the following:
 - 1. Division 1 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

- A. Project Identification: Moffett Library Renovation Project (Phase 1).
 - 1. Project Location: Midwestern State University, 3410 Taft Blvd, Wichita Falls, Texas.
- B. Owner: Midwestern State University.
 - 1. Owner's Representative: Kyle Owen
- C. Architect of Record: Holzman Moss Bottino Architect, Architect of Record; Phone: 212-465-0808; Contact: Doug Moss, Project Architect at dmoss@holzmanmossbottino.com or Ermira Kasapi, Project Manager, at ekasapi@holzmanmossbottino.com.
- D. Associate Architect: Harper Perkins Architects Inc., Associate Architect; Phone: (940) 767-1421; Fax: (940) 397-0273; contact Glenda Ramsey, at gramsey@harperperkins.com or Sam Kenshalo, at skenshalo@harperperkins.com
- E. Contractor: Midwestern State University has selected M & F Litteken as the Construction Manager at Risk. The Project Manager for M & F Litteken will be Kevin Darnell. M & F Litteken can be reached by mail at 1804 East Scott (P.O. Box 666), Wichita Falls, Texas, 76301, by telephone at 940-766-4442, or by email at kevin@mflitteken.com.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

- A. The Work of Project is defined by the Contract Documents and consists of the following:
 - 1. The Scope of Work includes the existing Moffett Library facility on MSU Campus. This Building will be renovated and receive a new Elevator Tower addition. The schedule of construction will greatly be affected by the school schedule. Students are on campus year around and will be utilizing all of the areas under construction. Significant coordination will be necessary to insure project completion.
 - 2. M & F Litteken, the CMaR for this project will maintain a project schedule that must be complied with.
 - 3. The following describes the main goals of Phase 1 work: Toilet Room Renovations, MEP modifications, and the Addition of an Elevator Tower.
- B. Type of Contract:
 - 1. The project will be accomplished under a Construction Manager at Risk.

1.5 OWNER-FURNISHED PRODUCTS

- A. Owner will furnish certain products for the work.
 - 1. Owner will arrange for and deliver Shop Drawings, Product Data, and Samples to Contractor.
 - 2. Owner will arrange and pay for delivery of Owner-furnished items according to Contractor's Construction Schedule.
 - 3. After delivery, Owner will inspect delivered items for damage. Contractor shall be present for and assist in Owner's inspection.
 - 4. If Owner-furnished items are damaged, defective, or missing, Owner will arrange for replacement.
 - 5. Owner will furnish Contractor the earliest possible delivery date for Owner-furnished products. Using Owner-furnished earliest possible delivery dates, Contractor shall designate delivery dates of Owner-furnished items in Contractor's Construction Schedule.
 - 6. Contractor shall review Shop Drawings, Product Data, and Samples and return them to Architect noting discrepancies or anticipated problems in use of product.
 - 7. Contractor is responsible for receiving, unloading, and handling Owner-furnished items at Project site.
 - 8. Contractor is responsible for protecting Owner-furnished items from damage during storage and handling, including damage from exposure to the elements.
 - 9. If Owner-furnished items are damaged as a result of Contractor's operations, Contractor shall repair or replace them.
 - 10. Contractor shall install and otherwise incorporate Owner-furnished items into the Work.
- B. Owner-Furnished Products: All Owner furnished products are to be installed by the CM@R.
 - 1. Toilet Accessories.

1.6 ACCESS TO SITE

- A. General: Contractor shall have limited use of the premises and Project Site for construction operations during construction period as indicated on the Drawings, by the Contract limits, and as indicated by requirements of this Section.
- B. Use of Site: Limit use of premises to areas within the Contract limits established by the Owner, Architect and CMaR. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 - 1. Limits: The site limits shall be determined in pre-work conference with Owner, Architect and CMaR prior to the commencement of work. Do not extend beyond the established parameters.
 - 2. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Condition of the Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- D. Erect dust proof/security temporary partitions to protect the existing building during construction.

1.7 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy site and existing building during entire construction period. Coordinate and cooperate with the Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations (limited during this summer work period). Maintain the existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from and coordination with the Owner and approval of authorities having jurisdiction.
 - 2. Notify Owner not less than 72 (seventy-two) hours in advance of activities that will affect Owner's operations.
 - 3. The building is a secure facility and access shall be through the designated checkpoint.
 - 4. Utility extensions to the addition will require access to portions of the existing building. Coordination with MSU through the Owner's Designated Representative (ODR) is mandatory. Access through the existing building areas may require work to be done at night and/or weekends.
- B. Owner Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed areas of building, before Substantial

Completion, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied before Owner occupancy.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner occupancy.
3. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of building.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of building.

1.8 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, unless specific arrangements have been made with School Officials.
 1. Weekend Hours: as approved.
 2. Early Morning or Late Evening Hours: as approved.
 3. Hours for Utility Shutdowns: as approved with advance notice.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
 1. Notify Architect and Owner not less than two (2) days in advance of proposed utility interruptions.
 2. Obtain Architect's and Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
 1. Notify Architect and Owner not less than two (2) days in advance of proposed disruptive operations.
 2. Obtain Architect's and Owner's written permission before proceeding with disruptive operations.
- E. Nonsmoking Campus: Smoking is not permitted inside or outside of the buildings or any of the university campus site.
- F. Controlled Substances: Use of tobacco products of any kind, illegal drugs, alcohol, and other controlled substances are prohibited on university property.

- G. Employee Identification: Provide picture identification tags for all Contractor and Sub-Contractor personnel working on Project site. Require personnel to use identification tags at all times. The tag shall identify the employee and the company by whom the person is employed. Any employee not wearing an identification badge, shall be removed from the site.
- H. Employee Screening: Provide background checks for all employees. Comply with Owner's requirements for background screening of Contractor personnel working on Project site.
 - 1. Maintain list of approved screened personnel with Owner's representative.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language may be used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, can be implied where a colon (:) is used within a sentence or phrase.
 - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations as included as part of this specification.
 - 3. Products or systems may be specified by brand name and number for quality standards.
 - 4. Specific brand names and products with no substitutions.

PART 2 - REQUEST FOR PROPOSALS:

- 2.1 BID PACKAGES: The following "Bid Packages" have been prepared by M & F Litteken. Submit your Proposal by identifying the Bid Package you are submitting for.
 - A. The Construction Manager has the right to present a Proposal.
 - 1. Each subcontractor and material supplier is hereby advised that M & F Litteken Construction will be providing Competitive Sealed Proposals for some of the various Proposal packages. M & F Litteken Construction will be providing sealed Proposals at the same time and place for opening and evaluation.
 - 2. MSU is striving to present an open and Competitive Proposal format.

3. The Proposal for each package that presents the best value for the project will be awarded a subcontract or purchase order by M & F Litteken Construction, who will perform as a General Contractor during the construction.
4. M & F Litteken Construction has the option to require performance and payment bonds of any subcontractor he deems appropriate.
5. In addition to any items included on the Proposal Form, M & F Litteken Construction will provide an Itemized Proposal Package to the Owner at the time of the opening of the Proposals for the following items: Temporary – Construction Fencing; Project Sign; Job Shack; Portable Toilets; Daily Cleaning; Final Cleaning; Trash Containment & Disposal; Land Fill Fees; De-watering; Labor & Material for Blocking; Material Only for Thru Wall Flashing; Miscellaneous (not Mechanical – Electrical related); Labor and Material for Backer Rod; Control and Expansion joints.

B. The Proposal Packages are as follows:

1. Selective Structure Demolition and Alteration Work - Sections 024119, SELECTIVE STRUCTURE DEMOLITION; Section 003132, GEOTECHNICAL REPORT, and Section 316329, DRILLED PIERS.
 - a. This Section is to include Site Clearing and selected Demolition.
 - b. Demolition of Interior Walls & Ceilings as indicated on Drawings
 - c. Demolition of Doors & Frames as Indicated on Drawings
 - d. Demolition of Cabinets as indicated on Drawings.
 - e. Mechanical Demolition to be included in Mechanical Package
 - f. Plumbing Demolition to be included in Plumbing Package
 - g. Electrical Demolition to be included in Electrical Package
2. Earthwork
 - a. The work shall include site clearing, site demolition, under floor excavation, and engineered fill. Drainage fill provided within 4" of final sub grade elevation at the location as directed and at the time scheduled by the Project Superintendent.
 - b. The work shall be as indicated on the Drawings and in Sections 003132 and 316329 of the Project Manual.
 - c. The Proposal shall include removal of all waste material not used at other locations on site.
 - d. The Proposal shall include all surveying work to establish cut and fill and finish grades, as well as locations of building and site elements.
 - e. Top Soil shall be provided and placed as a part of this section.
 - f. The Contractor shall provide engineered fill as indicated on drawings. Engineered fill shall meet requirements in the plans and specifications.
3. Landscaping
 - a. Landscaping is being included as an Allowance – refer to Section 012100, ALLOWANCES. This work shall consist of Hydromulching, sodding, and landscaping, and relocation, repair, etc., of any lawn irrigation lines which are disturbed by the new work.
4. Erosion Control
 - a. This shall consist of installing all silt fences and erosion control methods as shown on the drawings

5. Termite Treatment
 - a. The work shall include pre-treatment of building slab for termites – refer to Section 313116, TERMITE CONTROL.
6. Concrete
 - a. The work shall include labor and materials to provide all Concrete work excluding Concrete for masonry fill or grouting
 - b. The work shall be as indicated on the Drawings and in Division 3 and Section 316329, DRILLED PIERS of the Project Manual.
 - c. The Proposal shall include fine grading of drainage fill, vapor barrier, providing, placing and finishing of concrete, form work, setting all inserts and embeds provided by others, and labor to install reinforcing steel.
 - d. The final 4” of drainage fill by concrete contractor.
 - e. Installation of reinforcing steel in slab and flat work.
 - f. This shall be the provision of drilled piers, Section 316329, DRILLED PIERS including drilling, reinforcing steel, tying and placement as well as concrete and concrete placement. Also, this shall include the removal of spoils associated with pier drilling.
7. Masonry
 - a. The work shall include all Masonry; including Concrete Masonry units, Brick Masonry and precast stone. The work shall include all materials, labor, and all Masonry work as indicated on the Drawings, and in Division 4 of the Project Manual.
 - b. The Proposal shall include providing concrete fill for Masonry, grout, mortar, mortar color, all joint reinforcing insulation and accessories, flashings, damp-proofing if any, shoring and templates or false work, lintels and labor for placing all reinforcing steel associated with Masonry.
 - c. The work shall include labor to install and set all masonry imbedded items. The Masonry Contractor shall furnish and install fastening systems, anchors, and provide welding of any anchors where required.
 - d. The work shall include water repellants of exterior face brick as specified (including existing wall where indicated) in Section 071900, WATER REPELLANTS.
 - e. Installation of reinforcing steel in masonry walls.
 - f. Shall include all Masonry Demolition and patching of existing masonry as required.
 - g. The work shall include fluid applied membrane air barriers as specified in Section 072726.
8. Structural Steel (Materials Only)
 - a. The work shall include all structural steel trusses, joists, steel deck, miscellaneous steel and metal fabrications, pipe and tube railings, and architectural joint systems (expansion joint covers) and shall include installation of all elements.
 - b. The work shall include labor on site handling at time of delivery.
 - c. The work shall be as indicated on the Drawings and in Division 5 of the Project Manual.

- d. The work associated with the structural steel shall be completed in the phases as laid out by CM@R.
- 9. Reinforcing Steel (Materials Only)
 - a. The work shall include all reinforcing steel for concrete, masonry and any miscellaneous reinforcing steel as indicated on the Drawings and in the Project Manual, Section 032000, CONCRETE REINFORCEMENT.
 - b. The work shall include labor on site handling at time of delivery.
 - c. Provide all reinforcing steel for concrete and masonry.
- 10. Steel Erection
 - a. This shall include all labor and equipment required to erect the Structural Steel provided in Bid Package #8.
- 11. Rough Carpentry, and Miscellaneous Installations
 - a. The work shall provide materials and labor for all wood nailers, including nailers that are a part of the roofing system, equipment bases, and blocking, for attachment of other work. The blocking for the attachment of cabinetwork shall be by others. The work shall include all caulking and sealants, except those performed by window installation and painting.
 - b. The work shall be as indicated on the Drawings and in the Project Manual, including Section 061000, ROUGH CARPENTRY.
 - c. The work shall include Sections 079200, JOINT SEALERS and 078413, FIRESTOPS AND SMOKESEALS.
 - d. Installation of all Division 10 items not otherwise indicated for materials and installation; doors, frames and hardware not otherwise indicated for materials and installation, toilet partitions, and accessories.
 - e. Installation of all Doors and Hardware
 - f. Include Galvanized Metal Covered Base in this Item.
 - g. This shall include the provision of new wood framing, plywood, etc., associated with the single-slope clay tile roof as shown on the plans.
 - h. This shall include installation of Section 071616, CRYSTALLINE WATERPROOFING.
 - i. This shall include installation of Section 058100, EXPANSION JOINT COVER ASSEMBLIES.
- 12. Cabinets
 - a. The work shall include the provision of Architectural Woodwork and Countertops as indicated on the Drawing and in the Project Manual, Section 064023, INTERIOR ARCHITECTURAL WOODWORK; and Section 066119, ENGINEERED QUARTZ COUNTERTOPS.
- 13. Roofing & Sheet Metal
 - a. This shall include all work covered by Section 073213, CLAY ROOF TILES; Section 075423, THERMOPLASTIC POLYOLEFIN (TPO) MEMBRANE ROOFING; Section 076200, SHEET METAL FLASHING; and Section 077100, ROOF SPECIALTIES AND ACCESSORIES.
 - b. This shall also include the removal and storage on site of the existing Clay Tile Roofing as shown on plans and the installation of these tiles in new locations.

- c. This shall include installation of Section 071326, SHEET MEMBRANE WATERPROOFING.
- 14. Exterior Insulation and Finish System (EIFS)
 - a. This shall include all work covered by Section 072419, EXTERIOR INSULATION AND FINISH SYTEM.
 - b. The Proposal shall include caulking and sealants associated with this work where the EIFS adjoins other materials.
- 15. Hollow Metal Doors, Frames, Hardware (Materials Only)
 - a. The work shall include providing all Doors, Frames and Hardware.
 - b. The work shall include providing materials for all work indicated on the Drawings and in the Project Manual, including Section 081113, STEEL DOORS AND FRAMES; Section 081416, WOOD DOORS; Section 083113, ACCESS DOORS; and Section 087100, DOOR HARDWARE.
 - c. The materials shall be provided as appropriate with the stage of construction and as scheduled by M & F Litteken Construction.
 - d. Any individual item may be bid separately. Include breakdown for each section.
- 16. Drywall and Acoustical Ceiling
 - a. The work shall include all Interior Metal Framing and Drywall sheathing, including Acoustical Ceiling and associated Insulation.
 - b. The work shall be as indicated on the Drawings and in the Project Manual, including; Section 092900, GYPSUM DRYWALL; Section 095113, ACOUSTICAL PANEL CEILINGS; and appropriate portions of Section 072100, THERMAL INSULATION.
 - c. Tape and bedding shall be part of the painting.
- 17. Special Ceiling (Ceiling Type 4 – elliptical-shaped “clouds” with wire mesh and suspended ceiling baffles)
 - a. The work shall include all materials associated with this special ceiling type.
 - b. The work shall be as indicated on the Drawings (Floor Plans, Reflected Ceiling Plans, and Sheet “A-652”).
- 18. Floor Covering
 - a. The work shall include all Floor Covering work as indicated on the Drawings and in the Project Manual, Section 096513, RESILIENT BASE AND ACCESSORIES; and Section 096519, RESILIENT TILE FLOORING.
 - b. Demolition of Flooring as indicated on Drawings, including minor ACM abatement.
 - c. The Proposal shall include floor covering and base, including vinyl composition tile, rubber base, and accessories.
- 19. Ceramic Tile – Materials and Labor
 - a. The work shall include Ceramic Floor and Wall Tile, associated trim, corners and caps; floor prep and leveling, floor latex bond coat, and crack suppression membrane, if required.

- b. The work shall be as indicated on the drawings and in the Project Manual including Section 093013, CERAMIC TILING, Finish Schedule, and Finish Schedule Key on the Drawings.
- 20. Painting
 - a. The work shall provide all Painting both, exterior and interior where specified in finish schedule and drawings.
 - b. The work shall be as indicated on the Drawings and in the Project Manual, including Section 099000, PAINTING AND FINISHING, and Finish Schedule.
 - c. The work shall include the taping, bedding, and texturing (where specified) of all drywall.
 - d. The work shall include painting, staining or finishing cabinetry and interior wood detail and trim.
- 21. Division 10 (Materials Only) – Toilet Compartments & Accessories;
 - a. The work shall include providing all Division 10 Items and miscellaneous items indicated on plans.
 - b. The work shall include providing materials for all work indicated on the Drawings and in the Project Manual, including Section 102113, TOILET PARTITIONS; Section 102600, CORNER GUARDS; Section 102813, TOILET ACCESSORIES; and Section 104413, FIRE PROTECTIONS SPECIALTIES.
 - c. The materials shall be provided as appropriate with the stage of construction and as scheduled by M & F Litteken Construction.
 - d. Any individual item may be bid separately. Include breakdown for each section.
- 22. Hydraulic Elevator
 - a. The work shall include all materials and labor to furnish and install Hydraulic Elevator as indicated on the Drawings and Section 142400, HYDRAULIC ELEVATORS of the Project Manual.
 - b. The work shall include coordination with MEP and Structural Contractors for complete assembly and final connections as necessary.
 - c. The work shall include coordination with trades as necessary for color and finish selections.
 - d. The work shall include all fire caulking of all penetrations and grout, leveling and caulking.
 - e. All work necessary for a complete functioning Elevator.
- 23. Plumbing
 - a. The work shall include all Plumbing work as indicated on the Drawings and in Division 22 of the Project Manual.
 - b. The Proposal shall include all Plumbing work including plumbing site work (including all patchwork necessary to return to existing condition).
 - c. The Proposal shall include providing the fire caulking of all penetrations through fire-rated partitions or floor assemblies.
 - d. The work shall include color-coding and identification of piping and valves on Mechanical Systems and Equipment.
 - e. The work shall include labor and materials for the installation of condensate drain piping as indicated on the Mechanical Drawings.
 - f. All utility extensions and connections to main locations shall be included

- g. Provide Sinks and coordination of installation with Cabinet Sub-contractor.
 - h. The Proposal shall include making and patching any floor penetrations as necessary to complete this scope of work.
24. Mechanical
- a. The work shall include all Heating, Ventilation, and Air Conditioning work as indicated on the Drawings and in Division 23 of the Project Manual.
 - b. The Proposal shall include all HVAC Controls, including conduit and conductor, as well as providing installation and connection of control devices.
 - c. The Proposal shall include providing the fire caulking of all penetrations through fire-rated partitions or floor assemblies.
 - d. The Proposal shall include making and patching any floor penetrations as necessary to complete this scope of work.
25. Electrical, Digital, Addressable Fire-Alarm System
- a. The work shall include all Electrical work and as indicated on the Drawings and in Project Manual, Divisions 26.
 - b. The work shall include all Digital, Addressable Fire-Alarm System work as indicated on the Drawings and in the Project Manual, Division 28.
 - c. The Proposal shall include providing fire caulking for all penetrations of fire-rated partitions and floor assemblies.
 - d. The Proposal shall include the cost for installation of temporary electrical service, power and lighting, as well as the removal of all temporary electrical as the project completes. It is the intent for the power to be drawn from existing devices or temporarily connected to existing panels.
 - e. The actual cost of consumption of the electrical power will be provided by the Owner.
 - f. This proposal to include all computer and data conduit and boxes as shown on the drawing and as specified.
 - g. The Proposal shall include making and patching any floor penetrations as necessary to complete this scope of work.

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 012100

ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements governing allowances.
 - 1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.
- B. Types of allowances include the following:
 - 1. Contingency allowances.
- C. Related Requirements:
 - 1. Section 012200 "Unit Prices" for procedures for using unit prices.
 - 2. Section 014000 "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.

1.3 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

1.4 ACTION SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

1.5 INFORMATIONAL SUBMITTALS

- A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.6 COORDINATION

- A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.7 CONTINGENCY ALLOWANCES

- A. Provide a five percent (5%) contingency allowance to be used only as directed by the Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance. This allowance is to be provided by the CM@R only.
- B. Contractor's[overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, insurance, equipment rental, and similar costs.
- C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit margins.
- D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.8 ADJUSTMENT OF ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
 - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
 - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
 - 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
 - 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

- A. Allowance No. 1 - Contingency Allowance: Include a contingency allowance of five percent (5%) for use by the CM@R when approved in writing by the Owner after consultation with the Architect. Any unused funds in this allowance will be returned to the Owner at the end of the project. This allowance is to be provided by the CM@R only.
- B. Allowance No. 2 – Landscaping Allowance: Include an allowance of \$5,000 shall be included for the provision of hydro-mulching, sodding, and landscaping on this project. Sod material is to be installed along any new concrete, the width of one standard piece of sod with the sod's long axis parallel with the concrete. Hydro-mulch shall be provided on areas that are disturbed and regraded as part of new construction work. New landscaping in the form of plants, bushes, etc. (to be determined in coordination with the Owner. In addition, this allowance will be used to relocate, repair, etc. any lawn irrigation lines which are disturbed by the new work. The funds from this allowance can be used when approved in writing by the Owner after consultation with the Architect and Owner. Any unused funds in this allowance will be returned to the Owner at the end of the project.

END OF SECTION

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SECTION 012200

UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.
- B. Related Requirements:
 - 1. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.

1.3 DEFINITIONS

- A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- C. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

A. Unit Price 1: Painting:

1. Provide a unit price for paint preparation and application of coats as specified.
2. Unit of Measure: SQ.FT.

B. Unit Price 2: Drilled Piers.

1. Provide a Unit Price for Drilled Piers including drilling/excavation, concrete, and steel reinforcing.
2. Unite of Measure: LN.FT.

C. Unit Price 3: Drilled Piers (Casings).

1. Provide a Unit Price for Drilled Piers, Casing only.
2. Unite of Measure: LN.FT.

END OF SECTION

SECTION 012500

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Refer to Uniform the General Conditions, Section 8.3.5 and 8.3.6 for substitutions. The most stringent requirement between UGC and this section shall apply.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
 - 1. All substitution documents shall be done electronically.
- B. Related Requirements:
 - 1. Section 016000 "Product Requirements" and UGC for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit electronic copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed side by side comparison of the qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. The qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated, only if specifically required.
 - i. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - j. Cost information, showing the cost reduction or no change to the contract amount.
 - k. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, is appropriate for applications indicated and the Contractor accepts total responsibility for the performance of the substituted item or system.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven (7) days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.
 - a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.
 - c. Architect's approval of substituting does not certify the performance of the material or system.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than fifteen (15) days prior to time required for preparation and review of related submittals.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Requested substitution provides sustainable design characteristics that specified product provided.
 - c. Substitution request is fully documented and properly submitted.
 - d. Requested substitution will not adversely affect Contractor's construction schedule.
 - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - f. Requested substitution is compatible with other portions of the Work.
 - g. Requested substitution has been coordinated with other portions of the Work.
 - h. Requested substitution provides specified warranty.
 - i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Architect will consider requests for substitution if received within thirty (30) days after the Notice to Proceed. Requests received after that time will not be considered.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect

will return requests without action, except to record noncompliance with these requirements:

- a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
- b. Requested substitution does not require extensive revisions to the Contract Documents.
- c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- d. Requested substitution provides sustainable design characteristics that specified product provided.
- e. Substitution request is fully documented and properly submitted.
- f. Requested substitution will not adversely affect Contractor's construction schedule.
- g. Requested substitution has received necessary approvals of authorities having jurisdiction.
- h. Requested substitution is compatible with other portions of the Work.
- i. Requested substitution has been coordinated with other portions of the Work.
- j. Requested substitution provides specified warranty.
- k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 012600

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Refer to Uniform General Conditions, Article 11 for Change Order procedures. The most restrictive between the UGC and this section shall apply.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
 - 2. Refer to UGC Article 11.8 for maximum allowable percentages for changes in the work.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.4 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within twenty (20) days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

- a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use forms acceptable to Architect.
- B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.
 - 5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - 6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
 - 7. Proposal Request Form: Use AIA Forms.

1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Changes Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Work Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work where the time or cost cannot be agreed upon. See General Conditions for detailed procedures, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 012900

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Refer to Uniform General Conditions, Article 10 for payment procedures that may differ from this section. The most restrictive of the two shall prevail.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 2. Section 013200 "Progress Schedule" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.

2. Submit the schedule of values to Architect at earliest possible date, but no later than fourteen (14) days before the date scheduled for submittal of initial Applications for Payment.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 2. Arrange schedule of values consistent with format of AIA Document G703, 1992 Edition.
 3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
 4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five (5%) percent of the Contract Sum but specifically for plumbing, mechanical and electrical. Provide a line item for each Specification Section.
 5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
 6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. No payment will be made for items stored off-site.
 7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
 8. Allowances: Provide a separate line item in the schedule of values for each allowance.
 9. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

- a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
10. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: Submit Application for Payment to Architect by the 30th day of the month. The period covered by each Application for Payment is one month, ending on the 25th day of the month.
 1. Submit draft copy of Application for Payment seven (7) days prior to due date for review by Architect.
- D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.
- E. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.
 1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
 5. Retainage of 5% shall be included for all work and stored materials that are shown on application.
- F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored at the site of construction, but not yet installed. No payment will be made for materials stored off site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- G. Transmittal: Submit four (4) signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Contractor's construction schedule.
 4. Schedule of unit prices.
 5. Submittal schedule.
 6. List of Contractor's staff assignments.
 7. List of all Sub Contractors and suppliers.
 8. Copies of building permits.
 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 10. Initial progress report.
 11. Report of preconstruction conference.
 12. Certificates of insurance and insurance policies.
 13. Performance and payment bonds.
- I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.
10. Retainage will not be released until all documents have been processed and punch list items have been completed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

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SECTION 013100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Refer to Uniform General Conditions for Pre-Construction Conference and general responsibilities.

1.2 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. Requests for Information (RFIs).
 - 4. Project meetings.
- B. Related Requirements:
 - 1. Section 013200 "Progress Schedule" for preparing and submitting Contractor's construction schedule.
 - 2. Section 017700 "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form, using Excel software:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.

- B. Key Personnel Names: Within 15 (fifteen) days of the Notice to Proceed, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses.
- C. Sub-Contractors: Within 15 (fifteen) days of the Notice to Proceed, submit a list of Sub-Contractors with the names of their key personnel assignments. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses.

1.5 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's construction schedule.
 - 2. Preparation of the schedule of values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Preinstallation conferences.
 - 7. Project closeout activities.
 - 8. Startup and adjustment of systems.
- C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

1.6 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
 - b. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - c. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
 - d. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
 - e. Indicate required installation sequences.
 - f. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
 2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
 6. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.

- b. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
- 7. Electrical Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 inches (32 mm) in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor control center locations.
 - d. Location of pull boxes and junction boxes dimensioned from column center lines.
- 8. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
- 9. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Section 013300 "Submittal Procedures."

1.7 REQUESTS FOR INFORMATION (RFIs)

- A. General: After thorough examination of the Contract Documents it is discovered of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 - 1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
 - 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name.
 - 2. Project number.
 - 3. Date.
 - 4. Name of Contractor.
 - 5. Name of Architect.
 - 6. RFI number, numbered sequentially.
 - 7. RFI subject.
 - 8. Specification Section number and title and related paragraphs, as appropriate.
 - 9. Drawing number and detail references, as appropriate.
 - 10. Field dimensions and conditions, as appropriate.
 - 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 12. Contractor's signature.

13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- C. RFI Forms: AIA Document G716 or Software-generated form with substantially the same content as indicated above, acceptable to Architect.
 1. Attachments shall be electronic format to allow Architect to respond on the RFI or attachment.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven (7) working days, after receipt by the Architect, for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
 1. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within ten (10) days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log at each project site meeting and with each Certificate of Payment. Software log in Excel with not less than the following:
 1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number including RFIs that were returned without action or withdrawn.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's response was received.

- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven (7) days if Contractor disagrees with response.
 - 1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.8 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
 - 1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 - 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 - 3. Minutes: The CMAA is responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within five (5) days of the meeting. The minutes shall be comprehensive including looking forward to two week approaching milestones. The notes shall also include job tasks assigned if information is needed and deadline for information responsibility.
- B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Contractor, but no later than fifteen (15) days after execution of the Agreement.
 - 1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Lines of communications.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for RFIs.
 - h. Procedures for testing and inspecting.
 - i. Procedures for processing Applications for Payment.
 - j. Distribution of the Contract Documents.
 - k. Submittal procedures.
 - l. Preparation of record documents.
 - m. Use of the premises and existing building.
 - n. Work restrictions.
 - o. Working hours.

- p. Owner's occupancy requirements.
 - q. Responsibility for temporary facilities and controls.
 - r. Procedures for moisture and mold control.
 - s. Procedures for disruptions and shutdowns.
 - t. Construction waste management and recycling.
 - u. Parking availability.
 - v. Office, work, and storage areas.
 - w. Equipment deliveries and priorities.
 - x. First aid.
 - y. Security.
 - z. Progress cleaning.
3. Minutes: The CMaR is responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within five (5) days of the meeting. The minutes shall be comprehensive including looking forward to two week approaching milestones. The notes shall also include job tasks assigned if information is needed and deadline for information responsibility.
- C. Coordination Meetings: Project coordination meetings at weekly intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
- 1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.

- 7) Site utilization.
- 8) Temporary facilities and controls.
- 9) Work hours.
- 10) Hazards and risks.
- 11) Progress cleaning.
- 12) Quality and work standards.
- 13) Change Orders.

- 3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 013200

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes administrative and procedural requirements for documenting the progress of construction during performance of the work, including but not limited to, the following:
 - 1. Contractor's construction schedule.
 - 2. Construction schedule updating reports.
 - 3. Daily construction reports.
 - 4. Material location reports.
 - 5. Site condition reports.
 - 6. Special reports.
 - 7. Rain Delay Days.

1.3 RELATED SECTIONS

- A. Submittal Procedures - Section 013000.
- B. Quality Requirements - Section 014000.

1.4 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum unless otherwise approved by Architect.

- C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- D. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - 3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.
- H. Rain Days: According to U.S. Climate Data, the following days will be allowed as typical weather days. They must be used before additional days are approved
 - 1. January 1, February 2, March 2, April 2, May 4, June 3, July 1, August 2, September 3, October 3, November 2 and December 2.

1.5 INFORMATION SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. PDF electronic file.
 - 2. Two (2) paper copies.
- B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- C. CPM Reports: Concurrent with CPM schedule, submit three printed copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float.
 - 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.

2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
- D. Construction Schedule Updating Reports: Submit with each Application for Payment. Payment Applications will NOT be processed without schedule update.
- E. Daily Construction Reports: Submit at monthly intervals with each Application for Payment.
- F. Material Location Reports: Submit at monthly intervals with each Application of Payment.
- G. Site Condition Reports: Submit at time of discovery of differing conditions.
- A. Special Reports: Submit at time of unusual event.

1.6 QUALITY ASSURANCE

- A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:
 1. Review software limitations and content and format for reports.
 2. Verify availability of qualified personnel needed to develop and update schedule.
 3. Discuss constraints, including phasing, work stages, area separations, interim milestones, and partial Owner occupancy.
 4. Review delivery dates for Owner-furnished products.
 5. Review schedule for work of Owner's separate contracts.
 6. Review submittal requirements and procedures.
 7. Review time required for review of submittals and resubmittals.
 8. Review requirements for tests and inspections by independent testing and inspecting agencies.
 9. Review time required for Project closeout and Owner startup procedures.
 10. Review and finalize list of construction activities to be included in schedule.
 11. Review procedures for updating schedule.

1.7 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 1. Activity Duration: Define activities so no activity is longer than twenty (20) days, unless specifically allowed by Architect.
 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than sixty (60) days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 4. Startup and Testing Time: Include no fewer than fifteen (15) days for startup and testing.
 5. Substantial Completion: Indicate completion.
 6. Punch List and Final Completion: Include not more than thirty (30) days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 1. Work by Owner: Include a separate activity for each portion of the Work performed by Owner, if any.
 2. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 011000 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.

4. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.

 5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.

 6. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Temporary enclosure and space conditioning.
 - c. Permanent space enclosure.
 - d. Completion of mechanical installation.
 - e. Completion of electrical installation.
 - f. Substantial Completion.

 - D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.

 - E. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
 1. Use Microsoft Project, for operating system.
- 2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)
- A. General: Prepare network diagrams using AON (activity-on-node) format.

- B. CPM Schedule: Prepare Contractor's Construction Schedule using a CPM network analysis diagram.
1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for commencement of the Work.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
 4. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.
- C. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing.
 - j. Punch list and final completion.
 - k. Activities occurring following final completion.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.

4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
- D. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
 1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Main events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
- F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
 1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.

2.3 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.

4. Equipment at Project site.
 5. Material deliveries.
 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 7. Accidents.
 8. Meetings and significant decisions.
 9. Unusual events (see special reports).
 10. Stoppages, delays, shortages, and losses.
 11. Meter readings and similar recordings.
 12. Emergency procedures.
 13. Orders and requests of authorities having jurisdiction.
 14. Change Orders received and implemented.
 15. Construction Change Directives received and implemented.
 16. Services connected and disconnected.
 17. Equipment or system tests and startups.
 18. Partial completions and occupancies.
 19. Substantial Completions authorized.
- B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:
1. Material stored prior to previous report and remaining in storage.
 2. Material stored prior to previous report and since removed from storage and installed.
 3. Material stored following previous report and remaining in storage.
- C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.4 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within one (1) day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Scheduling Consultant: At the Contractor's option, engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.
 - 1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.
 - 2. Meetings: Scheduling consultant or in-house scheduler shall attend all meetings related to Project progress, alleged delays, and time impact.
- B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule before each regularly scheduled progress meeting with Certificate of Payment. Certificates of Payment will NOT be processed without an updated construction schedule.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate final completion percentage for each activity.
- C. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION

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SECTION 013300

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete submittal requirements as specified herein, including, but not limited to, the following:

- 1. Shop Drawings, Product Data, Samples, and other submittals.

1.3 RELATED SECTIONS

- A. Payment Procedures - Section 012900.
- B. Construction Progress Documentation - Section 013200.
- C. Operation and Maintenance Data - Section 017823.
- D. Project Record Documents - Section 017839.

1.4 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.5 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 - 2. Final Submittal Schedule: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
 - 3. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's final release or approval.
 - g. Scheduled date of fabrication.
 - h. Scheduled dates for purchasing.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.6 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals.
 - 1. Architect will furnish Contractor limited digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Digital Drawing Software Program: The Contract Drawings are available in Auto CAD DWG or PDF format.
 - c. The following digital data files will be furnished for each appropriate discipline:
 - 1). Floor plans.
 - 2). Reflected ceiling plans.
 - 3). Mechanical and Electrical electronic files will not be made available.
 - 4). Structural drawings will only be made available on a selected basis and with permission of the structural engineer.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 14 total days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 14 total days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 14 total days for initial review of each submittal.
 5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 14 total days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
- D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. All submittals are to be in Digital Format.
 2. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 3. Name file with submittal number or other unique identifier, including revision identifier.

4. Transmittal Form for Electronic Submittals: Use form acceptable to Architect, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Contractor.
 - e. Name of firm or entity that prepared submittal.
 - f. Names of subcontractor, manufacturer, and supplier.
 - g. Category and type of submittal.
 - h. Submittal purpose and description.
 - i. Specification Section number and title.
 - j. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - k. Drawing number and detail references, as appropriate.
 - l. Location(s) where product is to be installed, as appropriate.
 - m. Related physical samples submitted directly.
 - n. Indication of full or partial submittal.
 - o. Transmittal number, numbered consecutively.
 - p. Submittal and transmittal distribution record.
 - q. Other necessary identification.
 - r. Remarks.
- E. Options: Identify options requiring selection by Architect.
- F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. For files larger than 2 megabytes post electronic submittals as PDF electronic files directly to Architect's email address or to "Transfer Big Files" or "Drop Box".
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - 2. For files 2 megabytes or smaller submit electronic submittals via email as PDF electronic files.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - 3. Action Submittals: Submit digital copies of each submittal unless otherwise indicated. Architect will return electronically.
 - 4. Informational Submittals: Submit digital copies of each submittal unless otherwise indicated. Architect will return electronically.
 - 5. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 - 4. For equipment, include the following in addition to the above, as applicable:

- a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
- 5. Submit Product Data before or concurrent with Samples.
- 6. Submit Product Data in the following format:
 - a. PDF electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
 - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 - 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2" by 11", but no larger than 24" by 36".
 - 3. Submit Shop Drawings in one of the following format:
 - a. PDF electronic file.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
 - 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 - 3. Samples for Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

- a. Number of Samples: Submit one (1) full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will indicate the option selected in color schedule.
- E. Coordination Drawing Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."
- F. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- G. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."
- H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- J. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- N. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- O. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- P. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- Q. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

- R. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
- D. Should it become evident that the Contractor has not performed a thorough review, but rubber stamped and sent forward, the Architect shall return unchecked for the Contractor to provide a thorough review.

3.2 ARCHITECT'S ACTION

- A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
 - 1. Approved – The work covered by the submittal may proceed provided it complies with the contract documents. Final acceptance will depend on that compliance.
 - 2. Approved As Noted – The work covered by the submittal may proceed provided it complies with both Architect's notations and corrections on the submittal and the contract documents. Final acceptance will depend on that compliance.
 - 3. Not Approved – Revise and Resubmit – DO NOT proceed with the work covered by the submittal, including purchasing, fabrication, delivery, or other activity for the product submitted. Revise or prepare a new submittal according to the Architect's notations and corrections.
 - 4. Rejected – DO NOT proceed with the work covered by the submittal. Prepare a new submittal for a product that complies with the contract documents.
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

- C. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- D. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION

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SECTION 014000

QUALITY REQUIREMENTS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. 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-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
 - 4. Specific test and inspection requirements are not specified in this Section.

1.3 DEFINITIONS

- A. 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.
- B. Quality-Control Services: 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. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not

Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.
 2. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.
 3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five (5) previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction

1.4 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

- A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.
- B. Qualification Data : For Contractor's quality-control personnel.
- C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Entity responsible for performing tests and inspections.
 - 3. Description of test and inspection.
 - 4. Identification of applicable standards.
 - 5. Identification of test and inspection methods.
 - 6. Number of tests and inspections required.
 - 7. Time schedule or time span for tests and inspections.
 - 8. Requirements for obtaining samples.
 - 9. Unique characteristics of each quality-control service.

1.6 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.

6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
- B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of technical representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement that equipment complies with requirements.
 3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 4. Statement whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.

- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.7 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. 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.
- C. Fabricator Qualifications: A firm experienced in producing products 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.
- D. 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.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in Texas, who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or products that are similar in material, design, and extent to those indicated for this Project.
- F. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- G. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- H. Factory-Authorized Service Representative Qualifications: An 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.

- I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - f. When testing is complete, remove test specimens, assemblies, mockups; do not reuse products on Project.
 - g. Contractor shall pay for all tests to show compliance with Contract Documents.
 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 2. Notify Architect seven (7) days in advance of dates and times when mockups will be constructed.
 3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
 4. Demonstrate the proposed range of aesthetic effects and workmanship.
 5. Obtain Architect's and Owner's approval of mockups before starting work, fabrication, or construction.
 6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 7. Demolish and remove mockups when directed unless otherwise indicated.

1.8 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 - 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 - 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.
 - 3. In general the Owner will pay for On-Site testing. Tests required to prove materials are acceptable for the project and responsibility of the Contractor.
- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
 - 1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
 - 2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 - 3. Notify testing agencies at least twenty-four (24) hours in advance of time when Work that requires testing or inspecting will be performed.
 - 4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 - 5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 - 6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."
- D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of

Installer activities, inspection of completed portions of the Work, and submittal of written reports.

- E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 - 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 - 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 - 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 - 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 - 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 - 6. Do not perform any duties of Contractor.
- G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the 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 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 control by testing agency.
 - 7. Security and protection for samples and for testing and inspecting equipment at Project site.

- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
 - 1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Update as the Work progresses.
 - 1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 PRODUCTS

(Not Applicable)

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 or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

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SECTION 014200

REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": 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.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if

bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 015000

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the temporary facilities and controls as shown on the drawings and specified herein, including, but not limited to, the following:

- 1. Temporary utilities, support facilities, and security and protection facilities.

1.3 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, testing agencies, and authorities having jurisdiction.
- B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- B. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
 - 1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
 - 2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.

3. Indicate sequencing of work that requires water, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
- C. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
1. Locations of dust-control partitions at each phase of work.
 2. HVAC system isolation schematic drawing.
 3. Location of proposed air-filtration system discharge.
 4. Waste handling procedures.
 5. Other dust-control measures.

1.5 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.
- B. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36" by 60".
- C. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
 - 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
 - 2. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - 3. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
 - 4. Perform daily construction cleanup and final cleanup.
- B. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.
- C. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- D. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- E. Telephone Service: Provide temporary telephone service in Field Office for use by all construction personnel.
 1. Provide additional telephone lines for the following:
 - a. Provide a dedicated telephone line for each facsimile machine in each field office.
 2. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Contractor's emergency after-hours telephone number.
 - e. Architect's office.
 - f. Engineers' offices.
 - g. Owner's office.
 - h. Principal subcontractors' field and home offices.
 3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.
- F. Electronic Communication Service: Provide a desktop computer in the primary field office adequate for use by Architect and Owner to access Project electronic documents and maintain electronic communications.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

- B. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 - 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 - 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - 3. Maintain and touchup signs so they are legible at all times.
- C. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."
- D. Lifts and Hoists: Provide facilities necessary for hoisting materials.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- E. Existing Elevator Use: Use of Owner's existing elevators will be permitted, provided elevators are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.
 - 1. Do not load elevators beyond their rated weight capacity.
 - 2. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to the shop, make required repairs and refinish entire unit, or provide new units as required.
- F. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Comply with work restrictions specified in Section 011000 "Summary."

- C. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
 - 1. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.
 - a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches between doors. Maintain water-dampened foot mats in vestibule.
 - 2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 - 3. Insulate partitions to control noise transmission to occupied areas.
 - 4. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 - 5. Protect air-handling equipment.
 - 6. Provide walk-off mats at each entrance through temporary partition.
- D. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 - 1. Prohibit smoking in construction areas.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.

2. Use permanent HVAC system to control humidity.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for forty-eight (48) hours are considered defective.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for forty-eight (48) hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove materials that cannot be completely restored to their manufactured moisture level within forty-eight (48) hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Operate Project-identification-sign lighting daily from dusk until 12:00 midnight.
- D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- E. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

END OF SECTION

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SECTION 016000

PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete product requirements as specified herein, including, but not limited to, the following:
 - 1. Product delivery, storage and handling.
 - 2. Manufacturers' standard warranties on products.
 - 3. Special warranties.
 - 4. Comparable products.

1.3 RELATED SECTIONS

- A. Substitution Procedures - Section 013300.

1.4 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the

significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.5 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within fifteen (15) days of receipt of request, or seven (7) days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
 - b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.6 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. 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.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.
7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.8 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
- B. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered.
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
4. Manufacturers:
 - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered.
 - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
 1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.

PART 3 EXECUTION

(Not Applicable)

END OF SECTION

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SECTION 017300

EXECUTION REQUIREMENTS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Installation of the Work.
 - 2. Cutting and patching.
 - 3. Progress cleaning.
 - 4. Starting and adjusting.
 - 5. Protection of installed construction.
 - 6. Correction of the Work.

1.3 RELATED SECTIONS

- A. Closeout Procedures - Section 017700.

1.4 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.5 SUBMITTALS

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting

and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 - a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Exterior curtain-wall construction.
 - d. Sprayed fire-resistive material.
 - e. Equipment supports.
 - f. Piping, ductwork, vessels, and equipment.
 - g. Noise- and vibration-control elements and systems.
 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 PRODUCTS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- B. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- C. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 2. Allow for building movement, including thermal expansion and contraction.
 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

1.1 CUTTING AND PATCHING

- K. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- L. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- M. Temporary Support: Provide temporary support of work to be cut.
- N. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- O. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."
- P. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.
- Q. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 5. Proceed with patching after construction operations requiring cutting are complete.
- R. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- S. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.4 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg. F.
 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
 4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls." Section 017419 "Construction Waste Management and Disposal."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.5 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.6 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION

SECTION 017700

CLOSEOUT PROCEDURES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.

1.3 RELATED SECTIONS

- A. Execution Requirements - Section 017300.
- B. Operation and Maintenance Data - Section 017823.
- C. Project Record Documents - Section 017839.
- D. Demonstration and Training - Section 017900.

1.4 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.5 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.7 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of ten (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.
 - 5. Submit test/adjust/balance records.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of ten (10) days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise Owner of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 3. Complete startup and testing of systems and equipment.

4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
 6. Advise Owner of changeover in heat and other utilities.
 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 9. Complete final cleaning requirements, including touchup painting.
 10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of ten (10) days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 2. Results of completed inspection will form the basis of requirements for final completion.

1.8 FINAL COMPLETION PROCEDURES

- A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:
1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
 2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
 3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report.

- B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
 - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.9 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 - 1. Organize list of spaces in sequential order.
 - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 - 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.
 - 4. Submit list of incomplete items in the following format:
 - a. MS Excel or MS Word electronic file. Architect will return annotated file.

1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within fifteen(15) days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, **RED** in color, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.

2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 EXECUTION

3.1 FINAL CLEANING

- A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.

- f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - o. Clean ducts, blowers, and coils if units were operated without filters during construction.
 - 1). Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
 - p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - q. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. Construction Waste Disposal: Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

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SECTION 017823

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the operation and maintenance data as specified herein.
 - 1. Operation and maintenance documentation directory.
 - 2. Operation manuals for systems, subsystems, and equipment.
 - 3. Product maintenance manuals.
 - 4. Systems and equipment maintenance manuals.

1.3 RELATED SECTIONS

- A. Submittal Procedures - Section 013300.
- B. Closeout Procedures - Section 017700.

1.4 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.5 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
 2. Three (3) paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves. Architect will return two (2) copies.
- C. Initial Manual Submittal: Submit draft copy of each manual at least thirty (30) days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least fifteen (15) days before commencing demonstration and training. Architect will return copy with comments.
1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within fifteen (15) days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
1. List of documents.
 2. List of systems.
 3. List of equipment.
 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

- B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
 - 1. Binders: Heavy-duty, three-ring, vinyl-covered, RED in color, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2" x 11" paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, subject matter of contents. Indicate volume number for multiple-volume sets.
 - 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 - 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
 - 4. Supplementary Text: Prepared on 8-1/2" x 11" white bond paper.
 - 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 - 2. Performance and design criteria if Contractor has delegated design responsibility.
 - 3. Operating standards.
 - 4. Operating procedures.
 - 5. Operating logs.
 - 6. Wiring diagrams.
 - 7. Control diagrams.
 - 8. Piped system diagrams.
 - 9. Precautions against improper use.
 - 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
 - 1. Product name and model number. Use designations for products indicated on Contract Documents.
 - 2. Manufacturer's name.
 - 3. Equipment identification with serial number of each component.
 - 4. Equipment function.
 - 5. Operating characteristics.
 - 6. Limiting conditions.
 - 7. Performance curves.
 - 8. Engineering data and tests.
 - 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
 - 1. Startup procedures.
 - 2. Equipment or system break-in procedures.
 - 3. Routine and normal operating instructions.

4. Regulation and control procedures.
 5. Instructions on stopping.
 6. Normal shutdown instructions.
 7. Seasonal and weekend operating instructions.
 8. Required sequences for electric or electronic systems.
 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.

- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

PART 3 EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.
 2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."
- F. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION

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SECTION 017839

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. Refer to the Uniform General Conditions in total with emphasis on Article 6. This specification shall take precedence over UGC.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
 - 4. Miscellaneous record submittals.
- B. Related Requirements:
 - 1. Section 017300 "Execution Requirements" for final property survey.
 - 2. Section 017700 "Closeout Procedures" for general closeout procedures.
 - 3. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one (1) set(s) of marked-up record prints.
 - 2. Number of Copies: Submit copies of record Drawings as follows:
 - a. Initial Submittal:
 - 1) Submit one (1) paper-copy set(s) of marked-up record prints.
 - 2) Submit PDF electronic files of scanned record prints and one (1) of file prints.
 - 3) Submit record digital data files and one (1) set(s) of plots.
 - 4) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:

- 1) Submit three (3) paper-copy set(s) of marked-up record prints.
- 2) Submit PDF electronic files of scanned record prints and three (3) set(s) of prints.
- 3) Print each drawing, whether or not changes and additional information were recorded.

c. Final Submittal:

- 1) Submit three (3) paper-copy set(s) of marked-up record prints.
- 2) Submit record digital data files and three (3) set(s) of record digital data file plots.
- 3) Plot each drawing file, whether or not changes and additional information were recorded.

B. Record Specifications: Submit one (1) paper copy and annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one (1) paper copy and annotated PDF electronic files and directories of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit three (3) paper copies and annotated PDF electronic files and directories of each submittal.

E. Reports: Submit written report weekly indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.

- c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding archive photographic documentation.
2. Content: Types of items requiring marking include, but are not limited to, the following:
- a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Depths of foundations below first floor.
 - d. Locations and depths of underground utilities.
 - e. Revisions to routing of piping and conduits.
 - f. Revisions to electrical circuitry.
 - g. Actual equipment locations.
 - h. Duct size and routing.
 - i. Locations of concealed internal utilities.
 - j. Changes made by Change Order or Change Directive.
 - k. Changes made following Architect's written orders.
 - l. Details not on the original Contract Drawings.
 - m. Field records for variable and concealed conditions.
 - n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Newly Prepared Record Drawings: Prepare new Drawings instead of preparing record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.
- 1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
 - 2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared record Drawings into record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.
- C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
- 1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 - 2. Format: Annotated PDF electronic file with comment function enabled.

3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
 5. Note related Change Orders and record Drawings where applicable.
- B. Format: Submit record Specifications as scanned PDF electronic file(s) of marked-up paper copy of Specifications.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, in record Specifications, and on record Drawings where applicable.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

- B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s) of marked-up miscellaneous record submittals.
 - 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's reference during normal working hours.

END OF SECTION 017839

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SECTION 017900

DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. The Uniform General Conditions are a part of the Contract Document. Where they differ from these specifications, the more restrictive shall prevail.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, on equipment as requested by Owner.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Attendance Record: For each training module, submit list of participants and length of instruction time.
- C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

- A. Transcript: Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same

label information as the corresponding video recording. Include name of Project and date of video recording on each page. In addition provide a

- B. PDF in electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
- C. At completion of training, submit complete training manual(s) for Owner's use prepared and bound in format matching operation and maintenance manuals and in PDF electronic file format on compact disc.

1.5 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
 - 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.

- e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
5. Adjustments: Include the following:
- a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
6. Troubleshooting: Include the following:
- a. Diagnostic instructions.
 - b. Test and inspection procedures.
7. Maintenance: Include the following:
- a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
8. Repairs: Include the following:
- a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 - 2. Owner will furnish an instructor to describe Owner's operational philosophy.
 - 3. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner, through Architect, with at least seven (7) days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of an oral performance-based test.
- F. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

END OF SECTION

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SECTION 024119

SELECTIVE STRUCTURE DEMOLITION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the selective demolition work as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Demolition and removal of selected site elements.
 - 3. Salvage of existing items to be reused or recycled.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site at date prior to commencement of demolition operations.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.

3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection, including but not limited to, roof and clearstory on existing building.

1.6 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property for dust control and, for noise control. Indicate proposed locations and construction of barriers.
- B. Schedule of Selective Demolition Activities: Indicate the following:
 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 3. Coordination for shutoff, capping, and continuation of utility services.
 4. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- C. Predemolition Photographs: Submit before Work begins. Carefully and completely document any existing damage to existing structure.
- D. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 1. Maintain fire-protection facilities in service during selective demolition operations.
 2. Utilities service may not be interrupted during normal MSU hours of operation. Schedule interruptions at night or weekend.

1.9 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties if any.
- B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Request and review record documents of existing construction available through the Architect. Owner does not guarantee that existing conditions are same as those indicated in record documents.
- C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
 - 1. Comply with requirements specified in Section 013233 "Photographic Documentation."
 - 2. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.
 - 3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
 - 1. Comply with requirements for existing services/systems interruptions specified in Section 011000 "Summary."
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

- f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
- C. Refrigerant: Where refrigerant is in a system to be demolished, remove refrigerant from mechanical equipment to be demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 - 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain[fire watch and] portable fire-suppression devices during flame-cutting operations.
 5. Maintain adequate ventilation when using cutting torches.
 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Dispose of demolished items and materials promptly; comply with requirements in Section 017419 "Construction Waste Management and Disposal."
- B. Reuse of Building Elements: Project has been designed to result in end-of-Project rates for reuse of building elements as follows. Do not demolish building elements beyond what is indicated on Drawings without Architect's approval.
- C. Removed and Salvaged Items:
1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area off-site as designated by Owner.
 5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.

3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4" at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings.
- E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Roofing Section for new roofing requirements.
 1. Remove portions of existing roof membrane, flashings, copings, and roof accessories.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION

SECTION 031100

CONCRETE FORMING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Furnish all labor, materials, services and equipment as required in conjunction with or properly incidental to constructing concrete formwork as described herein and/or as shown on the Drawings.
 - 2. Furnish all labor, materials, services and equipment as required in conjunction with or properly incidental to excavation and installation of spread and continuous footings as described herein and/or as shown on the Drawings.
 - 3. Formwork for site work concrete is specified in other sections.
- B. Related Documents:
 - 1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1, General Requirements, apply to Work of this Section.
- C. Related Sections:
 - 1. Section 033050 – Vapor Barrier.
 - 2. Section 031106 – Void Forms.
 - 3. Section 032000 – Concrete Reinforcement.
 - 4. Section 033000 – Cast-in-Place Concrete.
 - 5. Geotechnical Investigation Report: Furnished by Owner.

1.2 REFERENCES

- A. The Work described in this Section, unless otherwise noted on the Drawings, or herein specified, shall be governed by the latest editions of the following Codes or Specifications.
 - 1. ACI 301, Specifications for Structural Concrete of Buildings.
 - 2. ACI 318, Building Code Requirements for Structural Concrete.
 - 3. ACI 347R, Guide to Formwork for Concrete.

1.3 SYSTEM DESCRIPTION

- A. Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension. Design criteria shall conform to ACI 347R.

1.4 SUBMITTALS

- A. Submit shop drawings in accordance with other sections.

- B. Shop Drawings: Submit a diagram of proposed construction joints not indicated on Drawings prior to or concurrent with reinforcing steel shop drawings.
 - 1. Shop drawings will be reviewed for proposed construction joint locations with respect to aesthetic criteria and general design conformance only.
- C. Product Data: Submit complete manufacturer's product data sheets for each specified product.

1.5 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 347R, ACI 301, and ACI 318.
- B. Except when close coordination and fitting of various trades' work precludes allowance of tolerance, maximum total permissible deviations from established line, grades and dimensions shall conform to ACI 347R. Set and maintain forms in such manner as to ensure completed work within specified tolerance limits.
 - 1. Variation in location of embedded structural items unless provided with sleeves or other means of adjustment shall be a maximum of 1/4".
- C. Footing installation Tolerances:
 - 1. Maximum lateral variation off of centerlines: 2".
 - 2. Plan Dimensions: Plus 3", minus 1/2".
 - 3. Thickness: Not smaller than scheduled sizes.
 - 4. Top of Footing Elevation: Plus 0", minus 3".

1.6 DELIVERY, STORAGE AND HANDLING

- A. Form material shall be delivered to the job site as far in advance of its use as is practical, and shall be carefully stacked clear of the ground in such a manner as to facilitate air drying.
- B. Store form materials and accessories on dunnage and under cover with protective sheeting.
- C. Store void forms and installation instructions in manufacturer's packaging.

1.7 COORDINATION

- A. Notify responsible trades of schedules of concrete pours to as to allow adequate time for installation and coordination of their work.
- B. Schedule footing excavations such that reinforcing and concrete can be placed immediately after excavations are completed and inspected.

PART 2 PRODUCTS

2.1 FORM MATERIALS

- A. Forms: Wood, metal and other approved material that will not adversely affect surface of concrete and will provide or facilitate obtaining specified surface finish:

1. Wood forms for unexposed concrete surfaces shall be built of No. 2 Southern Pine Lumber or other material of equal qualifications, of sufficient thickness to be capable of sustaining the loads to be imposed thereon, dressed to uniformly smooth contact surfaces and so constructed as to be readily removable.
2. Wood forms for exposed concrete surfaces shall be constructed of moisture-resistant, concrete form sheathing, not less than five (5) ply, and at least nine-sixteenths inch (9/16") thick, with one smooth face.
3. Metal forms shall be clean, unpainted and in good condition. Forms shall at all times be straight to provide members of the widths and depths required. Damaged or indented forms will not be acceptable.
4. Rustications and bevels in exposed concrete shown on the Drawings shall be neatly formed. All rustication strips shall be milled so that the edges are smooth and free from sawmarks or other irregularities.

2.2 FORMWORK ACCESSORIES

- A. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.
- B. Corner Chamfer: 3/4 inch polyvinyl chloride PVC form strip.
- C. Form Ties:
 1. Exposed concrete surfaces; shall be manufactured to allow a positive breakback of no less than one inch (1") inside the concrete surface. Ties shall be equipped with a plastic cone of not less than five-eighths inch (5/8") diameters and one inch (1") long which will completely cover the hole and prevent the leakage of any mortar.
 2. Unexposed surfaces; shall be bolt rods or patented devices having a minimum tensile strength of three thousand (3,000) pounds when fully assembled. Ties shall be adjustable in length and free of lugs, cones, washers or other features which would leave a hole larger than seven-eighths inch (7/8") in diameter, or depressions back of the exposed surface of the concrete. Ties shall be of such construction that, when the forms are removed, there will be no metal remaining within one-inch (1") of the finished surface of the concrete.
- D. Form Sealer: High performance, transparent, penetrating polyurethane sealer for wood forms.
- E. Compressible Filler: Premolded plastic strips, non-asphaltic, ASTM D1752, Type 1.
- F. Construction Joint Form: Manufactured key-joint form that produces smooth, flush surface joint.
- G. Vapor Barrier: Plastic extrusion in accordance with Section 03 30 50 Vapor Barrier.
- H. Waterstops: Synko-Flex Preformed Plastic Waterstop of Synko-Flex Products Co. or approved equivalent, meeting requirements of Fs SS-S-00210.

- I. Void Form System: If required by Drawings, Void Forms to create a temporary support for placement of structural concrete over expansive soils shall be in accordance with Section 03 11 06 Void Forms.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Refer to Division 1, General Requirements – Execution, for additional requirements on Verification of existing conditions before starting work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
 1. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.
- C. Report in writing to Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.
- D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.2 ERECTION

- A. All concrete members shall be adequately shored to safely support all loads and lateral pressures outlined in “Recommended Practice for Concrete Formwork” (ACI 347R), without distortion, excessive deflection and other damage.
- B. All necessary forms, centering, shores and molds shall be built to conform to the shapes, lines and dimensions of the various members of concrete construction, as shown or scheduled on the Drawings. They shall be sufficiently tight and so substantially assembled as to prevent bulging or the leakage of mortar. All forms shall be assembled to facilitate their removal without damage to the concrete.
- C. Provide temporary openings at the bottom of cast-in-place walls, columns and elsewhere as required to facilitate cleaning, drainage and inspection.
- D. Construct forms with such care as to produce concrete surfaces which will not have unsightly or objectionable form marks in exposed (concrete) surfaces. Lumber once used as forms shall have all contact surfaces thoroughly cleaned before reuse.
- E. Soffits: If indicated on Drawings, form the soffits of grade beams, walls and slabs bearing on piers using a void form system.
- F. Slab Voids: If indicated on Drawings, install forms continuous and tightly butted together. Cut forms tight around all projections. Prior to placing reinforcements, entire carton form area shall be covered with topping sheets secured with ¾” staples.

3.3 FOOTING EXCAVATION

- A. Spread and continuous footings shall extend to and penetrate bearing materials shown of the Drawings.
- B. The exposed subgrade soils shall be examined in the field by a geotechnical engineer or the testing laboratory to verify the strength and bearing capacity of the soils.
- C. Excavations and footings shall be the size and shape as shown on the Drawings. The bottom of each excavation shall be level, undisturbed, free of water, caving material or any other foreign substance.

3.4 FORM TIES

- A. Form ties shall be employed in such places and at such intervals as to securely hold the forms in position during the placing of concrete, and to withstand the weight and pressure of the wet concrete. Ties of a type intended to be entirely removed shall be coated with release agent to safeguard against damaging the concrete during such removal. The use of wire ties will not be permitted.

3.5 WOOD STRIPS, BLOCKINGS AND MOULDINGS

- A. Place in the forms wood strips, blocking, moulding, nailers, etc., as required to produce the finished profiles and surfaces shown on the Drawings and to provide nailing for wood members or other features required to be attached to concrete surfaces in such manner. Coat wood strips, blocking and moulding with release agent.
- B. Chamfers: All exposed external corners of concrete member shall have 3/4" chamfer strips placed in the forms to relieve the angles.

3.6 FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.7 CONSTRUCTION JOINT

- A. Except as otherwise specifically indicated on the Drawings, each concrete member shall be considered as a single unit of operation, and all concrete for the same shall be placed continuously in order that such unit will be monolithic in construction. Should construction joints prove to be absolutely unavoidable, the joints shall be located at or near the midpoints of spans.
- B. Additional construction joints shall not be made under any circumstances without prior approval by the Architect. All construction joints must be either plumb or level. Provide appropriate keys and dowels in all construction joints, whether horizontal or

vertical.

3.8 FORM CLEANING

- A. Immediately before placing concrete, clean forms free of chips, wire clippings and other debris.
- B. Clean formed cavities of debris prior to placing concrete.
 - 1. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
 - 2. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.9 INSERTS AND ACCESSORIES

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
- B. Locate and set in place items that will be cast directly into concrete.
- C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.
- D. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.

3.10 WALLS

- A. Construct concrete walls to the heights, thicknesses and profiles shown on the Drawings. Provide temporary openings at the bottom of all wall forms to facilitate cleaning and inspection. Close such openings securely, immediately in advance of pouring concrete in the wall forms. Provide appropriate keys and haunches in walls to receive free edge of concrete floors.

3.11 WATERSTOPS

- A. Provide continuous waterstops in all joints below grade. Position waterstops accurately and support against displacement. Splice sections watertight in accordance with manufacturer's recommendations.

3.12 VAPOR BARRIER

- A. Install vapor barrier under all concrete floor slabs on grade and elsewhere as indicated on drawings. Smooth subgrade to prevent protrusions that may cause damage or rupture of film.

3.13 MISCELLANEOUS

- A. Construct forms for any and all items of concrete work required for or in connection with the satisfactory completion of the project, whether each such item is specifically shown or referred to or not.
- B. Do not sleeve any columns, beams, slabs or joists unless such sleeves are indicated on the Structural Drawings, or are previously approved on Shop Drawings by the Structural Engineer.

3.14 REMOVAL OF FORMS

- A. Forms shall not be removed until the concrete has adequately hardened and set. Clamps or tie rods may be loosened twenty-four (24) hours after the concrete is placed; ties, except for a sufficient number to hold the forms in place, may be removed at that time. Throughwall ties that are to be wholly withdrawn shall be pulled toward the inside face of the respective wall or beam. Cutting ties back from the face of the concrete will not be permitted, and care shall be exercised to avoid spalling concrete surfaces. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- B. Formwork for concrete members that support the weight of concrete shall remain in place until the concrete has reached 75% of its specified 28-day strength, unless otherwise specified or permitted.
- C. Under normal conditions, the minimum period of time to be allowed to elapse before forms may be removed shall be as indicated in ACI 347R, but its observance shall not operate to relieve the Contractor of the responsibility for the safety of the structure. Deviations shall be submitted to and reviewed by the Architect prior to removal of forms.
- D. When the temperature falls below forty degrees Fahrenheit (40 degrees F.), the forms shall remain in place an additional period equal to the time the structure has been exposed to such lower temperature. Adequate measures shall be taken to protect the concrete from cold weather conditions.
- E. Adequately reshore members subject to additional loads during construction to support both member and construction loads in a manner that will protect member from damage.
- F. When reshoring is required, the operations shall be planned in advance and shall be the responsibility of the Contractor.
- G. Contractor shall pay for and have Testing Laboratory make additional test cylinders to confirm strength requirements for early form recovery. Reshore before removing original shoring. Reshoring shall remain in place until members have attained required compressive strength, or as long as required to support additional construction loads.

3.15 FORM REUSAGE

- A. Thoroughly clean surfaces of forms and remove nails before reuse. Do not reuse

damaged or worn forms. Inspect forms and re-tighten rustications. Remove traces of joint treatment and where required for taping joints, remove traces of release agent with appropriate solvents.

- B. Recoat contact surfaces of forms and liners with a light spray coat of release agent. Do not apply until after joint treatment is complete.

3.16 FIELD QUALITY CONTROL

- A. Refer to Division 1, General Requirements, for additional requirements for a Contractor Quality Control Representative to perform contractor quality control inspections.
 - 1. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.
 - 2. Document preparatory, initial and follow-up inspection in Contractor's Test and Inspection Reports.
 - 3. Test and Inspection Reports shall be available to Architect upon request.
- B. Footing Excavations:
 - 1. Soils Testing Laboratory shall inspect each footing excavation to determine that proper bearing stratum is obtained and utilized for bearing and that excavations are properly clean and dry before placing concrete.
 - 2. Furnish complete footing log showing location, elevation of top of bearing stratum, footing size and depth, condition of the material, excavation properly clean and dry before placing concrete, reinforcement in compliance with the Contract Documents and any and all observed irregularities, deficiencies or deviations from the Contract Documents.
 - 3. Footing excavation shall be scheduled such that the concrete can be placed immediately after inspection.
- C. Correct deficiencies in products and installation found not to be in compliance with Contract Documents.

END OF SECTION

SECTION 031106

VOID FORMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Pier top forms.
 - 2. Pier and grade beam void forms.
 - 3. Backfill retainers.
- B. Related Documents:
 - 1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1, General Requirements, apply to the Work of this section.
- C. Related Sections:
 - 1. Section 031100 - Concrete Forming.
 - 2. Section 033000 - Cast-in-Place Concrete.

1.2 SYSTEM DESCRIPTION

- A. Void Form System: Corrugated paper or plastic void form materials and accessories to properly create a temporary support for the placement of structural concrete over expansive soils.

1.3 SUBMITTALS

- A. Division 1, General Requirements - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit data indicating form materials, configurations and limitations.

1.4 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Manufacturer: Company specializing in manufacturing Products specified with minimum five (5) years documented experience.
 - 2. Installer: Company specializing in performing the Work of this Section with minimum five (5) years documented experience.
- B. Manufacturer Installation Instructions: Contractor shall maintain a current copy of void form manufacturer published instructions in Project Field Office and refer to installation instructions at all times during installation.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Division 1, General Requirements - Product Options: Transport, handle, store, and protect Products.
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Accept Products on site in manufacturer's packaging. Inspect for damage. Return damaged Products and replace with undamaged Products.
- D. Deliver Material Safety Data Sheet (MSDS) for each material to Project Field Superintendent for Contractor Records.
- E. Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
- F. Environmental Requirements: Place forms in clean dry grade beam excavation. Do not place forms if excavation is damp or wet. Do not place forms during rain or if rain is forecasted.
- G. Water Spraying: Spraying water into grade beam excavation to clean top of previously placed pier not permitted. Clean top of pier concrete by means other than water. Keep void forms dry.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design for Void Forms is based on the product named.
 - 1. SureVoid Products, Incorporated: www.surevoid.com.
- B. Division 1, General Requirements - Product Options: Product options and substitutions. Substitutions: Permitted.

2.2 MATERIALS

- A. Pier Top Forms: Suretop, Commercial. Cylindrical corrugated form that properly forms and contains upper portion of concrete piers.
 - 1. Composition: Waterproof corrugated plastic.
 - 2. Diameters: Slightly undersized to pier diameter indicated on Drawings.
 - 3. Length: Maximum 24 inches.
- B. Grade Beam Void Forms: WallVoid. Rectangular form with panel flange used in-between the panels of grade beam form system. Panels are placed on flange to hold piece in place preventing it from floating up into grade beam during concrete placement.
 - 1. Function: To create void space directly under grade beams.
 - 2. Composition: Corrugated paper material with a moisture resistant exterior, having an interior fabrication of a uniform, cellular configuration, composed with components with wet-strength paper and wax impregnated medium/liners and moisture resistant adhesive (Extra Slow).
 - 3. Depth: Indicated on Drawings.

4. Position: Between form panels.
 5. Strength: For wall height indicated on Drawings based on manufacturer's recommendations.
 6. Accessories:
 - a. Seam Pads: Cover for void form joints to prevent moisture and concrete from flowing in between and into wall void interior.
 - b. End Caps: Covers exposed ends of void forms to prevent moisture and concrete from flowing into wall void interior.
- C. Grade Beam Void Forms (Earth Formed Grade Beams): TrenchVoid. Rectangular form without flange used in bottom of trenched grade beam where earth is used to form beam. Width of form is same as trenched grade beam.
1. Function: To create void space directly under grade beams.
 2. Composition: Corrugated paper material with a moisture resistant exterior, having an interior fabrication of a uniform, cellular configuration, composed with components with wet-strength paper and wax impregnated medium/liners and moisture resistant adhesive (Extra Slow).
 3. Depth: Indicated on Drawings.
 4. Position: Between form panels.
 5. Strength: For wall height indicated on Drawings based on manufacturer's recommendations.
 6. Accessories:
 - a. Seam Pads: Cover for void form joints to prevent moisture and concrete from flowing in between and into wall void interior.
 - b. End Caps: Covers exposed ends of void forms to prevent moisture and concrete from flowing into wall void interior.
- D. Pier Void Forms: Sure Round PierVoid.
1. Function: To create void space adjacent to upper portion of drilled piers under pier cap.
 2. Composition: Same as WallVoid.
 3. Interior Profile: Pre-manufactured, non-field cut, sealed unit with curved, radial, vertical edge adjacent to pier, diameter as required for pier diameter.
 4. Strength: Same as WallVoid.
- E. Slab Void Forms: Sure Void System.
1. Forms shall be capable of supporting not less than 1200 psf or actual load from deep wall or beam without deflection.
 2. Fiberboard void forms for beam soffits below grade and slab voids shall be rectangular forms manufactured by Sure Void products.
 3. Topping sheet shall be 1/4" masonite or fiberboard 275# Natural Wax Impregnated Sheet.
 4. Prior to placing reinforcements, entire carton form area shall be covered with topping sheets secured with 3/4" staples.
- F. Backfill Retainers: SureRetainer. Impact resistant, high-density, polyethylene (HDPE) plastic designed to prevent migration of backfill material into voided area and used to permit compaction equipment to operate directly adjacent to grade beam.
1. Retainer Extension Above Top of Void Form: Minimum 4 inches.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Refer to Division 1, General Requirements – Execution for additional requirements on the Verification of existing conditions before starting Work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
- C. Report in writing to Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.
- D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.2 PREPARATION/INSTALLATION

- A. Assemble knock-down products in accordance with manufacturer's published instructions to develop designed strengths.
- B. Keep forms dry before placing concrete. Remove forms that are wet and replace with new forms.
- C. Keep water away from trenches. Trenches shall be kept dry.
- D. Place only as many forms as can be installed and utilized in a reasonable amount of time during controlled concrete placement.
- E. Install forms and accessories in accordance with manufacturer's published instructions.
- F. Protect void forms from moisture, and replace wet or damaged pieces before placing concrete.
- G. Immediately protect base of wall after forms have been stripped with backfill retainers. Retainers will keep backfill material from migrating into voided area.
- H. Install backfill retainers in accordance with manufacturer's published instructions.
- I. Install backfill retainers at base of wall, overlap and seal pieces together and attach retainers to concrete grade beam.

3.3 FIELD QUALITY CONTROL

- A. Refer to Division 1, General Requirements, for additional requirements for a Contractor Quality Control Representative to perform contractor quality control inspections.
 - 1. Inspect installation of void forms, form type, material and configuration.
 - 2. Document preparatory, initial and follow-up inspection in Contractor's Test and Inspection Reports.

3. Test and Inspection Reports shall be available to Architect upon request.
- B. Correct deficiencies in products and installation found not to be in compliance with Contract Documents.

END OF SECTION

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SECTION 032000

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Furnish all labor, materials, services and equipment as required in conjunction with or properly incidental to placing reinforcing steel for cast-in-place concrete as described herein and/or as shown on the Drawings.
 - 2. Supports and accessories for steel reinforcement.
- B. Related Documents:
 - 1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1, General Requirements, apply to Work of this section.
- C. Related Sections:
 - 1. Section 031100 – Concrete Forming.
 - 2. Section 033000 - Cast-in-Place Concrete.

1.2 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 301 – Specifications for Structural Concrete for Buildings.
 - 2. ACI 318 – Building Code Requirements for Structural Concrete.
 - 3. ACI SP-66 – ACI Detailing Manual.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 185 – Standard Specification for Welded Steel Wire Fabric for Concrete Reinforcement.
 - 2. ASTM A 615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 3. ASTM A 706 – Standard Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement.
- C. Concrete Reinforcing Steel Institute (CRSI):
 - 1. CRSI MSP – Manual of Standard Practice.
 - 2. CRSI DET – Reinforcing Bar Detailing.

1.3 SUBMITTALS

- A. Shop Drawings: Comply with requirements of ACI SP-66 and CRSI DET. Include installation drawings with complete bending diagrams, assembly diagrams for splicing and laps of bars, shapes, dimensions and details of bar reinforcing and accessories.
 - 1. Show diagrammatic elevations of walls at scale large enough to clearly show position and erection marks of marginal bars, around openings, dowels,

- splices, etc., for these bars.
2. Show complete layout plan for each layer of reinforcing of slabs, beams and piers, showing number, arrangement, spacing, location, marking and orientations of reinforcement required for layer being described.
 3. Show details of drilled pier reinforcement placement including support and centering methods.

- B. Mill Test Reports: Certified copies, evidencing compliance with the requirements of these Specifications, shall be delivered to the Architect and Engineer with all deliveries of reinforcing steel.

1.4 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301, ACI SP-66, and ACI 318.
- B. Reinforcing steel shall be new domestic steel. Use of foreign or steel of undetermined origin not permitted.
- C. Steel supplier shall furnish mill certificate reports for all reinforcing.
1. Mill Test Reports shall be available for review by Architect and Engineer at time of delivery.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver reinforcing to project site in bundles marked with metal tags indicating bar size, length and mark.
- B. Contractor shall receive reinforcing at site, inspect reinforcing for specified requirements and verify contents of mill certificate. Contractor shall require tests as specified in Quality Assurance article if mill certificate is not provided with shipment.
- C. Unload reinforcing carefully to prevent damage. Store above ground in dry, well drained area and protect from mud, dirt, paint, corrosion, etc.
- D. Deliver pier reinforcing steel in 40 and 60 foot lengths.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Reinforcing Bars: ASTM A615, new, deformed billet steel bars, Grade 60. All reinforcement specifically noted as being welded shall be domestic steel conforming to ASTM A706.
1. New deformed billet-steel bars.
 2. Unfinished.
- B. Welded Wire Fabric Reinforcing: ASTM A185, Grade 65, new, domestic manufacturer, steel wire spot welded at intersections and of sizes indicated. Supply in flat sheets, rolls not permitted.

- C. Reinforcement Accessories: Include spacers, chairs, bolsters, ties and other devices necessary for properly placing, spacing, supporting and fastening reinforcement in place, conforming to the requirements of CRSI DET and ACI SP-66. Metal accessories shall be plastic protected where legs will be exposed in finished concrete surfaces. Plastic protection shall be the color of the concrete.
 - 1. Tie Wire: FS QQ-W-461, black annealed steel, minimum 16 gauge.
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 - a. Supports for reinforcement in concrete resting on earth or vapor barrier shall be pre-cast concrete briquettes, having tie wires embedded therein, or Individual High Chairs with bottom plates.
- D. Mechanical Splices: Lenton Taper Threaded Rebar Splices - as manufactured by ERICO Products or equal as submitted for approval.

2.2 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI MSP and ACI SP-66.
- B. Locate reinforcing splices not indicated on Drawings at point of minimum stress in accordance with CRSI MSP and ACI SP-66.
- C. Fabricate pier cages in 40 and 60 foot lengths ready for cutting to exact lengths as pier shafts are drilled.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Refer to Division 1, General Requirements – Execution for additional requirements on the Verification of existing conditions before starting Work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
- C. Report in writing to Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.
- D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.2 PREPARATION

- A. Cleaning: Before placing in work thoroughly clean reinforcement of loose rust, mill, scale, dirt, oil, and other coating which might tend to reduce bonding. Re-inspect reinforcing left protruding for future bonding, or following delay in work, and re-clean if necessary.
- B. In case of fabrication errors, do not straighten or re-bend reinforcement so as to

weaken or injure the material.

3.3 PLACEMENT – REINFORCING BARS

- A. Bar Placement: In accordance with ACI 301, ACI SP-66, ACI 318, and CRSI MSP.
- B. Bending: Bend bars cold; do not heat reinforcing or bend by makeshift methods. Discard bent, kinked or otherwise damaged bars.
- C. Splices: In accordance with ACI SP-66 and the Contract Documents.
- D. Placing: Reinforcement shall be accurately placed and securely saddle tied in accordance with CRSI recommended practice with No. 16 gauge black annealed wire, and shall be rigidly held in place during the placing of the concrete by means of metal chairs or spacers.
 - 1. Reinforcement in concrete walls shall be held in position, and to proper clearances, by means of concrete or metal spacers made especially for the locations where spacers are required.
 - 2. Reinforcement in footings, beams and slabs shall be held to exact location during placing of concrete by spacers, chairs, or other necessary supports.
- E. Supports: In accordance with ACI 301 and ACI SP-66 for number, type, spacing and placing.
- F. Protection: Concrete cover over reinforcing steel shall conform to Structural Drawings or to ACI 318, Chapter 7.
- G. Pier Cages: After each pier is drilled, the pier cage for that pier shall be cut to exact length and placed centered within pier shaft.
 - 1. Splicing of pier cage reinforcing is Not Permitted in upper 5 feet of pier.
 - 2. Bottom of pier cage shall be held in place above bottom of pier shaft as indicated on Structural Drawings.
- H. Footing Reinforcing:
 - 1. All steel reinforcing mats shall be completely fabricated in a rigid fashion in order to permit expeditious placement into the excavation with a minimum time delay.
 - 2. Accurately place reinforcement in excavations, maintaining specified coverage. Secure to prevent displacement during concreting.

3.4 PLACEMENT – WIRE FABRIC

- A. Install in longest practical lengths.
- B. Do not make end laps midway between supporting beams, or directly over beams or continuous structures.
- C. Offset end laps in adjacent widths to prevent continuous lap.
- D. Welded wire fabric in footings, beams and slabs shall be held to exact location during

placing of concrete by spacers, chairs or other necessary supports. Supports shall be spaced as required to hold welded wire fabric in place with a maximum spacing of 3 feet on center.

- E. Lap splices shall be in accordance with ACI 318.

3.5 WELDING

- A. No welding of reinforcing steel will be permitted unless specifically indicated on the Drawings.
- B. Welding of reinforcing steel shall conform to AWS D1.4.

3.6 FIELD QUALITY CONTROL

- A. Quality Control: Perform contractor quality control inspections.
 - 1. Inspect reinforcement installation, steel type and grade, supports, spacers and ties before concrete placement.
 - 2. Observe and report on placement of reinforcement, including size, quantity, vertical location, horizontal spacing, correctness of bends, splices, clearance between bars and forms, firmness of installation, and security of supports and ties, immediately prior to concreting.
 - 3. Correct deficiencies in products and installation found not to be in compliance with Contract Documents.
 - 4. Test and Inspection Reports shall be available to Architect upon request.
- B. Testing and Inspection Services – Testing Laboratory Services: Perform the following inspections and tests.
 - 1. If reinforcing steel is purchased direct from a United States mill, manufacturer's test sheets will be sufficient. Steel supplier shall furnish mill certificate reports.
 - 2. If steel is from an undetermined origin or manufacturer's test sheets or mill certificate reports are unavailable, perform tension and bending tests on three separate samples of each size of bar for every five tons of each type of steel as specified in the appropriate ASTM Specifications. Contractor shall furnish all material for testing and pay for all such tests.

END OF SECTION

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SECTION 033000

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Furnish all labor, materials, services and equipment as required in conjunction with or properly incidental to placing of concrete as described herein and/or as shown on the Drawings.
 - 2. Includes all cast-in-place concrete building members, and MEP equipment pads. Includes mixing, placing, and finishing.
- B. Related Documents:
 - 1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1, General Requirements, apply to the Work of this section.
- C. Related Sections:
 - 1. Section 033050 – Vapor Barrier.
 - 2. Section 031100 – Concrete Forming.
 - 3. Section 031106 – Void Forms.
 - 4. Section 032000 – Concrete Reinforcement.

1.2 REFERENCES

- A. American Concrete Institute (ACI):
 - 1. ACI 211.1, Standard Practice for Selecting Proportions of Normal, Heavyweight and Mass Concrete.
 - 2. ACI 301, Specifications for Structural Concrete for Buildings.
 - 3. ACI 302.2R, Guide for Concrete Floor and Slab Construction.
 - 4. ACI 304R, Guide for Measuring, Mixing, Transporting and Placing Concrete.
 - 5. ACI 305R, Hot Weather Concreting.
 - 6. ACI 306R, Cold Weather Concreting.
 - 7. ACI 308, Standard Practice for Concrete Curing.
 - 8. ACI 309, Standard Practice for Consolidation of Concrete.
 - 9. ACI 311, ACI Manual of Concrete Inspection.
 - 10. ACI 318, Building Code Requirements for Structural Concrete.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM C31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - 2. ASTM C33, Standard Specification for Concrete Aggregate.
 - 3. ASTM C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 4. ASTM C94, Standard Specification for Ready-Mix Concrete.
 - 5. ASTM C136, Standard Method for Sieve Analysis of Fine and Coarse

- Aggregates.
6. ASTM C143, Standard Specification for Slump of Portland Cement Concrete.
 7. ASTM C150, Standard Specification for Portland Cement.
 8. ASTM C172, Sampling of Freshly Mixed Concrete.
 9. ASTM C260, Standard Specification for Air-Entraining Admixtures.
 10. ASTM C330, Standard Specification for Lightweight Aggregates for Structural Concrete.
 11. ASTM C494, Standard Specification for Chemical Admixtures for Concrete.
 12. ASTM C618, Standard Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
 13. ASTM E1155, Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers.

1.3 SUBMITTALS

- A. Mix Designs: The Contractor shall submit proposed mix designs in accordance with ACI 318.
1. Proportions of cement, including fly ash content, fine and coarse aggregates, and water.
 2. Combined aggregate gradation.
 3. Aggregate specific gravity and gradations.
 4. Water-cement ratio, design strength, slump and air content.
 5. Type of cement and aggregates.
 6. Type and dosage of admixtures.
 7. Special requirements for pumping.
 8. Range of ambient temperature and humidity for which design is valid.
 9. Any special characteristics of mix which require precautions in mixing, placing, or finishing techniques to achieve finished product.
 10. Mix designs shall be accompanied with 30 strength test records not more than 24 months old in accordance with ACI 318, Table 5.3.2.1. If less than 30 test records are submitted, strength increases in accordance with the following will be required.
 - a. Less than 30 tests but equal to or more than 15 tests: Table 5.3.1.2 and Table 5.3.2.1.
 - b. Less than 15 tests: Table 5.3.2.2.
 - c. No test records, no trial mixes and mix strength less than 5,000 psi: Section 5.4. Section requires a minimum strength of 1,200 psi greater than the specified strength.
- B. Product Data: Submit manufacturers' data on manufactured products.
1. Air entrainment admixture.
 2. Water reducing admixture.
 3. Waterstop.
 4. Expansion and control joints.
 5. Sealants and waterproofing.
 6. Reinforcing bars and wire mesh.
 7. Vapor barrier.
 8. Actual break-out of concrete materials if requested, (sand/gravel/cement).
 9. Concrete accessories, complete.
 10. Epoxy and grout.

11. Lumber.
 12. Steel forms.
 13. Anchors.
 14. Architect may require additional information and or product material during construction. Provide when requested.
- C. Shop Drawings: Submit a Control Joint and Construction Joint plan indicating proposed locations of control joints and construction joints in concrete floor slabs. Control joint and construction joint plan shall be mechanically drawn to scale.
- D. Test Reports:
1. Compressive strength tests for each set of test cylinders.
 2. Slump test for each set of test cylinders.
 3. Air content test for each set of test cylinders.
 4. Unit weight test for each set of test cylinders.
 5. Temperature test for each set of test cylinders.
 6. Floor Flatness and Levelness tests.
- E. Special Inspection Reports:
1. Special Inspection Reports: Submit inspection reports directly to Building Official and Architect from Independent Special Inspector with copy to Contractor in accordance with requirements of International Building Code, Section 1704 - Special Inspections, if required by the Building Official.

1.4 QUALITY ASSURANCE

- A. Source Quality Control:
1. Concrete production facilities shall meet the requirement for certification by the National Ready Mixed Concrete Association.
 2. Concrete batchers shall be completely interlocked semi-automatic or automatic batchers, as defined by the Concrete Plan Manufacturer's Bureau.
 3. Concrete batchers shall have graphic, digital, or photographic recorders, which shall register both empty balance and total weight (or volume of water or admixture) of each batched material, time to the nearest minute, date, identification of batch, and numerical count of each batch. Copies of the record shall be furnished to the Testing Laboratory.
- B. Qualifications:
1. Installer: Company specializing in concrete work specified with minimum five (5) years documented experience.
 2. Concrete Samples and Slump Tests:
 - a. Testing Agency: Sample cylinders taken and slump test performed by Independent Testing Laboratory personnel.
 - b. Contractor: Sample cylinders and slump tests may be taken by Contractor if taken by person trained in concrete sampling and testing, and holding a current ACI Concrete Laboratory Technician - Grade 1 Certification. Submit certification to Architect as part of Qualification Documentation.
- C. Perform work of this section in accordance with ACI 301 and ACI 318.

- D. Acquire cement from same source and aggregate from same source for entire project.
- E. Concrete Floor Slab Moisture Emission and Acidity:
 - 1. Do not place or permit placement of underslab granular mat if building area subgrade pad is wet. Place granular mat only when building area subgrade pad area is dry.
 - 2. Do not place or permit placement of underslab vapor barrier over granular mat if granular mat is wet. Place underslab vapor barrier only when granular mat is dry. Refer to Section 03 30 50 - Vapor Barrier.
 - 3. Do not add water into transit-mixer at Project site before concrete placement unless instructed by Independent Testing Laboratory representative as specified in this Section.
 - 4. Concrete Contractor is responsible for properly curing concrete floor slab to provide concrete floor slab with moisture emission and acidity test results conforming to each floor material manufacturer requirements for moisture emission and acidity as specified in each floor material specification section when tested in accordance with ASTM F 1869. Refer to each floor material specification section for specific requirements.

1.5 PRODUCT DELIVERY, STORAGE, HANDLING AND SEQUENCING

- A. Mix and deliver concrete to project ready-mixed in accordance with ASTM C94.
- B. Schedule delivery so that continuity of any pour will not be interrupted for over 15 minutes.
- C. Place concrete on site within 90 minutes after proportioning materials at batch plant.
- D. Coordinate Work of this Section with work of other Sections as required to properly execute the Work and as necessary to maintain satisfactory progress of the work of other Sections.

1.6 PROJECT CONDITIONS

- A. Hot Weather Concreting:
 - 1. Follow ACI 301 and ACI 305.
 - 2. Provide retarding type admixture conforming to ASTM C494, Type A or D in accordance with manufacturer's recommendations.
 - 3. Maximum concrete temperature shall not exceed 95 degrees F at time of placement.
 - a. With prior approval, Concrete with temperatures above 90 degrees F shall be placed only if a high range water reducer (super plasticizer) is added to the mix as directed the Testing Laboratory to maintain the specified slump during placement.
- B. Cold Weather Concreting: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures.
 - 1. Follow ACI 301 and ACI 306R.
 - 2. When ambient temperature at site is below 40 degrees F or is expected to fall to that temperature within ensuing 24 hours, measures shall be taken so that

the temperature of concrete will be between 55 degrees F and 85 degrees F at time of placement.

3. Once the concrete has been placed, it must be maintained at a temperature above 50 degrees F for minimum of 72 hours after placing.
4. Temperature Changes: Maintain changes in concrete temperature as uniformly as possible, but in no case exceed change of 5 degrees F per hour or 25 degrees F in any 24 hour period.
5. Combustion heaters shall not be used during the first 48 hours without precautions to prevent exposure of concrete and workmen to exhaust gases containing carbon dioxide and/or carbon monoxide.

- C. Select admixture type (normal, retarder, or high early) best suited for concrete at the time of placing. The use of calcium chloride is specifically prohibited.

PART 2 PRODUCTS

2.1 FORMWORK

- A. Standard Formwork: Specified in Section 03 11 00 - Concrete Forming.

2.2 REINFORCEMENT

- A. Specified in Section 03 20 00 - Concrete Reinforcement.

2.3 CONCRETE MATERIALS

- A. Cement/Fly Ash:

1. Portland Cement, Type I, conforming to the requirements of ASTM C150.
2. Fly Ash, Class C or F, conforming to the requirements of ASTM C618. The use of Fly Ash shall be subject to review by the Architect. Where Fly Ash is used in the mix design, Fly Ash shall comprise no more than 30% by weight of the total cementitious material in the mix. Fly Ash shall not be used in architecturally exposed concrete.

- B. Aggregate:

1. Fine: ASTM C33; clean, hard, durable, uncoated, natural sand, washed, free of silt, loam or clay.
2. Coarse: ASTM C33; hard, durable, uncoated gravel, washed and screened without adherent coatings.
3. Coarse aggregate for structural lightweight concrete shall conform to the applicable requirements of ASTM C330 suitably processed, washed and screened, and shall consist of durable particles without coatings. Gradation in accordance with Size Designation 3/4 inch to No. 4, Table 1, ASTM C330.
4. Grading shall be in accordance with "Standard Method for Sieve Analysis of Sieve and Coarse Aggregates" (ASTM C136).

- C. Water: ASTM C94, Paragraph 4.1.3; potable, clean and free from oil, acid and injurious amount of vegetable matter, alkalies, and other impurities.

2.4 ADMIXTURES

- A. Cement-dispersing, water-reducing types. Admixtures shall conform to ASTM C494, Type A or D, and shall be used strictly in accordance with manufacturer's recommendations and as determined by the Testing Laboratory. Admixture shall not discolor concrete or in any way affect the appearance of the concrete.
 - 1. High-range water reducing admixture conforming to ASTM C494, Type F, may be used.
- B. An air-entraining admixture conforming to ASTM C260 shall be used as required.
- C. Use of calcium chloride is specifically prohibited.

2.5 CONCRETE ACCESSORIES

- A. Non-Shrink Grout: Premixed, non-shrink, non-metallic, cement grout requiring only addition of water. Minimum compressive strength of 5,000 psi at 7-days and 7,500 psi at 28 days when placed at a plastic consistency of 115% flow factor.
- B. Bonding Agent: ASTM C 1059, Type II acrylic non-redispersable type.
- C. Vapor Barrier: Specified in Section 03 30 50 - Vapor Barrier.
- D. Epoxy Adhesive: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material type, grade, and class to suit Project requirements.
- E. Joint Filler: Non-extruding, resilient asphalt impregnated fiberboard or felt, complying with ASTM D 1751, thickness as indicated on Drawings and width/depth as indicated.
- F. Construction Joint Devices: Steel slab construction joints not permitted.
- G. Sealant and Primer: Refer to Division 7: Thermal and Moisture Protection, for additional information regarding sealant and primer.
- H. Miscellaneous Structural Metals Associated with Structural Concrete:
 - 1. All structural steel pieces including miscellaneous structural metals placed in concrete exposed to weather, in permanent contact with soil, or accessible to salt intrusion shall be hot dipped galvanized in accordance with ASTM A123.
 - 2. All structural steel pieces embedded in concrete shall conform to ASTM A36, unless noted otherwise on the Drawings.
 - 3. Welding of inserts, anchors and other steel pieces used in conjunction with structural concrete shall conform to AWS D1.1.
 - 4. Welding of reinforcing steel used in conjunction with structural concrete shall conform to AWS D1.4.
 - 5. Headed stud anchors shall conform to ASTM A108, minimum tensile strength 60,000 PSI.
 - 6. Concrete expansion anchors shall be wedge-type anchors, meeting the requirements of Federal Specifications FF-S-325, Group II, Type 4, Class 1, plated in accordance with Federal Specification QQ-Z-325C, Type II, Class 3. Size and location shall be as indicated on the Drawings.

- I. Cure and Seal Compound: shall comply with ASTM C309. For concrete floors not to receive other finishes, use Ashford Formula to cure, seal and harden concrete.
- 2.6 CONCRETE MIX DESIGN
- A. Strength: Concrete is classified and specified by ultimate compressive strength (f'_c) at the age of 28 days.
 - B. Design concrete to ultimate compressive strengths (f'_c) indicated on the Drawings.
 - C. Proportioning Concrete: Proportions of cement, aggregate, and water to attain required plasticity and compressive strength shall be in accordance with ACI 318. Do not make changes in proportions without submitting proposed changes to Testing Laboratory for evaluation.
 - 1. Mix designs furnished by the concrete supplier, and accompanied by test data showing an acceptable strength history meeting the requirements of Method 2 as specified in section 3.8 of ACI 301.
 - a. Temperature of concrete in test data shall be in within 5 degrees F of maximum temperature specified for this project.
 - b. Strengths indicated in test data shall be in accordance with ACI 318, paragraphs 5.3 and 5.4.
 - c. The specified strength of concrete used in supporting test data shall vary no more than 500 PSI plus or minus from that specified for this project.
 - 2. The Testing Laboratory shall keep a strength history record of all concrete for the duration of the project as specified in this section.

PART 3 EXECUTION

3.1 GENERAL

- A. Classes of Concrete and Usage: Concrete of the several classes required shall have the characteristics shown on the Drawings.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
 - 1. Verify lines, levels, and dimensions before proceeding with work of this section.
 - 2. Verify that screeding equipment is calibrated to provide concrete slab to specified flatness and levelness requirements.
- C. Inserts: Give the various trades and subcontractors ample notification and opportunity to furnish any and all anchors, nailers, pipes, conduits, boxes, inserts, thimbles, sleeves, frame vents, wires, supports, or other items required to be built into the concrete by the provisions of the Drawings or of the Specification governing the work of such trades and subcontractors, or as it may be necessary for the proper execution of their work. Obtain suitable templates or instructions for the installation of such items which are required to be placed in the forms.

- D. Mixing:
1. Transit-mixed concrete conforming to the requirements of ASTM C94 and ACI 304 shall be used in lieu of concrete mixed at the job site. Concrete shall not be transported or used in any case after a period in excess of ninety (90) minutes has elapsed after the introduction of water into the mixer.
 2. Indiscriminate addition of water to increase slump of concrete is prohibited. Add water only at the direction the Testing Laboratory. No water shall be added which increases the water cement ratio of the concrete in excess of the water cement ratio indicated on the approved mix design. At the direction of the Testing Laboratory the addition of a high range water reducing admixture may be used to retemper concrete.
 3. The agency supplying transit-mixed concrete shall have a plant of sufficient capacity and adequate transportation facilities, to assure continuous delivery at the rate required. The frequency of deliveries to the site of the work must be such as to provide for placing the concrete continuously throughout any one (1) pour.
- E. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner. Costs for correcting unsuitable conditions will be at Contractor's expense.

3.2 PLACING CONCRETE

- A. Place concrete in uniform layers, approximately horizontal, and not more than eighteen inches deep, exercising care to avoid vertical joints or inclined planes. The piling up of concrete in the forms in such a manner as to cause the separation or loss of any of its ingredients will not be permitted. Concrete which has partially set or hardened shall not under any circumstances, be deposited in the Work.
- B. Place concrete in the forms as nearly in its final position as is practical to avoid rehandling. Deposit concrete in horizontal layers maximum 24 inches and in a manner to avoid inclined construction joints. Exercise special care to prevent splashing the forms or reinforcement with concrete. Remove any hardened or partially hardened concrete which has accumulated on the forms or reinforcement before the work proceeds. Do not place concrete on previously deposited concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the respective member of section, except as hereinafter specified.
- C. Placing Concrete Slabs: Place and consolidate concrete slabs in continuous operation, within limits of construction joints, until completion of panel or section placement.
1. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.
 2. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or derbies to smooth surface free of humps or hollows. Do not disturb slab surfaces before beginning finishing operations.
 3. Maintain reinforcing in proper position on chairs during concrete placement.
- D. Do not permit concrete to drop freely any distance greater than five feet (5'). Where longer drops are necessary, use a chute, tremie, or other acceptable conveyance to

assist the concrete into place without separation. Do not pour directly into any excavations where water is standing.

- E. Concrete shall be placed as soon as practical after footing excavations have been completed. If concrete is not to be placed within eight hours, a 3 inch thick lean concrete “working mat” shall be placed over the bearing surface of the exposed subgrade soils within four hours after the excavation has been completed. The “working mat” shall not extend above the bottom elevation of the spread or continuous footing.
- F. Vibration: As soon as concrete is deposited, thoroughly agitate same by means of mechanical vibrators and suitable hand tools, so manipulated as to work the mixture well into all parts and corners of the forms and entirely around the reinforcement and inserts. Mechanical vibrators shall maintain frequencies in accordance with the recommendations of ACI 309, Table 5.1.4, and shall be operated by competent workmen. Over vibrating and use of vibrators to transport concrete within forms shall not be allowed. A spare vibrator shall be kept on job site during all concrete placing operations.
- G. Conveying Concrete: Convey concrete from the mixer to the place of final deposit by methods which will prevent the separation or loss of the ingredients. Concrete to be conveyed by pumping shall be submitted to the Testing Laboratory for evaluation for each class of concrete shall be taken at the discharge end of the pumping equipment.
- H. Equipment for chuting, pumping and pneumatically conveying concrete shall be of such size and design as to assure a practically continuous flow of concrete at the delivery end without separation of the materials. The use of gravity-flow or aluminum chutes or conveyors for transporting concrete horizontally will not be permitted.
- I. Bonding: Before depositing any new concrete on or against previously deposited concrete which has partially or entirely set, the surface of the latter shall be thoroughly roughened and cleaned of all foreign matter, scum and laitance. Coat surface of previously deposited concrete with a bonding agent per manufacturer’s direction.
- J. Construction Joints: Except as otherwise specifically indicated on the Drawings, each concrete member shall be considered as a single unit of operation and all concrete for the same shall be placed continuously in order that such unit will be monolithic in construction. Should construction joints prove to be absolutely unavoidable, same shall be located at or near the midpoints of spans. Additional construction joints shall not be made under any circumstances without prior review by the Architect and Structural Engineer.
- K. Protect all freshly placed concrete from washing by rain, flowing water etc. Do not allow the concrete to dry out from the time it is deposited in the forms until the expiration of the curing period.
- L. Refer to structural drawings for column base plate and other structural grouting requirements.
- M. Grout shall be mixed only in such quantities as are needed for immediate use. No

retempering shall be permitted and materials which have been mixed for a period exceeding thirty (30) minutes shall in no case be used upon any portion of the work.

- N. Imperfect or damaged work, or any material damaged or determined to be defective before final completion and acceptance of the entire job, shall be satisfactorily replaced at the Contractor's expense and shall be in conformity with all of the requirements of the Contract Documents. Removal and replacement of concrete work shall be done in such a manner as not to impair the appearance or strength of the structure in any way.
- O. Cleaning: Upon completion of the work, all forms, equipment, protective coverings and any rubbish resulting therefrom shall be removed from the premises. Finished concrete surfaces shall be left in clean and perfect condition, satisfactory to the Owner. Sweep with an ordinary broom and remove all mortar, concrete droppings, loose dirt, mud, etc.
- P. Separate slabs on grade from vertical surfaces with joint filler.
- Q. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
- R. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface.
- S. Locate construction joints in coordination with floor slab pattern placement sequence. Provide keyways minimum 1-1/2 inches deep in walls and slabs and between walls and footings.
 - 1. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless indicated otherwise.
- T. Screed floors level, maintaining surface Flatness and Levelness in accordance with the Architectural requirements.

3.3 FIELD QUALITY CONTROL

- A. Quality Control: Quality Control Representatives shall perform contractor quality control inspections.
 - 1. Inspect concrete placement, concrete pumping, leveling and screeding operations.
 - 2. Check floor slab for compliance with specified Floor Flatness and Floor Levelness.
 - 3. Document preparatory, initial and follow-up inspection in Contractor's Test and Inspection Reports.
 - 4. Test and Inspection Reports shall be available to Architect upon request.
- B. Testing and Inspection Services:
 - 1. Perform the following tests.
 - a. Compressive Strength Tests: Perform minimum one (1) test for each 100 cubic yards or fraction thereof, of each mix design of concrete placed in any one (1) day. Specimens for pumped concrete shall be taken at the discharge end of pumping equipment.

- 1) Test Cylinders: Mold and cure four (4) 6"x12" or five (5) 4"x8" specimens from each set of samples in accordance with ASTM C 31.
- 2) Tests: Each set of four (4) 6"x12" or five (5) 4"x8" cylinders.
One (1) 6"x12" or 4"x8" cylinder at seven (7) days for information.
Two (2) 6"x12" or Three (3) 4"x8" cylinders at twenty-eight (28) days.
One (1) 6"x12" or 4"x8" cylinder held in reserve for minimum fifty-six (56) days tested as directed.
- b. Slump Tests: Perform one (1) slump test for each set of samples in accordance with ASTM C 143 or as directed by Architect.
- c. Air Content Tests: Perform one (1) test for each set of samples in accordance with ASTM C 231 or ASTM C 173.
- d. Unit Weight Tests: Perform one (1) test for each set of samples in accordance with ASTM C 138.
- e. Temperature Tests: Measure temperature of concrete sample for each set of samples.
- f. Floor Flatness and Levelness Tests: Perform tests using measuring equipment in accordance with ASTM E 1155.
- g. Test Results: Testing Laboratory shall report test results in writing to Architect and Contractor within twenty-four (24) hours of test.
2. Inspections: Perform the following inspections.
 - a. Batch Inspection and Monitoring Water: Inspect each batch of concrete, monitor addition of mixing water to assure uniform consistency from truck to truck. Check mixing from mixers before mix begins to set and within time limits set forth in ASTM C94.
 - 1) Monitor addition of water to concrete at job site and length of time concrete is allowed to remain in truck during placement.
 - 2) Certify each delivery ticket indicating class of concrete delivered, amount of water added and time at which cement and aggregate was discharged into truck, and time at which concrete was discharged from truck.
3. Test Procedures:
 - a. Sample Technician: Test cylinders and slump tests performed only by person holding a current ACI Concrete Laboratory Technician - Grade 1 Certification.
 - b. Sampling: Secure composite samples in accordance with ASTM C 172. Each sample shall be obtained from a different batch of concrete on a random basis, avoiding any selection of the test batch other than by a number selected at random before commencement of concrete placement.
 - c. Pumped Concrete Samples: Specimens for pumped concrete shall be taken at the discharge end of pumping equipment.
 - d. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
4. Test Reports:

- a. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- b. Any deviations from the requirements of ASTM Specifications shall be recorded in the test report. Test concrete specimens in accordance with ASTM C 39.
- c. Should strength of concrete fall below the minimum, then additional tests, including load tests, may be required. These tests, if required, shall be made at Contractor's expense and shall be in accordance with ASTM C42 and ACI 318. If tests do not meet applicable requirements, then structure, or any part of structure, shall be removed and replaced at Contractor's expense.
- d. Test reports shall include but not be limited to the following information:
 - 1) Date of concrete placement.
 - 2) Concrete mix identification number or proportions of ingredients.
 - 3) Truck ticket number.
 - 4) Time test was made.
 - 5) Time of batching.
 - 6) Location of each placement.
 - 7) Slump.
 - 8) Unit weight and air content of concrete sampled.
 - 9) Date and results of strength test.
- e. Report promptly to Architect all details of reasons for rejection of any and all quantities of concrete. Give all information concerning locations of the concrete pours, quantities, date of pours, and other pertinent facts concerning concrete represented by the specimens.
- f. Any concrete testing requested by the Contractor for early formwork or shoring removal, etc., shall be at Contractor's expense.
- g. Furnish a statistical analysis for each class of concrete placed on the project in accordance with ACI 214 and ACI 318. Information shall be updated and distributed once a month as directed by Architect. Information shall include, but not be limited to, the following:
 - 1) Strength test at seven (7) days.
 - 2) Strength tests at twenty-eight (28) days of two (2) cylinder averages.
 - 3) 28-day moving average strength tests of last three (3) test groups.
 - 4) Standard deviation and coefficient of variation based on twenty-eight (28) day strength tests.
 - 5) Average strength and number of twenty-eight (28) day tests for most recent month.

C. Testing and Inspection Services: Special Inspections.

1. Perform Special Inspections as required by the International Building Code Section 1704 - Special Inspections as indicated on Drawings, if required by the Building Official.

3.4 DEFECTIVE CONCRETE

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- C. Do not patch, fill, touch-up, repair or replace exposed concrete except upon express direction of Architect for each individual area.
- D. Failed Strength Tests: If compressive strength tests indicate results below specified strength, Architect may require any or all of the following corrective measures be performed at Contractor's expense. Architect will determine extent of concrete removal if required.
 - 1. Change concrete mix.
 - 2. Core test in conformance with ASTM C 42.
 - 3. Load test on portion or portions of structure where test cylinders indicate concrete is below specified strength. Load testing performed in conformance with ACI 318.
 - 4. Remove and replace concrete below specified strength.

END OF SECTION

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SECTION 033050

VAPOR BARRIER

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Furnish all labor, materials, services and equipment as required to place vapor barrier, seam tape, and mastic for installation under concrete slabs.
- B. Related documents:
 - 1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1, General Requirements apply to Work of this section.
- C. Related sections:
 - 1. Section 031100 – Concrete Forming.
 - 2. Section 033000 – Cast-in-Place Concrete.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM E 1745-11 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
 - 2. ASTM E 154-99 (2005) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
 - 3. ASTM E 96-05 Standard Test Methods for Water Vapor Transmission of Materials.
 - 4. ASTM F 1249-06 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
 - 5. ASTM E 1643-11 Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- B. American Concrete Institute (ACI):
 - 1. ACI 302.2R-06 Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.

1.3 SUBMITTALS

- A. Quality control/assurance:
 - 1. Summary of test results as per paragraph 8.3 of ASTM E 1745.
 - 2. Manufacturer's samples, literature.
 - 3. Manufacturer's installation instructions for placement, seaming and penetration repair instructions.

1.4 QUALITY ASSURANCE

- A. Conform to the requirements of ACI 302.2R.
- B. Installer Qualifications: Company specializing in performing under slab vapor barrier installations experienced in use of specified projects with minimum five (5) years documented experience in under slab vapor barrier installation.
- C. Stego Manufacturer Regional Representative: Manufacturer representative shall be on-site the day of vapor barrier placement to instruct contractor in proper vapor barrier system installation, document installation and verify that proper procedures are followed.
- C. Manufacturer Installation Instructions: Contractor shall maintain current copy of vapor barrier manufacturer published installation instructions in Project Field Office and refer to installation instructions at all times during installation.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Division 1, General Requirements - Product Options: Transport, handle, store, and protect Products.
- B. Deliver vapor barrier in rolls in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Deliver Material Safety Data Sheet (MSDS) for each material to Project Field Superintendent for Contractor Records.
- D. Accept Products on site in manufacturer's packaging. Inspect for damage. Return damaged Products and replace with undamaged Products.
- E. Project Field Superintendent shall inspect Products immediately upon delivery to Project Site, determine Product conformance with specified requirements and reject Products not complying with specifications. Project Field Superintendent shall direct that non-complying Products be removed from Project Site immediately.
- F. Store materials protected from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Where noted on Drawings, 15 mil. Vapor barrier must have all of the following qualities:
 - 1. Permeance of less than 0.01 Perms [grains/(ft² * hr * in.Hg)] per ASTM F 1249 or ASTM E 96.
 - 2. Maintain permeance of less than 0.01 Perms [grains/(ft² *hr * in.Hg)] after mandatory conditioning tests per ASTM E 154 Sections 8,11,12, and 13.
 - 3. Other performance criteria:
 - a. Strength: ASTM E 1745 Class A.
 - 4. Vapor barrier products:

- a. Stego Wrap 15-mil Vapor Barrier by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
- B. Where noted on Drawings, 10 mil. Vapor barrier must have all of the following qualities:
 - 1. Permeance of less than 0.03 Perms [grains/(ft² * hr * in.Hg)] per ASTM F 1249 or ASTM E 96.
 - 2. Maintain permeance of less than 0.03 Perms [grains/(ft² * hr * in.Hg)] after mandatory conditioning tests per ASTM E 154 Sections 8,11,12, and 13.
 - 3. Other performance criteria:
 - a. Strength: ASTM E 1745 Class A.
 - 4. Vapor barrier products:
 - a. Stego Wrap 10-mil Vapor Barrier by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.

2.2 ACCESSORIES

- A. Seam tape:
 - 1. Permeance less than 0.3 perms or lower per ASTM F 1249 or ASTM E 96.
 - 2. Stego Tape by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
- B. Vapor-proofing mastic:
 - 1. Permeance less than 0.3 perms or lower per ASTM F 1249 or ASTM E 96.
 - 2. Stego Mastic by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
- C. Pipe Boots:
 - 1. Construct pipe boots from vapor barrier material pressure sensitive tape and/or mastic per manufacturer's instructions.

PART 3 EXECUTION

3.1 PREPARATION

- A. Ensure that base material is approved by Architect or Geotechnical Engineer.
 - 1. Level and compact base material.

3.2 INSTALLATION

- A. Install vapor barrier in accordance with manufacturer's instructions and ASTM E 1643-11.
 - 1. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete placement.
 - 2. Lap vapor barrier over footings and/or seal to foundation walls.
 - 3. Overlap joints 6 inches and seal with manufacturer's tape.
 - 4. Seal all penetrations (including pipes) per manufacturer's instructions.
 - 5. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
 - 6. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all sides with tape.

3.3 FIELD QUALITY CONTROL

- A. Refer to Division 1, General Requirements – Execution, for additional requirements on a Contractor Quality Control Representative to perform contractor quality control inspections.
 - 1. Inspect installation of vapor barrier, pipe boots, penetration sealing and tear sealing.
 - 2. Inspect under slab vapor barrier installation, verify that pipes, conduits, floor drains and other penetrations have been sealed and lap seams taped in conformance with ASTM E 1643-11 and manufacturers published instructions.
 - 3. Document preparatory, initial and follow-up inspection in Contractor's Test and Inspection Reports.
 - 4. Test and Inspection Reports shall be available to Architect upon request.
- B. Stego Manufacturer's Field Services:
 - 1. Provide technical assistance and guidance for installation of under-slab vapor barrier system.
 - 2. Inspect installation and certify that product has been furnished and installed in accordance with manufacturer's published instructions.
 - a. Prepare and submit inspection report for each inspection made.
- C. Correct deficiencies in products and installation found not to be in compliance with Contract Documents.

END OF SECTION

SECTION 042000

UNIT MASONRY

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the brick veneer masonry work as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:
 - 1. Face brick.
 - 2. Concrete block back-up walls.
 - 3. Metal joint reinforcing, anchors, ties, weeps, closures and related accessories for masonry.
 - 4. Control and expansion joints in masonry, filled with joint fillers.
 - 5. Through-wall flashing.
 - 6. Cavity drainage material.
 - 7. Chases, recesses, pockets and openings in masonry as required for installation of work by others.
 - 8. Building in of items furnished by others into masonry, including access doors, door frames, anchors, sleeves and inserts, and other similar items to be embedded in masonry.
 - 9. Grouting in of metal items built into masonry work.
 - 10. Protection, pointing and cleaning of masonry.

1.3 RELATED SECTIONS

- A. Cast-in-Place Concrete - Section 033000.
- B. Cast Stone - Section 047200.
- C. Steel lintels - Section 055000.
- D. Thermal Insulation - Section 072100.
- E. Sheet Metal Flashing - Section 076200.

F. Firestops and Smoke seals - Section 078413.

G. Joint Sealers - Section 079200.

1.4 SUBMITTALS

A. Submit Shop Drawings for the following:

1. Anchoring details.
2. Control and expansion joint locations and details.
3. Special brick shapes, if required.
4. Flashing at typical lintels indicating relationship of flashing to lintel hangers.

B. Submit Samples for the following:

1. Each type of face brick in sufficient number and color (not less than 5) to show full range of color, texture and shade. Submit certification that brick meets ASTM standards specified herein.
 - a. Submit samples of all special shapes required showing color range and sizes.
2. Joint reinforcing, each type, width and proposed location (labeled).
3. Anchors, wedges and ties, each type, width and proposed location (labeled).
4. Joint filler, each type.
5. Flashing, including splice sample, 12" long.
6. Mortar color, 12" long cured sample.

C. Submit technical and installation information for the following:

1. Mortar materials, each material and mortar type.
2. Certification of mortar mix.
3. Flashing material, descriptive literature.
4. Concrete block, joint reinforcing, anchors, ties and joint filler; submit manufacturer's technical and descriptive literature.
5. Block manufacturer shall submit certifications of compliance with ASTM C 90, C 331 and UL 618 prior to any job site delivery. Field sampling of concrete block may be tested by an Independent Testing Laboratory retained by the Owner according to the requirements of ASTM C 140.

D. Cleaning Procedures: Submit proposed procedures and materials for cleaning masonry work; including certification that cleaner will not adversely affect gaskets, sealants, etc.

1.5 QUALITY ASSURANCE

- A. Conform to the following non-cumulative tolerances (any masonry work not meeting these standards shall be re-built as directed by the Architect).

1. Variation from the plumb:

- a. In lines and surfaces of columns, walls and arrises:
 - 1). In 10 feet 1/8"
 - 2). In any story of 25 feet maximum 1/4"
 - 3). In 40 feet or more 1/4"
- b. For external corners, expansion joints and other conspicuous lines:
 - 1). In any story of 25 feet maximum 1/4"
 - 2). In 40 feet or more 3/8"

2. Variation from the level or the grades indicated on the drawings; for exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines:

- a. In any bay or 20 feet maximum 1/4"
- b. In 40 feet or more 1/4"

3. Variation of the linear building lines from established position in plan related portion of columns and partitions:

- a. In any bay or 20 feet maximum 1/4"
- b. In 40 feet or more 1/2"

4. Variation in cross-sectional dimensions of columns and in thickness of walls:

- a. Minus 1/8"
- b. Plus 1/8"

5. Variation in dimensions of masonry openings:

- a. Horizontal dimension -0" + 1/16"
- b. Vertical dimension +0" - 1/16"

- B. Job Mock-Up: Prior to installation of masonry work, erect sample wall panel mock-up using materials, bonding patterns and joint tooling required for final work and including cavity wall, projecting courses, anchors and reinforcement as detailed. Provide special features as directed by the Architect for caulking and contiguous work. Build mock-up at the site, 4' x 4' size as directed by the Architect, indicating the proposed range of colors, textures and workmanship to be expected in the completed work. Reconstruct mock-up if directed by the Architect until it meets with Architect's approval. Obtain Architect's acceptance of visual qualities of the mock-up before start of masonry work. Retain mock-up during construction as a standard for judging completed masonry work. Do not alter, move or destroy mock-up until work is completed and accepted by the Architect. Use sample panels to test proposed cleaning procedures after sample panel meets with Architect's approval.

1. Approved sample panel shall remain on view at the site until completion of face brick work and shall establish the technical and aesthetic standards for the Project.
 2. Architect shall direct distribution of brick color and texture variation within mock-up.
- C. Factory Control
1. The Architect reserves the right to visit the brick manufacturer's facility and review pre-sorting so that all brick falls within a color range acceptable to the Architect.
 2. 4' x 4' mock-ups shall be constructed at the factory using the face brick specified. This mock-up, after approval of the Architect, shall become the quality control panel for the selected brick.
 3. Prior to any shipment of the face brick from the factory, the Architect reserves the right to inspect the brick for the thoroughness of the pre-sorting and to reject any brick which in his opinion do not fall within acceptable color range.
- D. Testing for Efflorescence: Test selected face brick for efflorescence in accordance with ASTM C 67. If, at the end of the test period, the samples of brick or mortar show efflorescence, the materials represented shall be rejected and new materials shall be re-tested. This process shall be repeated until no efflorescence appears. Testing shall be done by an independent testing laboratory at the expense of the Contractor; submit test results in writing to the Architect.
- E. Work of this Section shall conform to the requirements of the following:
1. 2016 "Building Code Requirements for Masonry Structures," (TMS 402/602-16).
 2. 2016 "Specification for Masonry Structures," (TMS 602-16).
 3. Brick Industry Association (BIA) "Technical Notes on Brick Construction."
- F. Pre-Construction Conference: Prior to installation of masonry and associated work, Contractor shall arrange a meeting with Masonry Subcontractor, installers of related work, and other entities concerned with masonry wall performance, including the Architect and Owner. Contractor shall record discussions and agreements and furnish copy to each participant. Provide at least seventy-two (72) hours' advance notice to participants prior to convening conference. Review methods and procedures related to masonry work, including, but not limited to, the following:
1. Review masonry requirements (drawings, specifications and other Contract Documents).
 2. Review required submittals, both completed and yet to be completed.
 3. Review and finalize construction schedule related to masonry work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.

4. Review required inspection, testing, certifying and material usage accounting procedures.
5. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions.
6. Coordinate work with air/vapor barrier membrane and related flashing, review details to avoid conflicts.

1.6 PRODUCT HANDLING

- A. General: Deliver, store, handle and protect all materials from damage, moisture, dirt and intrusion of foreign matter. Store all masonry units and mortar materials on raised platforms and under ventilated and waterproof cover. Store packaged materials in manufacturer's unopened containers, marked with manufacturer's name and product brand name. Immediately reseal containers after partial use. Remove and replace damaged materials.
- B. Masonry Units: Pack, deliver and store to prevent breakage, cracking, chipping, spalling or other damage. Store, protect and ventilate units at project site.
- C. Aggregate: Store with provisions for good drainage.
- D. Reinforcement and Anchors: Store and protect so that when placed, joint reinforcement and anchors will be free of soil, dirt, ice, loose rust, scale, or other coatings which would destroy or reduce bond with mortar, and will not be disfigured or bent out of shape.

1.7 JOB CONDITIONS

- A. In cold weather, when the outside temperature is below forty (40) deg. F., conform to the requirements of "Cold Weather Masonry Construction and Protection Recommendations" publication by Brick Industry Association (BIA). No anti-freeze admixtures are permitted.
 1. In addition, conform to the following:
 - a. Masonry materials must be warmed as required.
 - b. Brickwork must be protected a minimum of 24 hours after installation so as to maintain enough heat for hydration of the cement in the mortar.
- B. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg. F. and above. In addition, conform to the following:
 1. Masonry materials must be cool.
 2. Mortar must be used within 2 hours of initial mixing.

- C. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24" down both sides and hold cover securely in place.
 - 2. Where one wythe of multi-wythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24" down face next to unconstructed wythe and hold cover in place.
- D. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

1.8 ATTIC STOCK

- A. Provide additional 10% of dry mortar mix labeled, packaged and delivered to location determined by Owner for attic stock.
- B. Provide additional 5% of brick labeled, packaged and delivered to location determined by Owner for attic stock.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Standard Concrete Block
 - 1. Portland cement, ASTM C 150, Type 1, low alkali (less than 0.6%), single source for entire project.
 - 2. Aggregates, ASTM C 331, lightweight expanded shale, clay or slate aggregates, manufactured by the rotary kiln process equal to "Solite," "Norlite," or "Haydite."
 - a. Block scheduled to receive painted finish shall contain normal weight aggregate meeting ASTM C 33 in addition to lightweight aggregate in order to receive a smooth, uniform finish.
 - 3. Concrete Masonry Units: Load bearing lightweight aggregate concrete masonry units conforming to the requirements of ASTM C 90, Type 1.

- a. Block behind face brick and block for rated walls shall be 75% solid units.
 - b. All other block may be hollow units.
4. The producer of the concrete masonry units shall furnish certification from an independent testing laboratory confirming that all 8" or larger masonry units meet all of the UL 618 requirements for two (2) hours or better (as required), referencing full scale fire test reports (ASTM E 119). All 4" and 6" units shall conform to "National Bureau of Standards" and "National Research Council" full scale fire tests.
5. Sizes and Shapes: Nominal face size 8" x 16" by thickness as indicated on drawings, with stretcher units, jamb units, header units, square corner units (at ends and corners of exposed or painted work), sash units (at control joints within masonry wall), lintel units and other special shapes and sizes required to complete the work.
6. Finish: For exposed or painted block surfaces, in addition to ASTM requirements, block shall have uniformly dense, flat, fine grain texture, with no cracks, chips, spalls, or other defects which would impair appearance. For concealed CMU, surfaces shall be free from deleterious materials that would stain plaster or corrode metal.
7. Curing: All concrete block shall be steam cured, and air dried for not less than thirty (30) days before delivery.
8. Density of concrete block shall not exceed one hundred and five (105) lbs. per cubic foot.
9. Shrinkage: Shrinkage of concrete blocks shall not exceed 0.065% when tested in accordance with ASTM C 426-16, Standard Test Method for Linear Drying Shrinkage of Concrete Masonry Units.
10. Water Content
 - a. At the time of delivery to the job site, concrete masonry units shall have a value, in weight of contained water, of not more than thirty (30) percent of the fully saturated content for the unit tested.
 - b. Ship all units from the factory, and store at the job site, with all necessary protection to prevent increase of water content from rain and other sources.

B. Brick

1. Size: Unless otherwise indicated, provide 3-5/8" deep x 2-1/4" high x 7-5/8" long modular bricks.
2. Facing Brick: ASTM C 216, Grade SW, Type FBX, equal to the following:
 - a. Cloud Ceramics Modular Velour face brick in 40% Driftwood Blend, 40% Terracotta Blend, 10% Cimarron Blend, 5% Cameo Blend, and 5% Old Rose Blend.

3. Where brick is fully concealed provide common brick conforming to ASTM C 62, Grade SW.
 4. Provide all special molded shapes as indicated on the drawings.
 5. For sills, caps and similar applications resulting in exposure of brick surfaces which otherwise would be concealed from view, provide uncured units with all exposed surfaces finished.
- C. Joint Reinforcing for Masonry Walls: For anchoring face brick to CMU back-up, provide welded "ladder" design, of 3/16" dia. gauge steel rods with adjustable 3/16" wire rectangular pintle anchors fastened to reinforcement 16" o.c. Provide special formed prefabricated pieces at corners and intersections of walls or partitions. Anchors to extend at least 2" into face of brick. Show anchor locations on approved shop drawings. Joint reinforcing shall be equal to Ladder Type 270 with "Lox All Adjustable Anchor" made by Hohmann & Barnard or equal manufacturer noted below in Para. C.5.
1. Reinforcing assembly shall have hot dip galvanized steel finish conforming to ASTM A 153 with zinc coating of 1.5 oz. of zinc per sq. ft. after fabrication.
 2. Wire used in assembly noted above shall be cold drawn steel wire conforming to ASTM A 82.
 3. Approved Joint Reinforcing Manufacturers
 - a. Hohmann & Barnard
 - b. Wire-Bond
 - c. Heckmann Building Products
 - d. National Wire Products Industries, Inc.
- D. Anchors and Ties
1. Dovetail Anchor Slots: Hot-dip galvanized steel, 16 gauge equal to No. 100 Dovetail Anchor Slot made by Heckmann Building Products, No. 305 anchor slot made by Hohmann & Barnard, or approved equal by other manufacturers in Para. C.5.
 2. Flexible Metal Ties for Dovetail Slots: Hot-dip galvanized, 16 gauge by 1" wide by Heckmann Building Products Inc., or approved equal manufacturer noted above in Para. C.5.
 - a. No. 106 Dovetail Corrugated Anchor.
 - b. No. 129 Dovetail Triangle Tie.
 3. Wire Mesh: Hot-dip galvanized sixteen (16) gage steel wire, square mesh, width 3" by length to suit condition; No. 268 by Heckmann Building Products, or approved equal by manufacturer noted above in Para. C.5.
 4. For anchoring face brick to concrete back-up where there are no dovetail slots provided, provide "CMU/Concrete Screw Wing-Nut Pos-I-Tie" with five (5)

gauge hot-dip galvanized (ASTM A 153, Class B-2) wire pintle tie made by Heckmann Building Products, or approved equal by manufacturer noted above in Para. C.5.

5. For anchoring masonry to structural steel, provide hot-dip galvanized steel, as listed, or approved equal by manufacturer noted above in Para. C.5:
 - a. Made by Heckmann Building Products. Galvanizing shall conform to ASTM A 153, with zinc coating of 1.5 oz. of zinc per sq. ft.
 - 1). No. 195 Column Anchors
 - 2). No. 197 Column Anchors
 - 3). No. 315 Weld-On Anchor Rods with No. 316 Triangle Ties
 - 4). No. 315-B Weld-On Anchor Straps with No. 316 Triangle Ties
 - b. Made by Hohmann & Barnard or approved equal. Galvanizing shall conform to ASTM A 153, with zinc coating of 1.5 oz. of zinc per sq. ft.
 - 1). No. 355 Column Anchors
 - 2). No. 356 Column Anchors
 - 3). No. 357 Beam Anchors
 - 4). No. 359 F anchor straps with VWT tie.

E. Reinforcing Bars and Rods: ASTM A 615, Grade 60. See Drawings for size.

F. Control and Expansion Joint Fillers

1. Vertical Installation Within Concrete Masonry Wall: Extruded high-grade neoprene rubber, cross shape, for use with concrete masonry sash units, which shall provide a force fit in the grooves of the sash block, and shall have 1/2" diameter tubular ends (compressed 25% when installed in 3/8" wide joint).
 - a. Provide the following sizes:
 - 1). 2-5/8" wide control joint fillers for 4" block walls.
 - 2). 4-5/8" wide for 6" block walls.
 - 3). 6-5/8" wide for 8", 10" and 12" block walls.
 - b. Provide backer rod and sealant joint over joint filler as per drawings and Section 079200 of these specifications.
2. Isolation Joint Filler at Abutting Construction and at Intersecting CMU Walls: Compressible and resilient closed cell neoprene gasket with pressure sensitive adhesive backing, thickness 30% greater than thickness of joint. Acceptable joint filler shall be "Everlastic, Type NN-1" by Williams Products, Inc., or approved equal. Recess joint filler and install backer rod and sealant as per drawings and Section 079200 of these specifications.
3. Within Face Brick: Provide filler rod and sealant installed by Section 079200. Filler depth shall be 2 times joint width.
 - a. Compressible filler between top of brick and bottom of shelf angle shall be "Soft Joint Sealant" made by Polytite, or approved equal.

4. Within Expansion Joint at Face Brick: Manufacturer's standard preformed, pre-compressed, open-cell polyurethane foam sealant impregnated with a water based, non-drying polymer modified acrylic water repellent. Provide "Seismic Colorseal" installed to twenty-five 25 percent compression, as manufactured by Emseal or approved equal.
 - a. Properties: Permanently elastic, mildew resistant, non-migratory, non-staining, and compatible with joint substrates and other joint sealants. Density: 8.4 to 9.1 lb./cu. ft.

2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type 1, standard color, one source.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Aggregate for Mortar: Clean, washed, buff colored sand, graded per ASTM C 144.
- D. Aggregate for Grout: ASTM C 404.
- E. Water: Clean, fresh and suitable for drinking.

2.3 MORTAR MIX

- A. Exterior Face Brick Construction: Mortar mixes shall meet ASTM C 270, Type N, cement/lime mortar. Colors of mortars shall use coloring agent made by Davis Colors, Lehigh Cement or approved equal. Color of mortar to meet with Architect's approval. The Contractor may use pre-packaged colored mortar equal to "Color Mortar Blend" made by Glen-Gery.
 1. Color of mortar must meet with Architect's approved sample and mock-up panel.
- B. Exterior Block Back-Up Construction: Provide Portland cement/lime mortar as noted above conforming to ASTM C 270, Type N.
- C. Reinforced Concrete Block: Provide Portland cement/lime mortar conforming to ASTM C 270, Type S.
- D. Mortar for Cement Cants: One (1) part Portland cement and four (4) parts sand, by volume.
- E. Grout for Unit Masonry: Comply with ASTM C 476 for grout for use in construction of unit masonry. Use grout of consistency (fine or coarse) at time of placement which will completely fill all spaces intended to receive grout. Grout shall have a minimum compressive strength of 3000 psi when tested in accordance with ASTM C 1019.
- F. Mixing
 1. General: Add cement just before mixing and mix dry. Use sufficient amount of water as necessary to produce workable mix. Mix in small batches to make plastic mass.

2. Mixing: Machine mix all mortars in approved type mixer with device to accurately and uniformly control water. Add hydrated lime dry. Mix dry materials not less than two (2) minutes. Add water, then mix not less than three (3) minutes, not to exceed five (5) minutes. Mix only amount of mortar that can be used before initial set. Do not use mortar which has reached its initial set or two (2) hours after initial mixing, whichever comes earlier. Mortar may not be re-tempered. Clean mixer for each batch, whenever mortar type is changed, and at end of each day's work.
3. Acceleration or other admixtures not permitted.
4. Mortar shall have a flow after suction of not less than seventy-five (75) percent of that immediately after mixing as determined by ASTM C 91.

G. Admixtures

1. No air-entraining admixtures or cementitious materials containing air-entraining admixtures shall be used in the mortar.
2. No antifreeze compounds or other substances shall be used in the mortar to lower the freezing point.
3. Calcium chloride or admixtures containing calcium chloride shall not be used in mortar.

2.4 MASONRY ACCESSORIES

- A. Weep Holes: Provide clear plastic weep holes 3/8" wide and 1-1/2" high by four (4) inches long equal to No. 342 made by Hohmann & Barnard or approved equal manufacturer listed above.
- B. Through-Wall Flashing: Provide sheet membrane flashing as part of exterior wall membrane system. Provide sealants and tapes as recommended by the manufacturer. Provide preformed corner sections "end dams" with system when flashing is discontinuous..
 1. Provide flashing for surface adhered applications at sheathed areas with 26 ga. stainless steel termination bar.
 2. Wall flashing shall have 26 ga. stainless steel drip edge adhered to edge of flashing, drip edge shall be set in sealant as specified in Section 079200.
- C. Cavity Drainage Material: Provide 10" high HDPE "Mortar Net" open mesh mortar net of width to fit masonry cavity shown on drawings, manufactured by Mortar Net USA, Ltd., or equal "Mortar Maze," made by Advanced Building Products.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

- A. Inspection: Prior to all work of this Section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
 - 1. Verify that masonry may be completed in accordance with all pertinent codes and regulations, the referenced standards, and the original design.
 - 2. Do not start any work until mock-ups are approved by the Architect.
- B. Discrepancies: In the event of discrepancy, immediately notify the Architect in writing. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved. Starting of work by the Contractor means acceptance by the Contractor of the substrate.

3.2 COORDINATION

- A. Carefully coordinate with all other trades to ensure proper and adequate interface of the work of other trades with the work of this Section.

3.3 PREPARATION

- A. Brick: Wet brick having an initial rate of absorption greater than 30 grams per 30 square inches when tested per ASTM C 67. Wet bricks by allowing water to run on the cubes or pallets of brick, or placing them in a large tank of water.
 - 1. Except for absorbent units specified to be wetted, lay masonry units dry.
- B. Concrete Block: Do not wet concrete block units.

3.4 INSTALLATION

- A. General
 - 1. Build walls to the full thickness shown. Build single wythe walls to the actual thickness of the masonry units, using units of nominal thickness shown.
 - 2. Build chases and recesses as shown or required for the work of other trades.
 - 3. Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.
 - 4. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to properly locate openings, movement type joints, returns and off-sets. Avoid the use of less than half size units at corners, jambs and wherever possible.
 - 5. Lay up walls plumb and true with courses level, accurately spaced and coordinated with other work.

6. Pattern Bond: Lay exposed masonry patterns as noted on drawings. Lay concealed concrete block with all units in a wythe bonded by lapping not less than two (2) inches. Bond and interlock each course of each wythe at corners. Do not use units of less than four (4) inches horizontal face dimensions at corners or jambs.
 7. Walls shall be plumb, true to line and free from defects such as open cells, voids, dry joints and other similar defects.
 8. Do not use any brick that do not meet chippage and tolerances of the applicable ASTM standard noted herein for the grade, type or class of brick.
- B. Mortar Bedding and Jointing: All joints between bricks shall be completely filled with mortar. Bed joints shall be beveled per BMI recommendations, with the brick then shoved in place. At cavity wall construction, care shall be taken that no excess mortar goes into masonry cavity. Head joints shall be completely filled with mortar and shall be formed by applying a full coat of mortar to the entire end or the entire side, as the case requires, and then shoving the mortar covered end and/or side of the brick tightly against the bricks previously laid; the practice of "slushing" by throwing mortar into the head joints will not be permitted. All brick shall be laid without disturbing the brick previously laid. Brick shall be laid within a minute or so after the mortar is placed. Dry or butt joints will not be permitted. Grouting shall be done only as necessary. Do not slush head joints.
1. After brick placement, mortar squeezed out of bed joints shall be cut off before tooling.
 2. Lay concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on exterior walls and in all courses of piers, columns and pilasters, where solid CMU is used and where adjacent to cells or cavities to be reinforced or filled with concrete or grout.
 - a. To ensure alignment of brick and block coursing, adjust block back-up by cutting block to insure alignment of coursing or use adjustable anchorage.
 3. Tool exposed joints slightly concave after the mortar joint is thumbprint hard. Concealed joints shall be struck flush.
 4. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners at jambs to fit stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.
- C. Stopping and Resuming Work: Rake back 1/2 brick length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh masonry.
- D. Built-In Work
1. As the work progresses, build in items specified under this and other Sections of these specifications. Fill in solidly with masonry around built-in items.

2. Mortar in door frames, access doors, louvers and other metal items embedded or built into masonry work solidly with mortar as the masonry units are laid up.
 3. Grout under lintels, bearing plates, and steel bearing on masonry with solid bed grout.
 4. Sleeves, pipes, ducts and all other items which pass through masonry walls shall be caulked with interior grade sealant meeting requirements of Section 079200, so as to be air tight and prevent air leakage. Refer to Section 078413 for packing of voids in rated masonry walls.
 5. Fill vertical cells of masonry units solid with grout which have anchoring, reinforcing rods, supporting or hanging devices embedded in the cell including stone anchors and window or curtain wall anchors.
 6. Fill vertical cells of masonry units solid with mortar on each side of door frames to sixteen (16) inches beyond.
 7. Unless otherwise noted, fill vertical cells of masonry units solid with grout which are below steel bearing plates, steel beams, and ends of lintels, to eight (8) inches beyond bearing and from floor to bearing.
 8. Place wire mesh in horizontal joint below masonry unit cells to be filled with mortar, to prevent mortar from dropping into unfilled cells below.
 9. Masonry indicated as being reinforced shall have all voids filled solid with grout. Grout shall be consolidated in place by vibration or other methods which insure complete filling of cells. When the least clear dimension of the grouted cell is less than two (2) inches, the maximum height of grout pour shall not exceed twelve (12) inches. When the least clear dimension is two (2) inches or more, maximum height of grout pour shall not exceed forty-eight (48) inches. When grouting is stopped for one (1) hour or longer, the grout pour shall be stopped 1-1/2" below the top of a masonry unit. Vertical bar reinforcing shall be accurately placed and held in position while being grouted, and shall be in place before grouting starts. All such reinforcing shall have a minimum clear cover of 5/8". Lap all bars a minimum of forty (40) bar diameters and provide steel spacer ties (not to exceed 192 bar diameter) to secure and position all vertical steel and prevent displacement during grouting. Provide continuous horizontal reinforcement embedded in mortar joints every second course.
- E. Cutting and Patching: All exposed masonry which requires cutting or fitting shall be cut accurately to size with motorized carborundum or diamond saw, producing cut edges.
1. Do not saw cut any masonry openings in face brick construction without Architect's approval and after a procedure has been reviewed and approved.
 2. Holes made in exposed masonry units for attachment of handrail brackets and similar items shall be neatly drilled to proper size.

3. All masonry which requires patching in exposed work, if approved by Architect, shall be patched neatly with mortar to match appearance of masonry as closely as possible and to the Architect's satisfaction. Rake back joints and use pointing mortar to match as required.

F. Cavity Walls

1. Two wythes of masonry cavity walls shall be securely tied together by horizontal joint reinforcement and ties anchored to reinforcement, as herein specified, spaced every other block course.
 - a. Where cavity back-up is concrete use ties specified herein spaced sixteen (16) inches o.c. both directions.
2. Cavity between facing and backing wythe shall be kept clean and clear of all mortar droppings, and no mortar ledges shall project into the cavity. Temporary wood strips, cut to width of cavity and fitted with lift-up wires, shall be laid on the joint reinforcement and carefully lifted out before placement of the next layer of reinforcement. Any projecting mortar shall be spread over the back of the outer wythe immediately following the setting of the masonry unit.
 - a. Cavity drainage material shall be installed at the bottom of each cavity over the flashing to protect weep holes.
3. Concrete block back-up at cavity wall construction shall be anchored to slab at top with dovetail anchors spaced sixteen (16) inches o.c.
4. Anchor CMU back-up with anchors as specified herein.
5. Refer to Section 072100, "Thermal Insulation," for material and installation of cavity wall insulation.

G. Ties and Anchors for Masonry Construction

1. Provide ties and anchors as shown or specified, but not less than one metal tie, spaced not to exceed sixteen (16) inches o.c. horizontally and/or vertically. Provide additional ties within 1'-0" of all openings and adjacent to expansion joints and spaced not more than 16" apart around perimeter of openings.
2. Anchoring Masonry to Structure: Provide an open space not less than 1/2" in width between masonry and structural member, unless otherwise shown. Keep open space free of mortar or other rigid materials.
3. Anchoring Partitions and Infill Abutting Existing Construction: Install buck anchors in bed joints 16" o.c. vertically. Build one bent end into the masonry. Expansion bolt other bent end to existing construction.

H. Control and Expansion Joints

1. Provide expansion, control and isolation joints in masonry as shown. Build in related items as the masonry work progresses.

2. CMU Control Joint Spacing: If location of control joints is not shown, place vertical joints spaced not to exceed 40'-0" o.c. In addition, locate joints at points of natural weakness in the masonry work, including the following:
 - a. At structural column or joint between bay.
 - b. Above control joints in the supporting structure.
 - c. Above major openings at end of lintels upward and below at ends of sills downward. Place at one side of jamb for openings not less than 6'-0" wide and at both sides for openings over 6'-0" wide.
 - d. At reduction of wall thickness.
 - e. Where masonry abuts supporting structure.
 - f. If additional joints are required, indicate same on approved shop drawings.
3. Brick Veneer Expansion Joint Spacing: Vertical expansion joints in brick veneer construction shall be located maximum 20'-0" o.c. unless otherwise noted in addition to expansion joints located within 2'-0" of each corner of the building.

I. Lintels

1. Install loose steel lintels furnished by Section 055000, allowing eight (8) inch bearing at ends.
2. For concrete block walls, use specially formed U-shaped concrete block lintel units with reinforcing bars in accordance with the following table, filled with grout.

Number and Size of Reinforcing Bars Required at Concrete Block Lintels		
Maximum Clearance Span	Wall Width	Rebar No. - Size
2'-0" to 6'-0" 6'-0" to 8'-0"	6"	2 - #3 2 - #4
2'-0" to 6'-0" 6'-0" to 8'-0"	8"	2 - #3 2 - #4
2'-0" to 6'-0" 6'-0" to 8'-0"	12"	3 - #3 3 - #4

3. U-shaped concrete block lintels shall extend a minimum of 8" at each side of opening.

3.5 FLASHING/WEEP HOLES

- A. General: Install embedded flashing and weep holes in masonry at relieving angles, shelf angles, lintels, ledges, other obstructions to the downward flow of water in the wall, and where indicated. Space weeps 16" o.c. unless otherwise shown on drawings.

- B. Prepare masonry surfaces so that they are smooth and free from projections that could puncture flashing.
- C. Flashing shall be placed, generally, at bottoms of cavity wall construction, over all wall openings, window jambs, at sills of window, and in other locations where indicated on the drawings. Flashing shall overlap a minimum of 6". At bottoms of cavity walls, the flashing shall be built extending from the exterior face of the brick, up and into the mortar joint 2" at the inner wythe of the CMU back-up. Extreme care shall be exercised in placing the masonry materials not to damage the flashing. Flashing damaged during the masonry erection shall be repaired or replaced by the Contractor at no additional cost to the Owner. Discontinuous flashing shall terminate with an end dam in a head joint, rising at least 1".
- D. When spanning an air space, flashing shall be supported with a mortar wash, insulation or treated wood blocking.
- E. Where flashing is penetrated by anchors, patch flashings at penetration using adhesive and mastic recommended by the manufacturer to insure watertight seal.
- F. Install flashing in accordance with manufacturer's instructions, using adhesive, primer, thinner, cleaner and mastic as recommended by flashing manufacturer.
 - 1. Flashing shall overlap adjacent piece of flashing a minimum of 6".
- G. Provide drip edge when flashing extends beyond face of brick.

3.6 CANTS

- A. Provide specified mortar for cement cants at beams and other projections in elevator shafts, where adjoining wall is of masonry construction. Cants shall slope twenty (20) degrees from the horizontal.

3.7 CLEANING, PROTECTION, ADJUSTMENT

- A. Protection
 - 1. The Contractor shall take adequate precautions for the protection of all surfaces against mortar spatter, and shall immediately remove any such spatter should it inadvertently occur, leaving no stain or discoloration.
 - 2. Excess mortar shall be wiped off the masonry surfaces as the work progresses.
 - 3. Wood coverings shall be placed over all such masonry surfaces as are likely to be damaged during the progress of the entire project.
 - 4. Protective measures shall be performed in a manner satisfactory to the Architect.
 - 5. Damaged masonry units shall be replaced to satisfaction of the Architect.
 - 6. Exterior masonry walls shall be draped with waterproof covering until copings are in place, to prevent water penetration in cavity.

- B. Cleaning of Masonry: Upon completion, all exposed masonry shall be thoroughly cleaned following recommendations of the BIA Technical Note No. 20. Before applying any cleaning agent to the entire wall, it shall be applied to a sample wall area of approximately 4' x 4' in a location approved by the Architect. No further cleaning work may proceed until the sample area has been approved by the Architect, after which time the same cleaning materials and method shall be used on the remaining wall area. If stiff brushes and water do not suffice, the surface shall be thoroughly saturated with clear water and then scrubbed with a solution of an approved detergent masonry cleaner, equal to "Vana Trol" made by ProSoCo Inc. or equal made by Diedrich or approved equal, mixed as per manufacturer's directions, followed immediately by a thorough rinsing with clear water. All lintels and other corrodible parts shall be thoroughly protected during cleaning.
1. Unless otherwise required by cleaning agent manufacturer use only low pressure device (30 to 50 psi) for application of cleaning agent and water rinsing.
- C. Pointing: Point any defective joint with mortar identical with that specified for that joint.

END OF SECTION

SECTION 042200

CONCRETE MASONRY UNITS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Furnish all labor, materials, services and equipment as required in conjunction with or properly incidental to construction of all concrete masonry units as described herein and/or as shown on the Drawings.
- B. Related Documents:
 - 1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1, General Requirements, apply to Work of this section.
- C. Related Sections:
 - 1. Section 03 20 00 – Concrete Reinforcement.
 - 2. Section 05 50 00 – Metal Fabrications.

1.2 REFERENCES

- A. Concrete masonry unit manufacturer shall certify that masonry units furnished meet or exceed requirements of this Specification.
- B. The work in this Section, unless noted on the Drawings, or herein specified shall be governed by the latest edition of the following codes or specifications.
 - 1. ACI 531 – Building Code Requirements for Concrete Masonry Structures.
 - 2. ASTM A 82 – Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
 - 3. ASTM C 145 – Standard Specifications for Solid Load Bearing Concrete Masonry Units.
 - 4. ASTM A 153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 5. ASTM A 615 – Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
 - 6. ASTM C 90 – Standard Specification for Loadbearing Concrete Masonry Units.
 - 7. ASTM C 144 – Standard Specification for Aggregate for Masonry Mortar.
 - 8. ASTM C 150 – Standard Specification for Portland Cement.
 - 9. ASTM C 20 – Standard Specification for Hydrated Lime for Masonry Purposes.
 - 10. ASTM C 270 – Standard Specification for Mortar for Unit Masonry.
 - 11. ASTM C 404 – Standard Specification for Aggregates for Masonry Grout.
 - 12. ASTM C 476 – Standard Specification for Grout for Masonry.
 - 13. International Masonry Industry All-Weather Council (MIAWC):
 - a. IMIABC (CW) - Recommended Practices & Guide Specifications for Cold Weather Masonry Construction.

- b. IMIAWC (HW) - Recommended Practices & Guide Specifications for Hot Weather Masonry Construction.

1.3 SUBMITTALS

- A. Product Data:
 - 1. Data for concrete masonry units, sizes, shapes and details. Include test data indicating block conformance to specified ASTM specification.
 - 2. Data for joint reinforcement.
 - 3. Data for block admixture integral water repellent.
- B. Shop Drawings: Indicate reinforcing bar sizes, spacings, reinforcement quantities, bending and cutting schedules, reinforcement supporting and spacing devices, and accessories.
- C. Samples for Verification: Submit set of unit masonry and mortar color samples to illustrate color, texture and extremes of color range for comparison with existing construction.
- D. Assurance/Control Submittals:
 - 1. Test and Inspection Reports: Submit the following test and inspection reports in conformance with Division 1, General Requirements, for Testing and Inspection Services.
 - a. Masonry, reinforcing and grouting inspections.
 - b. Mortar and grout testing.
 - 2. Qualification Documentation: Upon request, submit documentation of experience and Regulatory Requirements indicating compliance with specified qualification requirements.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in Work of this Section with minimum five (5) years documented experience.

1.5 STORAGE OF MATERIALS

- A. Division 1, General Requirements - Product Options: Transport, handle, store, and protect Products.
- B. Deliver materials to job site in undamaged condition.
- C. Store concrete masonry units on raised platforms. Cover and protect units from inclement weather.
- D. Store mortar and grout materials in manner to prevent intrusion of moisture and contaminants.

1.6 PROJECT CONDITIONS

- A. Environmental Requirements:

1. Cold Weather Requirements: Comply with recommendations of IMIAWC (CW).
 - a. Lay no concrete masonry unit when air temperature is below 40 degrees F unless materials are protected from weather and laid up in shelter. In such instances, maintain materials and surrounding air temperature to minimum 50 degrees F prior to, during, and 48 hours after completion of masonry work.
2. Hot Weather Requirements: Comply with IMIAWC (HW).
 - a. In temperatures exceeding 100 degrees F, do not lay out mortar beds ahead of placing units. Use a very light fog spray, not sufficient to penetrate masonry, on vertical surface of masonry to aid in mortar curing during that 24 hours after placing units.

1.7 COORDINATION

- A. Coordinate Work with other trades in advance and make provisions for the installation of their work as masonry units are installed to avoid cutting and patching.
- B. Coordinate masonry unit work with wall mounted lighting fixtures, plumbing items, openings and chases for heating ducts, plumbing pipes, electrical conduit and mechanical louvers or vents. Build into Work as construction progresses.
- C. Provide for installation of bolts, toggles, flashing, beams, anchors, hangers, attachment strips, wall plugs and frames as required for support of structure and miscellaneous appliances.

PART 2 PRODUCTS

2.1 EXTERIOR WALL CONCRETE MASONRY UNITS

- A. Concrete Block: ASTM C 90, Grade N, Type 1, light weight, load bearing, hollow block.
 1. Integral block admixture water repellent added during block manufacture.
 2. Integral color admixture pigment added during block manufacture to produce a uniformly colored surface.
 3. Size and Shape: Locations indicated on Drawings.
 - a. 16 inches x 8 inches and nominal depth of 8 inches.
 - b. 16 inches x 8 inches and nominal depth of 12 inches.
 4. Exposed Face Texture: Selected by Architect.
 5. Color: Selected by Architect.
 6. Provide standard and fire rated units.

2.2 INTERIOR PARTITION CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 1. Size: Standard units with nominal face dimensions indicated on Drawings.
 - a. 16 x 8 inches and nominal depth of 8 inches.
 - b. Bullnose Units: Provide bullnose units at all interior corners, unless indicated otherwise on Drawings.
 2. Load-Bearing Units: ASTM C 90, Grade N, Type 1, light weight.
 - a. Hollow block.

- b. Exposed Faces: Manufacturer's standard grey color and texture.
- 3. Fire Rated Partitions: Units listed in UL FRD or permitted by Building Code.

2.3 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I; non-staining. Masonry cement not permitted.
 - 1. Hydrated Lime: ASTM C 207, Type S.
 - 2. Mortar Aggregate: ASTM C 144, free of clay or organic matter.
 - 3. Grout Aggregate: ASTM C 404.
- B. Water: Clean and potable.
- C. Exterior Exposed Wall Mortar Color: Selected by Architect.
 - 1. Integral mortar admixture water repellent added during mixing.
- D. Interior Wall Mortar: Manufacturer's standard grey color, U.N.O. by Architect.

2.4 REINFORCEMENT AND ANCHORAGE

- A. Reinforcing Steel: ASTM A 615 Grade 60.
 - 1. Deformed billet-steel bars.
 - 2. Unfinished.
- B. Single Wythe Joint Reinforcement - Truss type, ASTM A 82 steel wire, hot dipped galvanized after fabrication to ASTM A 153, Class B.
 - 1. 9 gauge side rods and cross rods and diagonal ties, welded at 16" intervals to continuous side rods forming truss design.
 - 2. Prefabricated corner and "tee" intersecting units.
 - 3. Width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.
 - 4. Manufacturer:
 - a. Dur-O-Wall: www.dur-o-wall.com.
 - b. Holman & Barnard: www.h-b.com.
 - c. Masonry Reinforcing Corporation of America: www.wirebond.com.
 - d. Southern Construction Products: www.scponline.com.

2.5 MORTAR AND GROUT MIXES

- A. Mortar for Unit Masonry: ASTM C 270, using the Proportion Specification.
 - 1. Type M: 2500 psi at 28 days or Type S: 1800 psi at 28 days; slump 9 inches plus or minus 1 inch.
- B. Grout: ASTM C 476, Portland cement, sand, pea gravel and water, 2000 psi at 28 days, slump 9 inches plus or minus 1 inch. Consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.
- C. Mixing:

1. Mix mortar in accordance with ASTM C 270 in quantities needed for immediate use.
2. Mix grout in accordance with ASTM C 476 in quantities needed for immediate use.
3. Use mechanical batch mixer and comply with referenced standards.
4. Do not use anti-freeze compounds to lower the freezing point of mortar or grout.
5. Mix integral water repellent admixture per manufacturer's published instructions.
6. Control batching procedure to ensure proper proportions by measuring materials by volume. Measurement by shovel not permitted.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions to assure surfaces to support masonry are to proper grade, elevation, free from dirt or other deleterious matter and ready to receive Work.
- B. Report in writing to Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.
- C. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.2 PREPARATION

- A. Concrete Masonry Units:
 1. Lay only dry units, free of paint, oil, efflorescence or foreign matter.
 2. Remove laitance, loose aggregate or anything that prevents bonding to surface.
- B. Reinforcement: Before being placed, remove loose coatings from reinforcement.
- C. Use masonry saws to cut masonry units.
- D. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.
- E. Direct and coordinate placement of metal anchors supplied for installation under other sections.
- F. Verify holes and openings have been sealed to prevent escape of insulation.

3.3 INSTALLATION

- A. Installation Tolerances:
 1. Maximum Variation from Plumb:
 - a. Vertical lines and surfaces of columns and walls:
 - 1) 1/4" in 10'-0".

- 2) 3/8" in 20'-0" maximum.
 - 3) 1/2" maximum.
 - b. External corners or control joints:
 - 1) 1/4" in 20'-0".
 - 2) 1/2" in 40'-0" maximum.
 2. Maximum Variation from Level or Grades for Exposed Lintels, Sill, Parapets or Horizontal Grooves:
 - a. 1/4" on any bay or 20'-0".
 - b. 1/2" in 40'-0".
 3. Maximum Variation from Plan Location of Linear Building Line or Related Portions of Columns, Walls and Partitions:
 - a. 1/2" in any bay or 20'-0".
 - b. 3/4" in 40'-0".
 4. Maximum Variation in Cross-Sectional Dimensions of Columns and Thickness of Walls: 1/4".
- B. Pattern Bond: Running bond with vertical joints located at centerline of masonry units in alternate courses unless noted otherwise on architectural drawings.
- C. General:
1. Set units plumb, true to line and with level courses accurately spaced within allowable tolerances.
 2. Do not install cracked, broken or chipped masonry units exceeding ASTM allowable.
 3. Adjust masonry unit to final position while mortar is soft and plastic.
 4. Where adjustment must be made or if units are displaced after mortar has stiffened, remove units, clean joints and units of mortar and relay with fresh mortar.
 5. Do not pound corners and jambs to fit stretcher units after they are set in position.
 6. Adjust shelf angles to keep masonry level and at proper elevation.
 7. Provide pressure relieving joints by placing continuous 1/8" foam pad under shelf angle.
 8. Interlock intersections and external corners.
- D. Mortar and Grouting:
1. Place mortar in accordance with ASTM C 270.
 - a. Lay with full mortar coverage on horizontal and vertical face shells.
 - b. Provide full mortar coverage on horizontal and vertical face shells and webs where adjacent to cells of cavities to be filled with grout.
 2. Place grout in accordance with ASTM C 476.
 3. Provide protection for metal building frames and girts during placement of mortar and grout. Do not permit mortar or grout in contact with metal building frames and girts.
 4. High-Lift Grouting is not acceptable without prior written consent of the Engineer of Record.
 5. Low-Lift Grouting is acceptable as follows:
 - a. Limit height of pours to 60 inches.
 - b. For grout pours 12 inches high or less, the grout may be consolidated by rodding with a puddling stick.
 - c. For grout pours in excess of 12 inches, the grout shall be consolidated

- d. by means of a mechanical vibrator.
 - e. At intermediate levels, the top of the grout pour shall stop a minimum of 1 ½ inches below the top of the masonry units.
 - f. At the top of the wall, the grout shall be placed flush with the masonry units.
 - g. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
 - h. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1 ½ hours.
- 6. Remove excess mortar from grout spaces.
- E. Horizontal and Vertical Face Joints:
 - 1. Construct uniform joints, 3/8" nominal thickness.
 - 2. Shove vertical joints tight.
 - 3. Tool concave joints in exposed surfaces when thumb-print hard with round joints slightly larger than width of joint.
 - 4. Flush cut all joints not exposed.
 - 5. Fill horizontal joints between top of non-load bearing masonry partitions and underside of beams or slabs with flexible material.
- F. Control Joints:
 - 1. Keep joints free of mortar by inserting continuous wood or metal temporary strips.
 - 2. Install where indicated and at following locations:
 - a. Changes in thickness, height and direction.
 - b. Within 8'-0" of corners or offsets.
 - c. At control or expansion joints in structure.
 - d. At each side of openings greater than 24" wide.
 - e. At foundation walls, shelf angles, setbacks and materials expanding at different ratios.
 - f. Space joints at 30'-0" o.c. maximum in uninterrupted walls.
 - g. Provide continuous vertical control joints through bond beams except at lintels above openings.
 - h. Offset control joints to ends of lintels.
 - 3. Install joint sealer as specified by Architect.
- G. Collar Joints:
 - 1. Keep cavity in cavity walls clean.
 - 2. Remove all protruding mortar fins in cavity to be grouted.
- H. Joining of Work:
 - 1. When joining fresh masonry to set or partially set masonry construction, remove loose units and mortar and clean exposed surface of set masonry prior to laying fresh masonry.
 - 2. If necessary to stop off horizontal run of masonry, rack back one-half block length in each course.
 - 3. Do not use toothing to join new masonry to set or partially set masonry.
- I. Reinforcing and Ties:
 - 1. Reinforcing Bars: Secure at locations indicated and to avoid displacement

during grouting.

- a. Maintain position within 1/2 inch of dimensioned position.
 - b. Minimum spacing between bars or to masonry surfaces shall be one bar diameter.
2. Horizontal joint reinforcing: Install horizontal joint reinforcement 16 inches on center.
- a. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
 - b. Place continuous joint reinforcement in first and second joint below top of walls.
 - c. Extend joint reinforcement entire length of bed joint.
 - d. Lap reinforcement minimum 6" at ends.
 - e. Bend or weld at offsets or special conditions.

J. Bond Beams:

1. Provide CMU bond beams at top of CMU walls and lintels above openings.
2. Reinforce bond beams with minimum of two bars and grout. Support and secure reinforcing bars from displacement during grout fill.
3. Discontinue bond beams at expansion and control joints.
4. At bearing locations, fill masonry cores with grout for minimum 16 inches either side of opening.

K. Flashing:

1. General:
 - a. Clean surface to receive flashing and remove projections which might puncture or damage flashing material.
 - b. Seal joints with manufacturer's recommended adhesive.
 - c. Seal top of flashing to ensure moisture cannot infiltrate behind flashing.
 - d. Continue flashing around corners. Ensure membrane material is not interrupted in horizontal plane at corners.
2. Wall base, opening sills and heads:
 - a. Place flashing on mortar bed and cover with mortar.
 - b. Start 1/2" from outside face of wall and turn up in cavity 8" minimum.
 - c. Lap joints 4" minimum.
 - d. Place flashing under and behind sills.
 - e. Place flashing over steel lintels.
 - f. Extend flashing beyond opening jamb lines.

L. Weep Holes:

1. Provide weep holes in head joints in first course immediately above flashing by either leaving head joint free and clean of mortar or placing and leaving sash cord or plastic weeps in joint.
2. 24" o.c. maximum spacing.
3. Keep weep holes and area above flashing free of mortar waste.

M. Built-In Work:

1. As work progresses, install built-in metal door frames, window frames, fabricated metal frames, mechanical louvers, plates and anchor bolts and other

- items to be built into the work and furnished under other sections.
- 2. Install built-in items plumb, level and true to line.
- 3. Where electric conduit, outlet, switch and other boxes occur, grind and cut units before building-in services. Coordinate work with electrical installer.
- 4. Bed anchors of metal door frames in adjacent mortar joints.
 - a. Fill frame voids solid with grout.
 - b. Fill adjacent masonry cores with grout minimum 12 inches for framed openings.
- 5. Do not build into masonry construction organic materials that are subject to deterioration.
- 6. Where recessed fire extinguisher cabinets, recessed drinking fountains, electric conduit, outlet, switch and other boxes occur, grind and cut units before building-in services. Coordinate with item installer.

3.4 CLEANING

- A. Clean work. Remove efflorescence in accordance with manufacturer's recommendations.
- B. Remove excess mortar and mortar smears as work progresses.
- C. Replace defective mortar. Match adjacent work.
- D. Clean soiled surfaces with cleaning solution.
- E. Leave area and surfaces clean and free of mortar spots, drippings and broken masonry.

3.5 FIELD QUALITY CONTROL

- A. Refer to Division 1, General Requirements, for additional requirements for a Contractor Quality Control Representative to perform contractor quality control inspections.
 - 1. Inspect concrete masonry unit erection, color, texture, coursing, joints, placement and type of reinforcing, reinforcing splicing, mortar and grout mixing, and grouting.
 - 2. Document preparatory, initial and follow-up inspection in Contractor's Test and Inspection Reports.
 - 3. Test and Inspection Reports shall be available to Architect upon request.
- B. Refer to Division 1, General Requirements, for Testing and Inspection Services: Perform the following inspections.
 - 1. Perform the following inspections for conformance compliance with Contract Documents.
 - a. Start of Masonry Work:
 - 1) Concrete unit masonry size, grade and type.
 - 2) Proportions of site-prepared mortar.
 - 3) Construction of mortar joints.
 - 4) Location of reinforcement and connectors.
 - 5) Specified size, grade and type of reinforcement.
 - 6) Protection of masonry during cold weather or hot weather.
 - b. Before Grouting:

- 1) Verify that grout space is clean.
 - 2) Placement of reinforcing and connectors.
 - 3) Proportions of site-prepared grout.
 - 4) Construction of mortar joints.
 - c. Grout placement and grouting procedures.
 2. Perform the following tests:
 - a. Mortar: Test and evaluate mortar in accordance with ASTM C 780.
 - 1) Take 3 samples of mortar each day.
 - b. Grout: Test and evaluate grout in accordance with ASTM C 1019.
 - 1) Take 3 samples of grout each day.
 - c. Prism: Test in accordance with ACI 530.1.
 - 1) Perform 1 prism test for each 5,000 square feet of wall.
 3. Reports: Prepare and submit test reports indicating results of tests made as specified in Division 1, General Requirements, Quality Control.
- C. Refer to Division 1, General Requirements - Testing and Inspection Services: Special Inspections.
1. Perform Special Inspections as required by the International Building Code Section 1704 - Special Inspections, as indicated on Drawings and as required by the Building Official.
- D. Correct deficiencies in products and installation found not to be in compliance with Contract Documents.

3.6 PROTECTION OF FINISHED WORK

- A. Protect finished Work.
- B. Without damaging completed work, provide protective boards at external corners which may be damaged by construction activities.

END OF SECTION

SECTION 047200

CAST STONE

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the cast stone as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:
 - 1. Cast stone copings on building façade.
 - 2. Mortar.
 - 3. Anchors and accessories.
 - 4. Joint filler.

1.3 RELATED SECTIONS

- A. Unit Masonry - Section 042000.
- B. Joint Sealers - Section 079200.

1.4 QUALITY ASSURANCE

- A. Qualifications of Workmen
 - 1. For the actual cutting and placing of cast stone units, use only skilled journeyman masons who are thoroughly experienced with the materials and methods specified and thoroughly familiar with the design requirements.
 - 2. In acceptance or rejection of installed cast stone units, no allowance will be made for lack of skill on the part of workmen.
- B. Manufacturer shall have a minimum of ten (10) years' experience in the manufacture of cast stone. Manufacturer's products must have previously been used on the exterior with satisfactory results. Manufacturer must have capability to produce cast stone on schedule and must be a member of the Cast Stone Institute.
- C. Casting Tolerances: Maintain casting, bowing, warping and dimension tolerance within the following maximums:

1. Overall Dimension For Height and Width of Units: Plus zero of unit dimension to minus 3/32" for 10'-0" and over.
 2. Twist, Bowing or Warping: Do not exceed length/360 or 1/8", whichever is greater.
 3. Insert Locations: Place within plus or minus 1/8" in each direction.
 4. Length of units shall not deviate by more than +/- 1/8" from approved dimensions.
- D. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.
1. ASTM C 1364 Standard Specification for Architectural Cast Stone, except where more stringent standards are specified herein.
 2. ASTM C 150 Specification for Portland Cement.
 3. ASTM C 33 Specification for Concrete Aggregates
 4. ASTM C 979 Specification for Coloring Pigments for Integrally Pigmented Concrete.
 5. ASTM C 494 Specification for Concrete Admixtures
 6. ASTM A 615 Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
 7. ASTM C 1194 Test Method for Compressive Strength of Architectural Cast Stone.
 8. ASTM C 1195 Test Method for Absorption of Architectural Cast Stone.
 9. ASTM C 642 Test Method for Specific Gravity, Absorption, and Voids in Hardened Concrete.
 10. ASTM C 39 Test Method for Compressive Strength of Concrete Cylinders.
 11. ASTM D 2244 Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
- E. Testing: Test three specimens per 500 cubic feet at random from plant production in accordance with referenced standards.
- F. Cold weather setting practices shall conform to the requirements specified in Section 042000.

1.5 SUBMITTALS

- A. Submit samples of cast stone with documented independent testing laboratory reports to the Architect for approval.

- B. Samples: Before any cast stone materials are delivered to the job site, submit twelve (12) inch long samples of each profile type cast stone unit required.
 - 1. Submit 6" x 6" cast stone samples showing full range of colors and texture available.
- C. Shop Drawings: Submit complete shop drawings of all cast stonework showing anchorage, type, location and spacing, joint fillers, mortar, and cast stone profiles, sizes, connections, location, type and size of reinforcing and adjacent construction.
 - 1. The shop drawings shall show the setting mark of each stone and its location on the structure. The stone when delivered shall bear the same corresponding setting mark on an unexposed surface.
 - 2. Shop drawings must show exact profiles for each piece.
- D. Certification: Submit certification from an independent testing laboratory certifying to test results required under Article 1.4, Para. E. herein.

1.6 MOCK-UP

- A. Provide full size unit(s) for use in construction of wall mock-up specified in Section 042000. The mock-up becomes the standard of workmanship for the project.

1.7 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect cast stone and related materials before, during, and after installation, and to protect the installed work and materials of all other trades.
 - 1. Stone shall be stored on skids, off the ground and covered with plastic sheeting; all material in contact with stone shall be non-staining.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect and at no additional cost to the Owner.

PART 2 PRODUCTS

2.1 CAST STONE

- A. The Cast Stone used in this work shall match color and texture of samples approved by the Architect. The samples shall be approved by the Architect prior to fabrication of cast stone.
- B. Exposed surfaces, unless otherwise specified, shall exhibit a typically fine grained texture similar to natural stone. No bug holes will be permitted and all facing material shall be mixed in a muller mixer.
- C. Cast Stone used in this work shall conform to the following properties:
 - 1. Compressive Strength, ASTM C 1194: 7,000 psi min. for products at 28 days.

2. Absorption, ASTM C 1195 or ASTM C 642: 5% max. for products at 28 days.
3. Cumulative Percent Weight Loss (CPWL) shall be less than 5% after 300 freeze/thaw cycles when tested in accordance with ASTM C 1364.
4. Air Content: ASTM C 173 or C 231, for wet cast product only shall be 4-8%. Air entrainment is not required for dry cast products.
5. Linear Shrinkage: ASTM C 426: Shrinkage shall not exceed 0.065%.
6. Color Variation
 - a. Must match color and finish of approved sample when viewed in direct daylight at a 5 foot distance.
 - b. ASTM Color Variation Allowed: 2% hue; 6% lightness, chrome and hue combined.

2.2 MATERIALS

- A. Cement shall be Portland Type I white, meeting ASTM C 150.
- B. Fine aggregate shall be carefully graded and washed natural sands, or manufactured granite, marble, quartz or limestone sands meeting ASTM C 33, except that gradation may vary to achieve desired finish and texture.
- C. Coarse aggregate shall be carefully graded and washed natural gravel, or crushed graded stone such as granite, marble quartz, limestone or other durable stone meeting ASTM C 33, except that gradation may vary to achieve desired finish and texture.
- D. Coloring: All colors added shall be inorganic (natural or synthetic) iron oxide pigments meeting ASTM C 979 excluding the use of a cement grade of carbon black pigment, and shall be guaranteed by the manufacturer to be light fast and lime proof. The amount of pigment shall not exceed ten (10) percent by weight of the cement used. Colorant shall be manufactured by Davis Colors or approved equal.
- E. Cast stone shall be reinforced with new billet steel reinforcing bars meeting ASTM A 615, grade 60, when necessary for safe handling, setting and structural stress, and the size of the reinforcing shall be as shown on approved shop drawings. If the surfaces are to be exposed to the weather, the reinforcement shall be galvanized or epoxy coated when covered with less than two (2) inches of material for bars larger than 5/8 inch and 1-1/2 inches for bars 5/8 inch or smaller. The material covering in all cases shall be at least twice the diameter of the bars. Stone shall be fully reinforced to take all stresses including handling, temperature changes and structural stress.
- F. All anchors, dowels and other anchoring devices shall be furnished by the stone setter as shown on approved shop drawings using building stone anchors fabricated of stainless steel Type 304.
 1. Anchors shall allow for wracking of the structure (seismic) without stressing the cast stone units.

2.3 FABRICATION

- A. Cast stone, after being made, shall be cured as noted below in Article 2.5.
- B. Cast stone shall be "dry cast" or "wet cast" (depending upon selected finish) to produce sharp arrises to match profiles on approved shop drawings. Provide stone with sinkages to receive anchors.
- C. Cast stone for copings shall be fabricated to largest practical length, as shown on approved shop drawings.
- D. Acid etch exposed surfaces as required to remove cement film prior to packaging and shipment. Sandblasting or chemical retardation finishing is not permitted.

2.4 CURING

- A. Cure units in a warm curing chamber approximately 100 deg. F. at 95% relative humidity for approximately 12 hours, or cure in a 95% moist environment at a minimum 70 deg. F. for 16 hours after casting. Additional yard curing at 95% relative humidity shall be 350 degree days (i.e. 7 days at 50 deg. F. or 5 days at 70 deg. F. prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

2.5 ACCESSORIES

- A. Mortar for setting of cast stone sections shall conform to ASTM C 270, Type N, with not more than 1/2 part lime per part of white non-staining Portland cement with integral colorant as required to match color of stone.
- B. Joint Filler: Fill all joints with exposed tops with "Emseal" Greyflex Expanding Foam Sealant as manufactured by Emseal, Inc. or approved equal. Material shall be designed for compression in joint twenty-five (25) percent of its original width, depth of filler as per manufacturer's standard. Joint filler shall be recessed 3/4" from finished surface.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where cast stone is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. Carefully coordinate with all other trades to ensure proper and adequate interface of the work of other trades with the work of this Section.

3.3 JOINTING

- A. Joint Size: 3/8", unless otherwise noted.

B. Joint Material

1. Use a full bed of mortar at all bed joints.
2. Flush vertical joints full with mortar.
3. Leave all joints with exposed tops open for sealant.

C. Location of Joints: As shown on approved shop drawings.

3.4 SETTING

- A. All cast stone shall be set by experienced stone masons, accurately and in accordance with the shop and setting drawings. All anchors and dowels shall be firmly placed and all anchor holes and dowel holes and similar holes filled completely with mortar. Cast stone anchors shall be fastened only to concrete, fully grouted CMU, or cold formed metal framing, using anchors appropriate for each substrate.
- B. Setting Tolerances: Plus/minus 1/32" allowable out of plane with adjacent units.
- C. When setting with mortar, all stones not thoroughly wet shall be drenched with clear water just prior to setting.
- D. All stone shall be protected from splashing mortar or damage by other trades. Any foreign matter splashed on the stone shall be removed immediately.
- E. All joints with exposed tops shall be filled with joint filler specified herein recessed 3/4" from stone surface; balance of joint shall be filled with back-up rod and sealant by Section 079200.

3.5 PATCHING

- A. The repair of chipped or damaged cast stone shall be done only by mechanics skilled in this class of work, with materials furnished by the manufacturer and according to his direction.
- B. Patching will not be permitted on copings and any other piece which can be removed and replaced without undue difficulty. Replace such pieces which are chipped or damaged with identical new pieces. Reseal and/or repoint to remove any evidence of replacement.
- C. Cast stone shall show no obvious repairs or imperfections other than minimal color variations when viewed with the unaided eye under good typical lighting at a ten (10) foot distance.

3.6 CLEANING

- A. Before pointing, the face of all cast stone shall be scrubbed with a fiber brush, using soap powder and water and shall then be rinsed thoroughly with clean running water. Any mortar on the face of the cast stone shall be removed. No acids or prepared cleaners shall be used without the approval of the cast stone manufacturer.

3.7 POINTING

- A. When ready for tuck pointing, the mortar joints shall be dampened and raked back 3/4" for pointing. Pointing shall form a slight concave profile. No pointing shall be done in freezing weather nor in locations exposed to hot sun unless properly protected. Pointing mortar shall be composed of one (1) part non-staining cement (ASTM C 91), one (1) part hydrate lime (ASTM C 207, Type S) and four (4) parts of clean, washed sand (ASTM C 144). Coloring pigments shall be added as specified in Section 042000 for face brick construction. The Architect shall approve color of pointing mortar before proceeding with pointing.

3.8 PROTECTION

- A. All projecting cast stone pieces shall be fully protected when installed against damage of any kind. Any piece damaged shall be replaced at no additional cost.

3.9 INSPECTION AND ADJUSTMENT

- A. Upon completion of the work, make a thorough inspection of all installed cast stone and verify that all units and joints have been installed in accordance with the provisions of this Section; make all necessary adjustments.

END OF SECTION

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SECTION 051200

STRUCTURAL STEEL

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Furnish all labor, materials, services and equipment as required in conjunction with or properly incidental to installation of structural steel as described herein and/or as shown on the Drawings.
- B. Related Documents:
 - 1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1, General Requirements, apply to the Work of this section.
- C. Related Sections:
 - 1. Section 052100 – Steel Joist Framing.
 - 2. Section 053100 – Metal Deck.
 - 3. Section 055500 – Metal Fabrications.

1.2 REFERENCES

- A. American Institute of Steel Construction (AISC):
 - 1. AISC M016 – ASD Manual of Steel Construction.
 - 2. AISC S303 – Code of Standard Practice for Steel Buildings and Bridges.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 36 – Standard Specification for Carbon Structural Steel.
 - 2. ASTM A 53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 3. ASTM A 325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - 4. ASTM A 108 – Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.
 - 5. ASTM A 500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - 6. ASTM A 501 – Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - 7. ASTM A 992/992M – Standard Specification for Steel for Structural Shapes for Use in Building Framing.
 - 8. ASTM C 1107 – Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).
 - 9. ASTM E 164 – Standard Practice for Ultrasonic Contact Examination of Weldments.
- C. American Welding Society (AWS):

1. AWS A2.4 – Standard Symbols for Welding, Brazing, and Nondestructive Examination.
 2. AWS D1.1 – Structural Welding Code - Steel.
- D. Steel Structures Painting Council (SSPC):
1. SSPC 1 – Solvent Cleaning.
 2. SSPC 3 – Power Tool Cleaning.
 3. SSPC-Paint 15 – Steel Joist Shop Primer; Society for Protective Coatings.

1.3 QUALITY ASSURANCE

- A. Fabricate structural steel members in accordance with AISC M016.
- B. Erector Qualifications:
1. Company specializing in performing structural steel erection work with minimum five (5) years documented experience.
 2. A qualified installer who participates in the AISC Certification program and is designated an AISC Certified Erector, Category CSE at the time of bid.
- C. Fabricator Qualifications:
1. Company specializing in performing structural steel fabrication work with minimum ten (10) years documented experience.
 2. A qualified fabricator who participates in the AISC Certification program and is designated an AISC Certified Plant, Category STD at the time of bid.

1.4 SUBMITTALS

- A. Division 1, General Requirements - Submittal Procedures: Requirements for submittals.
- B. Product Data: Submit producer's or manufacturer's specifications and installation instructions for the following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
1. Structural steel (each type), including certified copies of all mill reports covering chemical and physical properties.
 2. High-strength bolts (each type), including nuts and washer.
 3. Structural steel primer paint.
 4. Non-shrink grout.
- C. Shop Drawings:
1. Submit shop drawings prepared under the supervision of a registered Professional Engineer licensed in the State in which the project is located in accordance with Specifications.
 2. Show complete details and schedules for the fabrication and shop assembly of members. Detail to conform to AISC "Structural Steel Detailing". Clearly indicate profiles, sizes, spacing and locations of structural members, connections, attachments, anchorages, framed openings, size and type of fasteners and cambers. Show AWS weld types.
 3. Shop drawings shall include erections sequences, procedures, diagrams, schedules and complete details. Provide setting drawings, templates and

directions for installation of anchor bolts and other anchorages to be installed by others. Any fabrication of material before review of shop drawings shall be at the risk of the contractor.

4. The Contractor shall completely outline a proposed method and sequence of erection to the Architect for review before delivering any material to the job site. The outline shall be prepared to avoid delay or any damage to the work of other trades.

- D. Welder's Certificate: Submit Welder's Certifications performed by a qualified testing laboratory in accordance with AWS standards within the previous twelve (12) months.
- E. Test Reports: The Testing Laboratory shall submit copies of reports of shop and field inspections and test performed in accordance with Specifications.
- F. Special Inspection Reports: Submit the following inspection reports directly to Building Official and Architect from Independent Special Inspector with copy to Contractor in accordance with requirements of International Building Code, Section 1704 - Special Inspections, if required by the Building Official.

1.5 STORAGE OF MATERIALS

- A. Storage of fabricated steel at the job site shall be the responsibility of the Contractor. Material stored at the job site shall be placed so that design loads on existing or newly constructed structures are not exceeded and members will not be distorted or otherwise damaged. All materials shall be protected against corrosion or deterioration of any kind.
- B. The Architect/Engineer will reject any material that has become damaged because of improper storage.

PART 2 PRODUCTS

2.1 MATERIALS

- A. All materials shall be new and shall conform to the respective specifications (latest revision) and other requirements specified below.
 1. Structural Steel Wide Flange and WT Shapes: ASTM A 992.
 2. Structural Steel Angles, Channels and Plates: ASTM A 36.
 3. Steel Pipe: ASTM A53, Type "E" or "S", Grade B, or ASTM A501.
 4. Steel Tube: ASTM A500, Grade B, 46, ksi.
 5. Bolts: Erection bolts not specified as high strength shall meet requirements of ASTM A307, Grade A.
 - a. High Strength bolts shall meet ASTM A325.
 - b. Embedded Anchor Rods and Headed Bolts shall meet requirements of ASTM F1554 Grade 36.
 - c. Nuts: ASTM A563 and ANSI B18.2.2.
 - d. Washers: ASTM F436.
 - e. Direct tension indicator bolts or load washers conforming to AISC Specifications for Structural Joints.
 6. Welding Electrodes: AWS D1.1 for Series E70 electrodes.

7. Headed Stud Anchors: ASTM A108, minimum tensile strength 60,000 PSI.
8. Galvanizing: All items of structural steel noted to be galvanized shall conform to ASTM A123 (latest edition). All anchors, bolts washers, etc. in conjunction with galvanized surfaces shall also be galvanized to conform to these requirements.
9. Grout: Premixed non-shrink, non-metallic aggregate type, complying with ASTM C 1107 and capable of developing a minimum compressive strength of 7,500 psi at 28 days when placed at a plastic consistency of 115 percent flow factor.
10. Shop and Touch-up Primer: SSPC-Paint 15, Type I - Red Oxide.

2.2 FABRICATION

A. General:

1. All work shall be shop assembled to greatest extent possible and delivered to the project site complete and ready for erection. Material shall be properly marked and match-marked where field assembly is required. The sequence of shipments shall be such as to expedite erection and minimize field handling of material.
2. Steel Members shall be cambered if so indicated on the Drawings.
3. Steel members without specified camber shall be fabricated so that after erection, any minor camber due to rolling or fabrication shall be upward.

B. Connections:

1. Connections shall conform to the standard specifications of the AISC.
2. Connections not detailed on the Drawings shall be selected from Part 4 of the Manual of Steel Construction of the AISC.
3. Shop and field connections shall be bolted or welded as detailed.
4. No combination of bolts and welds shall be used for stress transmission in the same faying face of any connection.

C. Shop Welding:

1. All welding shall be done in accordance with AWS D1.1.
2. Intermittent and continuous welding shall be done in a manner to minimize internal stress.
3. Welds not specified shall be continuous fillet welds, sufficient to transmit required forces, using minimum fillet as specified by AWS D1.1.

D. Openings for other work: Provide openings in structural members only as shown on the structural drawings, or as directed by the Architect.

E. Shop Painting:

1. Shop paint structural steel work, except those members or portions of members to be embedded in concrete or mortar, or contact surfaces which are to be welded or high-strength bolted. Paint embedded steel on exposed portions and initial 2" of embedded areas only. Do not paint steel surfaces which are to receive sprayed-on fire proofing.
2. Surface Preparation: Clean steelwork to be painted complying with SSPC SP 3. Remove oil, grease and similar contaminants, complying with SSPC SP-1.
3. Application: Immediately after surface preparation, apply one coat of

structural steel primer paint according to manufacturer's instructions to provide a uniform dry film thickness of 2.5 mils. Provide full covering on joints, corners, edges and all exposed surfaces.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Refer to Division 1, General Requirements, for requirements on Verification of existing conditions before starting work.
- B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
 - 1. Verify that conditions are appropriate for erection of structural steel and that Work may properly proceed.
- C. Report in writing to Architect prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.
- D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.2 PREPARATION

- A. Templates shall be secured in place to preclude misplacement of anchor bolts, and the bolts shall be installed at locations and with projections established on final structural steel shop drawings. Check correct positioning before concrete is placed.
- B. Furnish items required to be cast into concrete or embed in masonry with setting diagrams to appropriate Sections.

3.3 ERECTION

- A. Tolerances: Unless otherwise noted, structural steel shall be erected in accordance with AISC S303.
- B. Temporary Bracing: Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb and in true alignment until completion of erection and installation of permanent bracing.
- C. Do not field cut or alter structural members without approval of Architect and Structural Engineer.
- D. Field weld components indicated on shop drawings.
- E. After erection, prime welds, abrasions and surfaces not shop primed, except surfaces to be in contact with concrete.
- F. Grouting of Base Plates and Bearing Plates: Plates shall be set and anchored to the

proper line and elevation. Metal wedges, shims and/or setting nuts shall be used for leveling and plumbing of structural members, including columns. Concrete surfaces shall be rough, free of oil, grease and laitance, and shall be damp. Steel surfaces shall be clean and free of oil, grease and rust. Mixing and placing shall be in conformance with the material manufacturer's instructions. Grout shall be mixed by using a mortar mixer. Batches shall be of size to allow continuous placement of freshly mixed grout. Placing shall be quick and continuous. Exposed surfaces shall have smooth, dense finish.

- G. Headed Stud Anchor Welding: All members or items to which studs are to be attached must be free of all foreign material, such as rust, oil, grease, paint, etc. When the mill scale is sufficiently thick to cause difficulty in obtaining proper welds it must be removed by grinding or sandblasting. Ceramic ferrules used in the stud welding process shall be completely removed.

3.4 FITTING OF STRUCTURAL MEMBERS

- A. The Contractor alone shall be responsible for the correct fitting of all structural members and for the elevation and alignment of the finished structure.

3.5 ADJUSTMENTS

- A. Any adjustments necessary in the steel frame because of fabrication, construction or erection discrepancies in elevation and alignment shall be the responsibility of the Contractor. Any modification to the approved manufactured material shall be approved by the Architect and Structural Engineer.

3.6 CONSTRUCTION

- A. Interface with Other Work:
 - 1. Meet with steel joist and pre-engineered metal building erector to coordinate connection requirements and scheduling for erection interface.
- B. Site Tolerances:
 - 1. Maximum Variation From Plumb: 1/4 inch.
 - 2. Maximum Offset From True Alignment: 1/4 inch.

3.7 FIELD QUALITY CONTROL

- A. Refer to Division 1, General Requirements, for additional requirements on Quality Control: Contractor Quality Control Representative shall perform contractor quality control inspections.
 - 1. Inspect structural steel member installation, sizes, configurations and connections.
 - 2. Visually inspect field-welded connections.
 - 3. Visually inspect bolted connections.
 - 4. Document preparatory, initial and follow-up inspection in Contractor's Test and Inspection Reports.
 - 5. Test and Inspection Reports shall be available to Architect upon request.

- B. Contractor shall provide the Testing Laboratory with names of welder to be employed on work, during fabrication and erection, together with certification that each of these welders has passed qualifications tests within the last year, unless noted otherwise, in accordance with AWS Standards.
- C. Inspect all structural steel during and after erection for conformance with Contract Documents and shop drawings. Any cases of insufficient bracing or guying, or other unsafe conditions shall be immediately called to attention of Contractor and reported to Architect.
 - 1. No burning or other field corrections of steel members are permitted without express permission of Owner's representative. Immediately report violations.
 - 2. Shop Inspection:
 - a. Review shop drawings and shop procedures with fabricator's supervisory personnel.
 - b. Request and obtain necessary mill certification of steel and verify proper material throughout the duration of the job, as required.
 - c. Review welding procedures and welder operator qualifications for conformance to the technical requirements of the Specifications.
 - d. Check layout and dimensions of jigs and fixtures for multiple fabrication, joint preparation, fit-up and run-out plates.
 - e. Verify welding electrodes to be used and other welding consumables as job progresses.
 - f. Check preheating procedure for uniformity and thoroughness through the full thickness of material.
 - g. Make visual inspection of welding in progress for size, length and quality.
 - h. Check bolted connections as required by the technical requirements of the Specifications.
 - i. Perform random dimensional checks of completed members.
 - j. Provide inspection of surface preparation for coating and coating operations.
 - 3. Field inspection:
 - a. Obtain planned erection procedure and review with erector's supervisory personnel.
 - b. Check installation of anchor bolts and base plates.
 - c. Verify field welding procedures and welder qualifications to assure conformance with the Specifications.
 - d. Check steel as received in field for possible shipping damage, workmanship and piece marking.
 - e. Check plumbness, alignment and chamber as erection progresses including proper bracing.
 - f. Check joint preparation, fit-up, backing strips and runout plates.
 - g. Check preheating to assure proper temperature, uniformity and thoroughness through the full material thickness.
 - h. Review welding sequence.
 - i. Visually inspect field welding for size, length and quality.
 - 4. Inspection of High-Strength Bolted Construction shall be in accordance with the latest edition of AISC Specification for Structural Joints, and as follows:
 - a. All high-strength bolted connections shall be visually inspected.
 - b. At least two bolts of every third connection between floor beams and

girders shall be checked with a calibrated torque wrench for proper torque.

- c. At least two bolts of every third connection between girders and columns shall be checked as above.
 - d. All bolts in every connection in the primary exterior framing and braced framing shall be checked as above.
 - e. All bolted connections that fail shall be corrected and all bolts in the connection shall be retested.
 - f. Check calibration of impact wrenches at least twice daily.
 - 5. Inspection of all welds shall be in accordance with the latest edition of the AWS Structural Welding Code.
 - a. Visually inspect all welds in accordance with AWS D1.1.
 - b. All penetration column to base plate welds shall be inspected by ultrasonic testing in accordance with ASTM E-164.
 - c. All full penetration welds in moment connections shall be inspected by ultrasonic testing.
 - 6. Inspection of headed stud connector welding shall be in accordance with the latest edition of the AWS Structural Welding Code and as follows:
 - a. Visual inspection of all studs shall indicate complete fusion and weld flush or fillet for 100 percent circumference. There will be no indication of lack of infusion or undercut weld.
 - b. A minimum of two (2) shear studs shall be welded at the start of each production period in order to determine proper generator, control unit and stud welder setting. These studs shall be capable of being bent 45 degrees from vertical without weld failure. If, after welding, visual inspection reveals that a sound weld or a full 360 degree fillet has not been obtained for a particular stud, such stud shall be struck with a hammer and bent 15 degrees off perpendicular to the nearest end of the beam. Studs failing under this test shall be replaced.
- D. Refer to Division 1, General Requirements, for requirements on Testing and Inspection Services - Testing Laboratory Services: Special Inspections.
- 1. Perform Special Inspections as required by the International Building Code Section 1704 - Special Inspections, as indicated on Drawings and as required by the Building Official.
- E. Correct deficiencies in products and installation found not to be in compliance with Contract Documents.

END OF SECTION

SECTION 052100

STEEL JOIST FRAMING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Perform labor, materials, services and equipment as required to complete the steel joist and joist girder work indicated by the Contract Documents and furnish all supplementary items such as bridging, attached seats and anchors necessary for its proper installation.
- B. Related Documents:
 - 1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1, General Requirements, apply to Work of this section.
- C. Related Sections:
 - 1. Section 033000 – Cast-in-Place Concrete.
 - 2. Section 042200 – Concrete Masonry Units.
 - 3. Section 051200 – Structural Steel.
 - 4. Section 053100 – Metal Deck.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 36 – Standard Specification for Carbon Structural Steel.
 - 2. ASTM A 108 – Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.
- B. American Welding society (AWS):
 - 1. AWS D1.1 – Structural Welding Code - Steel.
- C. Steel Joist Institute (SJI):
 - 1. SJI (SPEC) – Standard Specifications Load Tables and Weight Tables for Steel Joists, Longspan Joists and Joist Girders.
 - 2. SJI Technical Digest No. 9 – Handling and Erection of Steel Joists and Joist Girders.
- D. Steel Structures Painting Council (SSPC):
 - 1. SSPC SP 2 – Hand Tool Cleaning.
 - 2. SSPC-Paint 15 – Steel Joist Shop Primer.

1.3 SUBMITTALS

- A. Refer to Division 1, General Requirements - Submittal Procedures: Requirements for submittals.

- B. Shop Drawings:
 - 1. Indicate joist types using standard SJI designations, spacing, location, bridging, anchorages and special conditions.
 - 2. Indicate welded field connections using standard AWS welding symbols.
 - 3. Indicate paint primer type, accessories and installation details.
 - 4. Joist setting plan.
- C. Assurance/Control Submittals:
 - 1. Inspection Reports: Submit the following inspection reports directly to Architect from Independent Testing Laboratory with copy to Contractor.
 - a. Testing Laboratory Inspection of steel joists.
 - 2. Certificates: Submit certificate with shop drawings stating joists and joist girders are manufactured by a member of the Steel Joist Institute and conform to the requirements of the Steel Joist Institute Standard Specifications.
 - a. Submit certified copies of mill test reports covering chemical and physical properties of steel used in work.
 - 3. Welders Certificates: Certify welders to AWS standards within previous twelve (12) months.
 - 4. Qualification Documentation: Upon request, submit documentation of experience indicating compliance with specified qualification requirements.

1.4 QUALITY ASSURANCE

- A. Perform Work, including that for headers and other supplementary framing, in accordance with SJI Standard Specifications Load Tables and SJI Technical Digest No.9.
- B. Qualifications:
 - 1. Fabricator: Member in good standing of the Steel Joist Institute.
 - 2. Erector: Company specializing in performing the work of this section with minimum five (5) years documented experience.
 - 3. Welders: Qualify welding operators in accordance with AWS Standard Qualification Procedures. Provide certification that welders employed on Work have satisfactorily passed AWS qualification tests within previous twelve (12) months.

1.5 DELIVERY, STORAGE AND PROTECTION

- A. Refer to Division 1, General Requirements - Product Options: Transport, handle, store and protect Products.
- B. Transport, handle, store and protect products to SJI requirements.
- C. Accept Products on site in manufacturer's packaging. Inspect for damage. Return damaged Products and replace with undamaged Products.
- D. Project Field Superintendent shall inspect Products immediately upon delivery to Project Site, determine Product conformance with specified requirements and reject

Products not complying with specifications. Project Field Superintendent shall direct that non-complying Products be removed from Project Site immediately.

- E. Storage of fabricated steel at Project Site is responsibility of Contractor. Material stored at Project Site shall be placed so that design loads on existing or newly constructed structures are not exceeded and members will not be distorted or otherwise damaged.
- F. Protect materials from corrosion or deterioration of any kind.
- G. Architect/Engineer will reject any material that has become damaged because of improper storage.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Open web Steel Joists and Joist Girders: As required by the Steel Joist Institute.
- B. Structural steel for supplementary framing: Bearing plates, bridging, wall anchors, etc. ASTM A36.
- C. Bolts for connections: ASTM A 325.
- D. Welding Materials: AWS D1.1, type per Steel Joist Institute Specifications.
- E. Shop and Touch-Up Primer: SSPC-Paint 15, Type I - Red Oxide.

2.2 EXTENDED ENDS

- A. Extended ends shall have a load carrying capacity at least equal to the uniform load carrying the capacity of the joists specified or as indicated on the Drawings. Provide extended ends and joist extensions as shown on drawings.

2.3 BRIDGING

- A. Provide member sizes and end anchorage in accordance with the Standard Specifications unless otherwise indicated in the Drawings. Use horizontal and diagonal bridging as required by SJI.

PART 3 EXECUTION

3.1 FABRICATION

- A. General: Contractor shall be responsible for errors in fabrication and for correct fitting of joists. Holes shall not be made or enlarged by burning, nor will burning of unfare holes in shop or field be permitted.
- B. Joists: Join members by welding in a manner that will produce finished connection of strength required.

- C. Accessories: Provide all necessary sag rods, bridging, extended ends, side wall and beam anchors, wall connectors, headers and ceiling extensions.
- D. Painting: Scale, rust or other deleterious materials shall be removed from fabricated joists, bridging, anchors, etc., by SJI approved methods before shop coat of paint is applied.

3.2 ERECTION

- A. General: Exercise care in handling and placing joists. Set joists to lines, levels and spacing as indicated. Execute general handling and erection in accordance with SJI Specifications. Minimum bearings and anchorage shall conform to SJI Specifications and/or Drawings. Do not start erection of joists until supporting Work is in place and connections made. Permanently fasten joists to supports and completely install all bridging and anchors before any construction loads are placed.
- B. Allow for erection loads: Provide sufficient temporary bracing to maintain framing safe, plumb and in true alignment.
- C. Bridging: Conform to requirements of Steel Joist Institute Standard Specifications and loads shown on the Drawings. Anchor each line of bridging to walls or supports and to each joist by welding or bolting. Do not permit erection of decking until joists are braced bridged and secured or until completion of erection and installation of permanent bridging and bracing.
- D. Welding: Execute welding in accordance with "Code for Arc and Gas Welding in Building Construction" of American Welding Society as amended to date and only by welding operators who have been previously qualified to perform the type of work required.
- E. Damaged Joists: Do not use joists with cracked or improper welds or joists otherwise damaged so as to affect their structural properties. Field repair of such damaged joists will be allowed only by special permission and subject to review of the Architect. Method of repairs shall be in accordance with manufacturer's recommendations.

3.3 CONSTRUCTION

- A. Interface with Other Work:
 - 1. Coordinate placement of anchorages in concrete and masonry construction for making connections and for securing bearing plates.
 - 2. Furnish anchor bolts and other devices built into concrete and masonry construction to responsible installer for installation.
 - 3. Meet with structural steel and pre-engineered metal building erector to coordinate connection requirements and scheduling for erection interface.
- B. Site Tolerances:
 - 1. Minimum Variation From Plumb: 1/4 inch.
 - 2. Maximum Offset From True Alignment: 1/4 inch.

3.4 PAINTING

- A. Fabrication Painting: Reference Paragraphs 2.1 E and 3.1 D.
- B. Field Touch-Up Painting: Prepare and coat welds, fasteners, burned and abraded areas as noted under Fabrication Painting.

3.5 FIELD QUALITY CONTROL

- A. Refer to Division 1, General Requirements for Quality Control: Contractor Quality Control Inspector shall perform contractor quality control inspections.
 - 1. Inspect joist installation, type, spacing and connections to structure.
 - 2. Visually inspect all field-welded connections.
 - 3. Document preparatory, initial and follow-up inspection in Contractor's Test and Inspection Reports.
 - 4. Test and Inspection Reports shall be available to Architect upon request.
- B. Refer to Division 1, General Requirements for Testing and Inspection Services: Perform the following.
 - 1. Inspect shop fabrication and field fabrication and erection at all times during process of Work. Inspect all connections of both bolted and welded types.
 - 2. Inspect erection of steel joists and joist girders for proper installation. Inspection shall include checking for proper bearing, welding, bolting and installation of bridging.
- C. Correct deficiencies in products and installation found not to be in compliance with Contract Documents.

END OF SECTION

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SECTION 053100

METAL DECK

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Furnish all labor, materials, services and equipment as required in conjunction with or properly incidental to installation of steel deck as described herein and/or as shown on the Drawings including type of deck, layout and orientation.
 - 2. Welds and mechanical fastener types, sizes and patterns.
 - 3. Supplemental framing for openings.
- B. Related Documents:
 - 1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1, General Requirements, apply to Work of this section.
- C. Related Sections:
 - 1. Section 033000 – Cast-in-Place Concrete.
 - 2. Section 051200 – Structural Steel.
 - 3. Section 052100 – Steel Joist Framing.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM A36 – Standard Specification for Structural Steel.
 - 2. ASTM A611 – Standard Specification for Structural Steel (SS), Sheet, Carbon, Cold-Rolled.
 - 3. ASTM A572 – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
 - 4. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 5. ASTM B633 – Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
 - 6. ASTM C423 – Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- B. American Institute of Steel and Iron (AISI):
 - 1. North American Specification for the Design of Cold-Formed Steel Structural Members, 2004 Supplement.
- C. American National Standards Institute (ANSI):
 - 1. Safety Requirements for Powder-Actuated Fastening Systems (ANSI A10.3).

- D. American Welding Society (AWS):
 - 1. Structural Welding Code – Steel (D1.1).
 - 2. Structural Welding Code – Sheet Steel (D1.3).
 - 3. Standard Symbols for Welding, Brazing and Nondestructive Examination (A2.4).
- E. Department of the Army, Navy and the Air Force:
 - 1. Technical Manual – Seismic Design for Buildings (TM 5-809-10, NAVFAC P-355, AFM 88-3, Chapter 13).
- F. Factory Mutual (FM):
 - 1. Building Materials Approval Directory.
 - 2. Standard Class No. 4450 – Class I Insulated Steel Roof Decks.
- G. International Code Council Evaluation Service (ICC ES):
 - 1. Uniform Building Code (UBC).
 - 2. International Building Code (IBC).
 - 3. Acceptance Criteria for Steel Decks (AC 43).
 - 4. Steel Deck Diaphragms Attached with Hilti X-ENP-19 L15, X-EDN19-THQ12 or X-EDNK22-THQ12 Fasteners and Self-Drilling Screws, Button Punches or Top Seam Welds (ESR-2197).
 - 5. Steel Deck Diaphragms (ESR-2199).
- H. Steel Deck Institute (SDI):
 - 1. Diaphragm Design Manual – Design Manual for Composite Decks, Form Decks and Roof Decks, Latest Edition.
 - 2. Manual of Construction with Steel Deck.
 - 3. Standard Practice Details.
 - 4. Deck Damage and Penetrations.
- I. Steel Joist Institute (SJI):
 - 1. Standard Specification Load Tables and Weight Tables for Steel Joist and Joist Girders, 40th Edition.
- J. Underwriters Laboratories (UL):
 - 1. Roofing Materials and Systems Directory.
 - 2. Fire Resistance Directory, Volume 1.
 - 3. UL Standard 580 – Tests for Uplift Resistance of Roof Assemblies.

1.3 SYSTEM DESCRIPTION

- A. Design Requirements: Provide adequate diaphragm shear resistance, uplift resistance and stiffness for imposed load combinations.
- B. Performance Requirements: FM classified Class I-90 minimum for uplift resistance and UL fire classified.

1.4 SUBMITTALS

- A. General: Submittals shall be in accordance with Conditions of the Contract and refer to Division 1, General Requirements, for Submittal Procedures.
- B. Shop Drawings Include:
 - 1. Deck layout and orientation, supporting steel framing and supports with dimensions and section details.
 - 2. Deck type and profile, dimensions, supports, projections, openings and reinforcement.
 - 3. Welds and mechanical fastener types, sizes and patterns.
 - 4. Sidelap connector types, sizes and patterns.
 - 5. Accessory details.
- C. Design Data Includes:
 - 1. Calculations in accordance with SDI design methods or approved alternative method verifying allowable diaphragm shears and stiffness.
 - 2. Weld and mechanical fastener performance data including ultimate tension and shear loads and flexibility factors.
- D. Assurance/Control Submittals:
 - 1. Inspection Reports: Submit the following inspection reports directly to Architect from Independent Testing Laboratory with copy to Contractor.
 - a. Testing Laboratory Inspection of steel deck.
 - 2. Fastener Inspection Reports: Submit the following inspection reports directly to Architect from fastener manufacturer Quality Control Representative with copy to Contractor.
 - a. Manufacturer inspection of mechanical fasteners.
 - 3. Welders Certificates: Certify welders to AWS standards within previous twelve (12) months.
 - 4. Qualification Documentation: Upon request, submit documentation of experience indicating compliance with specified qualification requirements.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Steel Deck Manufacturer: Member producer of SDI.
 - 2. Mechanical Fastener Manufacturer: Member producer of SDI and ISO 9001 accredited for manufacturing quality control.
- B. Qualifications:
 - 1. Company specializing in performing the work of this Section with minimum five (5) years of documented experience.
 - 2. Welders: Qualify welding operators in accordance with AWS Standard Qualification Procedures. Provide certification that welders employed on Work have satisfactorily passed AWS qualification tests within previous twelve (12) months.
 - 3. Powder or Air Actuated Fastener Installers: Tool operator licensed by pin manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Steel Deck:
 - 1. Do not rack, bend or mar steel deck sheets.
 - 2. Store steel deck sheets and accessories above ground and protected from free weathering with one end elevated.
 - 3. Cover and ventilate unpainted or uncoated steel deck sheets until final installation.
 - 4. Architecturally exposed steel deck sheets shall be appropriately packaged or protected to prevent damage during delivery, storage and handling.
- B. Welding Electrodes and Mechanical Fasteners:
 - 1. Store welding electrodes, mechanical fasteners and powder-actuated boosters in original packages in a cool, dry location until final installation.
 - 2. Comply with all project and national safety regulations regarding handling of welding equipment and powder-actuated fastening systems.
- C. Sidelap Connectors:
 - 1. Store connectors in original packages in a cool, dry location until final installation.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Steel Deck:
 - 1. Vulcraft.
 - 2. Verco Manufacturing Company.
 - 3. Wheeling Corrugating Company.
 - 4. Approved alternative.
- B. Mechanical Fasteners:
 - 1. Hilti, Inc.
 - 2. Other approved alternative.
- C. Sidelap Connectors:
 - 1. Self-drilling metal screws
 - a. Hilti, Inc.
 - b. Elco Textron.
 - c. Other approved alternative.

2.2 MATERIALS

- A. Steel Deck:
 - 1. Decking: Indicated on Drawings.
 - 2. Galvanized steel: ASTM A653 – SS Designation, Grade 33 with minimum yield strength 33 ksi.
 - 3. Cold rolled steel:
 - a. ASTM A611 – Grade C with minimum yield 33 ksi.
 - b. ASTM A446 – Grade A with zinc coating in accordance with ASTM A525 G60.

B. Welds and Mechanical Fasteners:

1. Welds:
 - a. Material: Electric shielded arc process using minimum E60 XX electrodes in accordance with AWS D1.3 procedures.
 - b. Weld Quality: All welds uniform size and appearance and free of pinholes, porosity, undercutting or other defects.
 - c. Weld Size: Minimum $\frac{3}{4}$ inch effective diameter.
 - d. Weld Washers: Use on steel deck thinner than 22 gauge.
2. Mechanical Fasteners:
 - a. Material: AISI 1070 modified.
 - b. Hardness: Minimum Rockwell Hardness C 54.5.
 - c. Strength: Minimum tensile strength 285 ksi; minimum shear strength 175 ksi.
 - d. Design and Manufacture: Knurled shank with forged ballistic. Manufacturing process shall ensure steel ductility and prevent development of hydrogen embrittlement.
 - e. Washers:
 - 1) For bar joist framing: Minimum 12 mm (0.472 in.) steel washers.
 - 2) For structural steel framing: Minimum 15 mm (0.591 in.) steel washers.
 - f. Corrosion Resistance:
 - 1) For steel decks with waterproofing membrane: 5 mm zinc electroplated in accordance with ASTM B633 SC1 Type III.
 - 2) For exposed steel decks: Minimum AISI 304 stainless steel sealing caps with bonded neoprene washer shall be installed over each fastener.
 - g. Design Requirements:
 - 1) SDI diaphragm shear and flexibility.
 - 2) FM wind uplift resistance.
 - 3) UL fire classification.
 - h. Approved Types:
 - 1) For use with bar joist framing supports with top chord thickness $\frac{1}{8}$ inch to $\frac{3}{8}$ inch:
 - a) Hilti X-EDNK22 THQ12 ($\frac{1}{8}$ in. up to, but not including $\frac{1}{4}$ in.).
 - b) Hilti X-EDN19 THQ12 (greater than $\frac{3}{16}$ in. up to and including $\frac{3}{8}$ in.).
 - c) Other approved alternative.
 - 2) For use with structural steel framing supports with top flange thickness $\frac{1}{4}$ inch or thicker:
 - a) Hilti X-ENP-19 L15 ($\frac{1}{4}$ inch or thicker).
 - b) Other approved alternative.

C. Sidelap Connectors:

1. Acceptable types of sidelap connectors:
 - a. Top or side seam welds
 - 1) 1-1/2 inch long fillet welds in accordance with AWS D1.3 procedures.
 - b. Self-metal drilling screws:

- 1) Drive self-metal drilling screws completely through adjacent lapped deck sheets to achieve positive engagement of adjacent sheets with a minimum of three thread penetration.
 - 2) Material: AISI 1022 modified.
 - 3) Hardness: Minimum Rockwell Hardness B 59.5.
 - 4) Strength: Minimum tensile strength 62 ksi; minimum yield 34 ksi.
 - 5) Design and Manufacture: High hex washer head undercut with reverse serrations; pilot point at center.
 - 6) Corrosion Resistance:
 - a) For steel decks with waterproofing membrane: 5 mm zinc electroplated in accordance with ASTM B633 SC1 Type III.
 - b) For exposed steel decks: AISI 410 or 304 stainless steel with bonded neoprene washer.
 - 7) Design Requirements:
 - a) SDI diaphragm shear and flexibility.
 - b) FM wind uplift resistance.
 - c) UL fire classification.
 - 8) Approved Types:
 - a) Hilti S-MD 10-16 x 7/8 HHWH Pilot Screw.
 - b) Hilti S-MD 12-14x 1 HHWH Stitch Screw.
 - c) Hilti S-MD 10-16 x 3/4 HWH #3 Stainless Steel Screw.
 - d) Other approved alternative.
- c. Button punch:
- 1) Button punches shall be deep and positively engage the male and female side edges of adjacent interlocking deck sheets.

2.3 ACCESSORIES

- A. Weld Washers: Flat washers with thickness between 0.05 and 0.08 inches with a minimum prepunched hole of 3/8 inch diameter.
- B. Verco Sheartranz II (or Sheartranz) restraining elements: ASTM A653 – SS Designation, Grade 33 with minimum yield strength 38 ksi, 16 gauge. Used with Verco HSB-36 (or HSB-36-SS) steel deck at shear collecting support elements perpendicular to the deck corrugations. Install restraining elements in accordance with manufacturer's instructions and ICC ES ESR-2199 as shown on the Drawings.

2.4 FINISHES

- A. As noted on Drawings:
 1. Prime Painted Finish: Acrylic primer applied to thoroughly cleaned and etched steel. Rust inhibitive primer roller applied and oven cured to thickness 4 mm nominal each side.
 2. Galvanized Finish: Zinc coated in accordance with ASTM A525 G60 with factory prime paint coat.

PART 3 EXECUTION

3.1 INSTALLERS

- A. Qualifications:
 - 1. All steel deck welders AWS certified for welding of sheet steel.
 - 2. All mechanical fastener installers certified or licensed by the fastener and tool system manufacturer on the project site. Certification or licensing includes all training necessary for proper tool operation, fastener selection, maintenance and troubleshooting.
- B. Experience:
 - 1. Minimum experience with three projects of similar size and type with chosen installation method.
- C. Compliance:
 - 1. Comply with all manufacturer catalog and carton installation instructions, product data and technical bulletins.

3.2 PREPARATION

- A. Examination: Examine condition of supporting steel framing. Confirm location and elevation of supporting steel framing with the Drawings.
- B. Layout: Place steel deck sheets as shown on the Drawings ensuring bearing on supporting steel framing. Sheets shall be true and straight with horizontal deviations less than 1/4 inch in 100 feet. Minimum endlaps 2 inches.
- C. Marking: Mark steel deck at the centerline of supporting steel members to prevent weld burn through and mechanical fastener punch through. Use a chalk line or indelible marker.
- D. Test Fastenings:
 - 1. Welds: Perform project specific test welds prior to final installation. Test welds are considered an example of representative work.
 - 2. Mechanical fasteners: Gauge pneumatic or powder actuated tool systems to the base material steel type and deck type and thickness prior to final installation. Confirm appropriate power regulation, powder actuated booster load and compressor air pressure prior to final installation.

3.3 INSTALLATION

- A. Install steel deck sheets and accessories in accordance with manufacturer's instructions and as shown on the Drawings.
- B. Secure steel deck to supporting steel framing with welds or mechanical fasteners. Install welds or mechanical fasteners at the spacing and pattern as shown on the Drawings.
- C. Secure steel deck sidelaps at the spacing and pattern as shown on the Drawings.

- D. End closures of the deck units shall be fastened by tack welding or sheet metal screws not more than 48 inches apart.
- E. Where deck changes direction, install 6 inch minimum wide sheet steel cover plates, of same thickness as deck. Fusion weld 12 inches on center maximum.
- F. Immediately after welding deck and other metal components in position, coat welds, burned areas and damaged surface coating, with touch-up primer.
- G. Position drain pans with flange bearing on top surface of deck. Weld at each deck flute.

3.4 REPAIR / RESTORATION

- A. Welds: Repair all portions of the steel deck coating damaged due to weld heat with compatible paint type or zinc rich compound. Repair burn throughs in accordance with SDI Deck Damage and Penetrations.
- B. Mechanical Fasteners: Replace or supplement underdriven and over driven fasteners with adjacent, properly installed fasteners.

3.5 OPENINGS

- A. At deck openings provide steel angle reinforcement indicated on Drawings. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and weld to deck at each flute.
- B. At openings between deck and walls, columns and openings, provide sheet steel closures and angle flashings to close openings.

3.6 HANGING LOADS

- A. Mechanical equipment or other loads shall not be hung from metal deck unless specifically indicated and detailed on Drawings. Method of attachment subject to review by Architect and Engineer.

3.7 FIELD QUALITY CONTROL

- A. Welds: Examination and qualification of puddle and fillet welds shall be in accordance with AWS D1.3 criteria.
- B. Mechanical Fasteners: Examine fastener washers to ensure steel deck is clamped to the supporting steel framing. Periodically examine fastener nail head standoff with template or gauge to within manufacturer accepted tolerances.
- C. Quality Control: Contractor Quality Control Representative shall perform contractor quality control inspections.
 - 1. Inspect steel deck installation, layout, types, gauge, finish and sizes of decking sheets, connections and tolerances, and welding.

2. Document preparatory, initial and follow-up inspection in Contractor's Test and Inspection Reports.
3. Test and Inspection Reports shall be available to Architect upon request.

3.8 SAFETY

- A. Do not use steel deck sheets for storage or working platform until permanently fastened to supporting steel framing.
- B. Do not exceed construction load carrying capacity of steel deck sheets for type and span defined in SDI Construction Load Tables.
- C. Cordon off the Controlled Decking Zone (CDZ) area and all areas below steel deck sheets being fastened during installation.

END OF SECTION

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SECTION 053123

METAL ROOF DECK

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Furnish all labor, materials, services and equipment as required in conjunction with or properly incidental to installation of steel roof deck as described herein and/or as shown on the Drawings including type of deck, layout and orientation.
 - 2. Welds and mechanical fastener types, sizes and patterns.
 - 3. Supplemental framing for openings.
- B. Related Documents:
 - 1. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1, General Requirements, apply to Work of this section.
- C. Related Sections:
 - 1. Section 051200 – Structural Steel.
 - 2. Section 052100 – Steel Joist Framing.

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM):
 - 1. ASTM A36 – Standard Specification for Structural Steel.
 - 2. ASTM A611 – Standard Specification for Structural Steel (SS), Sheet, Carbon, Cold-Rolled.
 - 3. ASTM A572 – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
 - 4. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 5. ASTM B633 – Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
 - 6. ASTM C423 – Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- B. American Institute of Steel and Iron (AISI):
 - 1. North American Specification for the Design of Cold-Formed Steel Structural Members, 2004 Supplement.
- C. American National Standards Institute (ANSI):
 - 1. Safety Requirements for Powder-Actuated Fastening Systems (ANSI A10.3).
- D. American Welding Society (AWS):

1. Structural Welding Code – Steel (D1.1).
 2. Structural Welding Code – Sheet Steel (D1.3).
 3. Standard Symbols for Welding, Brazing and Nondestructive Examination (A2.4).
- E. Department of the Army, Navy and the Air Force:
1. Technical Manual – Seismic Design for Buildings (TM 5-809-10, NAVFAC P-355, AFM 88-3, Chapter 13).
- F. Factory Mutual (FM):
1. Building Materials Approval Directory.
 2. Standard Class No. 4450 – Class I Insulated Steel Roof Decks.
- G. International Code Council Evaluation Service (ICC ES):
1. Uniform Building Code (UBC).
 2. International Building Code (IBC).
 3. Acceptance Criteria for Steel Decks (AC 43).
 4. Steel Deck Diaphragms Attached with Hilti X-ENP-19 L15, X-EDN19-THQ12 or X-EDNK22-THQ12 Fasteners and Self-Drilling Screws, Button Punches or Top Seam Welds (ESR-2197).
 5. Steel Deck Diaphragms (ESR-2199).
- H. Steel Deck Institute (SDI):
1. Diaphragm Design Manual – Design Manual for Composite Decks, Form Decks and Roof Decks, Latest Edition.
 2. Manual of Construction with Steel Deck.
 3. Standard Practice Details.
 4. Deck Damage and Penetrations.
- I. Steel Joist Institute (SJI):
1. Standard Specification Load Tables and Weight Tables for Steel Joist and Joist Girders, 40th Edition.
- J. Underwriters Laboratories (UL):
1. Roofing Materials and Systems Directory.
 2. Fire Resistance Directory, Volume 1.
 3. UL Standard 580 – Tests for Uplift Resistance of Roof Assemblies.

1.3 SYSTEM DESCRIPTION

- A. Design Requirements: Provide adequate diaphragm shear resistance, uplift resistance and stiffness for imposed load combinations.
- B. Performance Requirements: FM classified Class I-90 minimum for uplift resistance and UL fire classified.

1.4 SUBMITTALS

- A. General: Submittals shall be in accordance with Conditions of the Contract and refer to Division 1, General Requirements, for Submittal Procedures.
- B. Shop Drawings Include:
 - 1. Deck layout and orientation, supporting steel framing and supports with dimensions and section details.
 - 2. Deck type and profile, dimensions, supports, projections, openings and reinforcement.
 - 3. Welds and mechanical fastener types, sizes and patterns.
 - 4. Sidelap connector types, sizes and patterns.
 - 5. Accessory details.
- C. Design Data Includes:
 - 1. Calculations in accordance with SDI design methods or approved alternative method verifying allowable diaphragm shears and stiffness.
 - 2. Weld and mechanical fastener performance data including ultimate tension and shear loads and flexibility factors.
- D. Assurance/Control Submittals:
 - 1. Inspection Reports: Submit the following inspection reports directly to Architect from Independent Testing Laboratory with copy to Contractor.
 - a. Testing Laboratory Inspection of steel deck.
 - 2. Fastener Inspection Reports: Submit the following inspection reports directly to Architect from fastener manufacturer Quality Control Representative with copy to Contractor.
 - a. Manufacturer inspection of mechanical fasteners.
 - 3. Welders Certificates: Certify welders to AWS standards within previous twelve (12) months.
 - 4. Qualification Documentation: Upon request, submit documentation of experience indicating compliance with specified qualification requirements.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 - 1. Steel Roof Deck Manufacturer: Member producer of SDI.
 - 2. Mechanical Fastener Manufacturer: Member producer of SDI and ISO 9001 accredited for manufacturing quality control.
- B. Qualifications:
 - 1. Company specializing in performing the work of this Section with minimum five (5) years of documented experience.
 - 2. Welders: Qualify welding operators in accordance with AWS Standard Qualification Procedures. Provide certification that welders employed on Work have satisfactorily passed AWS qualification tests within previous twelve (12) months.
 - 3. Powder or Air Actuated Fastener Installers: Tool operator licensed by pin manufacturer.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Steel Deck:
 - 1. Do not rack, bend or mar steel deck sheets.
 - 2. Store steel deck sheets and accessories above ground and protected from free weathering with one end elevated.
 - 3. Cover and ventilate unpainted or uncoated steel deck sheets until final installation.
 - 4. Architecturally exposed steel deck sheets shall be appropriately packaged or protected to prevent damage during delivery, storage and handling.
- B. Welding Electrodes and Mechanical Fasteners:
 - 1. Store welding electrodes, mechanical fasteners and powder-actuated boosters in original packages in a cool, dry location until final installation.
 - 2. Comply with all project and national safety regulations regarding handling of welding equipment and powder-actuated fastening systems.
- C. Sidelap Connectors:
 - 1. Store connectors in original packages in a cool, dry location until final installation.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Steel Roof Deck:
 - 1. Vulcraft.
 - 2. Vercor Manufacturing Company.
 - 3. Wheeling Corrugating Company.
 - 4. Approved alternative.
- B. Mechanical Fasteners:
 - 1. Hilti, Inc.
 - 2. Other approved alternative.
- C. Sidelap Connectors:
 - 1. Self-drilling metal screws:
 - a. Hilti, Inc.
 - b. Elco Textron.
 - c. Other approved alternative.

2.2 MATERIALS

- A. Steel Roof Deck:
 - 1. Decking: Indicated on Drawings.
 - 2. Galvanized steel: ASTM A653 – SS Designation, Grade 33 with minimum yield strength 33 ksi.
 - 3. Cold rolled steel:
 - a. ASTM A611 – Grade C with minimum yield 38 ksi.

- b. ASTM A446 – Grade A with zinc coating in accordance with ASTM A525 G60.
- B. Welds and Mechanical Fasteners:
 - 1. Welds:
 - a. Material: Electric shielded arc process using minimum E60 XX electrodes in accordance with AWS D1.3 procedures.
 - b. Weld Quality: All welds uniform size and appearance and free of pinholes, porosity, undercutting or other defects.
 - c. Weld Size: Minimum $\frac{3}{4}$ inch effective diameter.
 - d. Weld Washers: Use on steel deck thinner than 22 gauge.
 - 2. Mechanical Fasteners:
 - a. Material: AISI 1070 modified.
 - b. Hardness: Minimum Rockwell Hardness C 54.5.
 - c. Strength: Minimum tensile strength 285 ksi; minimum shear strength 175 ksi.
 - d. Design and Manufacture: Knurled shank with forged ballistic. Manufacturing process shall ensure steel ductility and prevent development of hydrogen embrittlement.
 - e. Washers:
 - 1) For bar joist framing: Minimum 12 mm (0.472 in.) steel washers.
 - 2) For structural steel framing: Minimum 15 mm (0.591 in.) steel washers.
 - f. Corrosion Resistance:
 - 1) For steel decks with waterproofing membrane: 5 mm zinc electroplated in accordance with ASTM B633 SC1 Type III.
 - 2) For exposed steel decks: Minimum AISI 304 stainless steel sealing caps with bonded neoprene washer shall be installed over each fastener.
 - g. Design Requirements:
 - 1) SDI diaphragm shear and flexibility.
 - 2) FM wind uplift resistance.
 - 3) UL fire classification.
 - h. Approved Types:
 - 1) For use with bar joist framing supports with top chord thickness $\frac{1}{8}$ inch to $\frac{3}{8}$ inch:
 - a) Hilti X-EDNK22 THQ12 ($\frac{1}{8}$ inch up to, but not including $\frac{1}{4}$ inch).
 - b) Hilti X-EDN19 THQ12 (greater than $\frac{3}{16}$ inch up to and including $\frac{3}{8}$ inch).
 - c) Other approved alternative.
 - 2) For use with structural steel framing supports with top flange thickness $\frac{1}{4}$ inch or thicker:
 - a) Hilti X-ENP-19 L15 ($\frac{1}{4}$ inch or thicker).
 - b) Other approved alternative.
- C. Sidelap Connectors:
 - 1. Acceptable types of sidelap connectors:

- a. Top or side seam welds
 - 1) 1-1/2 inch long fillet welds in accordance with AWS D1.3 procedures.
- b. Self-metal drilling screws:
 - 1) Drive self-metal drilling screws completely through adjacent lapped deck sheets to achieve positive engagement of adjacent sheets with a minimum of three thread penetration.
 - 2) Material: AISI 1022 modified.
 - 3) Hardness: Minimum Rockwell Hardness B 59.5.
 - 4) Strength: Minimum tensile strength 62 ksi; minimum yield 34 ksi.
 - 5) Design and Manufacture: High hex washer head undercut with reverse serrations; pilot point at center.
 - 6) Corrosion Resistance:
 - a) For steel decks with waterproofing membrane: 5 mm zinc electroplated in accordance with ASTM B633 SC1 Type III.
 - b) For exposed steel decks: AISI 410 or 304 stainless steel with bonded neoprene washer.
 - 7) Design Requirements:
 - a) SDI diaphragm shear and flexibility.
 - b) FM wind uplift resistance.
 - c) UL fire classification.
 - 8) Approved Types:
 - a) Hilti S-MD 10-16 x 7/8 HHWH Pilot Screw.
 - b) Hilti S-MD 12-14x 1 HHWH Stitch Screw.
 - c) Hilti S-MD 10-16 x 3/4 HWH #3 Stainless Steel Screw.
 - d) Other approved alternative.
- c. Button punch:
 - 1) Button punches shall be deep and positively engage the male and female side edges of adjacent interlocking deck sheets.

2.3 ACCESSORIES

- A. Weld Washers: Flat washers with thickness between 0.05 and 0.08 inch with a minimum prepunched hole of 3/8 inch diameter.
- B. Verco Sheartranz II (or Sheartranz) restraining elements: ASTM A653 – SS Designation, Grade 33 with minimum yield strength 38 ksi, 16 gauge. Used with Verco HSB-36 (or HSB-36-SS) steel roof deck at shear collecting support elements perpendicular to the deck corrugations. Install restraining elements in accordance with manufacturer's instructions and ICC ES ESR-2199 as shown on the Drawings.

2.4 FINISHES

- A. As noted on Drawings:

1. Prime Painted Finish: Acrylic primer applied to thoroughly cleaned and etched steel. Rust inhibitive primer roller applied and oven cured to thickness 4 mm nominal each side.
2. Galvanized Finish: Zinc coated in accordance with ASTM A525 G60 with factory prime paint coat.

PART 3 EXECUTION

3.1 INSTALLERS

- A. Qualifications:
 1. All steel deck welders AWS certified for welding of sheet steel.
 2. All mechanical fastener installers certified or licensed by the fastener and tool system manufacturer on the project site. Certification or licensing includes all training necessary for proper tool operation, fastener selection, maintenance and troubleshooting.
- B. Experience:
 1. Minimum experience with three projects of similar size and type with chosen installation method.
- C. Compliance:
 1. Comply with all manufacturer catalog and carton installation instructions, product data and technical bulletins.

3.2 PREPARATION

- A. Examination: Examine condition of supporting steel framing. Confirm location and elevation of supporting steel framing with the Drawings.
- B. Layout: Place steel deck sheets as shown on the Drawings ensuring bearing on supporting steel framing. Sheets shall be true and straight with horizontal deviations less than 1/4 inch in 100 feet. Minimum endlaps 2 inches.
- C. Marking: Mark steel deck at the centerline of supporting steel members to prevent weld burn through and mechanical fastener punch through. Use a chalk line or indelible marker.
- D. Test Fastenings:
 1. Welds: Perform project specific test welds prior to final installation. Test welds are considered an example of representative work.
 2. Mechanical fasteners: Gauge pneumatic or powder actuated tool systems to the base material steel type and deck type and thickness prior to final installation. Confirm appropriate power regulation, powder actuated booster load and compressor air pressure prior to final installation.

3.3 INSTALLATION

- A. Install steel deck sheets and accessories in accordance with manufacturer's instructions and as shown on the Drawings.

- B. Secure steel deck to supporting steel framing with welds or mechanical fasteners. Install welds or mechanical fasteners at the spacing and pattern as shown on the Drawings.
- C. Secure steel deck sidelaps at the spacing and pattern as shown on the Drawings.
- D. End closures of the deck units shall be fastened by tack welding or sheet metal screws not more than 48 inches apart.
- E. Where deck changes direction, install 6 inch minimum wide sheet steel cover plates, of same thickness as deck. Fusion weld 12 inches on center maximum.
- F. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.
- G. Position drain pans with flange bearing on top surface of deck. Weld at each deck flute.

3.4 REPAIR / RESTORATION

- A. Welds: Repair all portions of the steel deck coating damaged due to weld heat with compatible paint type or zinc rich compound. Repair burn throughs in accordance with SDI Deck Damage and Penetrations.
- B. Mechanical Fasteners: Replace or supplement underdriven and over driven fasteners with adjacent, properly installed fasteners.

3.5 OPENINGS

- A. At deck openings provide steel angle reinforcement indicated on Drawings. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and weld to deck at each flute.
- B. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.

3.6 HANGING LOADS

- A. Mechanical equipment or other loads shall not be hung from metal deck unless specifically indicated and detailed on Drawings. Method of attachment subject to review by Architect and Engineer.

3.7 FIELD QUALITY CONTROL

- A. Welds: Examination and qualification of puddle and fillet welds shall be in accordance with AWS D1.3 criteria.

- B. Mechanical Fasteners: Examine fastener washers to ensure steel deck is clamped to the supporting steel framing. Periodically examine fastener nail head standoff with template or gauge to within manufacturer accepted tolerances.
- C. Quality Control: Contractor Quality Control Representative shall perform contractor quality control inspections.
 - 1. Inspect steel deck installation, layout, types, gauge, finish and sizes of decking sheets, connections and tolerances, and welding.
 - 2. Document preparatory, initial and follow-up inspection in Contractor's Test and Inspection Reports.
 - 3. Test and Inspection Reports shall be available to Architect upon request.

3.8 SAFETY

- A. Do not use steel deck sheets for storage or working platform until permanently fastened to supporting steel framing.
- B. Do not exceed construction load carrying capacity of steel deck sheets for type and span defined in SDI Construction Load Tables.
- C. Cordon off the Controlled Decking Zone (CDZ) area and all areas below steel deck sheets being fastened during installation.

END OF SECTION

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SECTION 055000

METAL FABRICATIONS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the miscellaneous metal work as indicated on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Rough hardware.
 - 2. Vertical steel elevator ladders.
 - 3. Loose steel lintels.
 - 4. Loose bearing and leveling plates.
 - 5. Light steel framing and supports not included as part of work of other trades.
 - 6. Miscellaneous steel trim and channels.
 - 7. Shelf angles.
 - 8. Steel bollards.
 - 9. Masonry support steel.
 - 10. Sleeves in concrete walls and slabs.
 - 11. Steel framing, bracing, supports, anchors, bolts, shims, fastenings, and all other supplementary parts indicated on drawings or as required to complete each item of work of this Section.
 - 12. Prime painting, touch-up painting, galvanizing and separation of dissimilar metals for work of this Section.
 - 13. Cutting, fitting, drilling and tapping work of this Section to accommodate work of other Sections and of concrete, masonry or other materials as required for attaching and installing work of this Section.

1.3 RELATED SECTIONS

- A. Structural Steel - Section 051200.

- B. Painting and Finishing - Section 099000.

1.4 QUALITY ASSURANCE

- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication, where possible. Do not delay job progress; allow for trimming and fitting where taking field measurements before fabrication might delay work.
- B. Shop Assembly: Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinated installation.
- C. Reference Standards: The work is subject to requirements of applicable portions of the following standards:
 - 1. "Manual of Steel Construction," American Institute of Steel Construction.
 - 2. AWS D1-1 "Structural Welding Code," American Welding Society.
 - 3. SSPC SP-3 "Surface Preparation Specification No. 3, Power Tool Cleaning," Steel Structures Painting Council.
 - 4. SSPC PA-1 "Painting Application Specification," Steel Structures Painting Council.
 - 5. "Handbook on Bolt, Nut and Rivet Standards," Industrial Fasteners Institute.
- D. Steel Materials: For steel to be hot dip-galvanized, provide steel chemically suitable for metal coatings complying with the following requirements: carbon below 0.25 percent, silicon below 0.24 percent, phosphorous below 0.05 percent, and manganese below 1.35 percent. Notify galvanizer if steel does not comply with these requirements to determine suitability for processing.
- E. Engage the services of a galvanizer who has demonstrated a minimum of five (5) years' experience in the successful performance of the processes outlined in this specification in the facility where the work is to be done and who will apply the galvanizing and coatings within the same facility as outlined herein. The Architect has the right to inspect and approve or reject the galvanizer/galvanizing facility.
- F. The galvanizer/galvanizing facility must have an ongoing Quality Control/Quality Assurance program which has been in effect for a minimum of five years and shall provide the Architect with process and final inspection documentation. The galvanizer/galvanizing facility must have an on-premise testing facility capable of measuring the chemical and metallurgical composition of the galvanizing bath and pickling tanks.
- G. Inspection and testing of hot-dip galvanized coating shall be done under the guidelines provided in the American Hot-Dip Galvanizers Association (AGA) publication "Inspection of Products Hot-Dip Galvanized After Fabrication."

1.5 SUBMITTALS

- A. Manufacturer's Literature: Submit manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions for products to be used in the fabrication of miscellaneous metal work, including paint products.
- B. Shop Drawings: Shop drawings for the fabrication and erection of all assemblies of miscellaneous iron work which are not completely shown by manufacturer's data sheets. Include plans and elevations at not less than 1" to 1'-0" scale, and include details of sections and connections at not less than 3" to 1'-0" scale. Show anchorage and accessory items.
- C. Welding shall be indicated on shop drawings using AWS symbols and showing length, size and spacing (if not continuous). Auxiliary views shall be shown to clarify all welding. Notes such as 1/4" weld, weld and tack weld are not acceptable.
- D. Certification: For items to be hot-dip galvanized, identify each item galvanized and to show compliance of application. The Certificate shall be signed by the galvanizer and shall contain a detailed description of the material processed and the ASTM standard used for the coating and, the weight of the coating. In addition, and as attachment to Certification, submit reports of testing and inspections indicating compliance with the provisions of this Section.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Metals
 - 1. Metal Surfaces, General: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.
 - 2. Steel Plates, Shapes and Bars: ASTM A 36.
 - 3. Steel Bar Grating: ASTM A 1011 or ASTM A 36.
 - 4. Steel Tubing: Cold formed, ASTM A 500; or hot rolled, ASTM A 501.
 - 5. Structural Steel Sheet: Hot rolled, ASTM A 570; or cold rolled, ASTM A 611, Class 1; of grade required for design loading.
 - 6. Galvanized Structural Steel Sheet: ASTM A 924, of grade required for design loading. Coating designation G90.
 - 7. Steel Pipe: ASTM A 53, type and grade as selected by fabricator and as required for design loading; black finish unless galvanizing is indicated; standard weight (Schedule 40), unless otherwise indicated.

8. Gray Iron Castings: ASTM A 48, Class 30, unless another class is indicated or required by structural loads.
 9. Malleable Iron Castings: ASTM A 47, grade as selected by fabricator.
 10. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported rails, unless otherwise indicated.
 11. Concrete Inserts: Threaded or wedge type; galvanized ferrous castings, either malleable iron, ASTM A 47, or cast steel, ASTM A 27. Provide bolts, washers and shims as required, hot-dip galvanized, ASTM A 153.
- B. Grout: Non-shrink, non-metallic grout conforming to the requirements of Section 033000.
- C. Fasteners
1. General: Provide zinc-coated fasteners for exterior use or where built into exterior walls. Select fasteners for the type, grade and class required.
 2. Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A.
 3. Anchor Bolts: ASTM F 1554, Grade 36.
 4. Lag Bolts: ASME B18.2.1.
 5. Machine Screws: ASME B18.6.3.
 6. Plain Washers: Round, carbon steel, ASME B18.22.1.
 7. Masonry Anchorage Devices: Expansion shields, FS FF-S-325.
 8. Toggle Bolts: Tumble-wing type, FS FF-B-588, type, class and style as required.
 9. Lock Washers: Helical spring type carbon steel, ASME B18.21.1.
- D. Shop Paint: Shop prime all non-galvanized miscellaneous metal items using Series 88 Azeron Primer made by Tnemec, ICI Devoe "Rust Guard" quick dry alkyd shop coat No. 41403, or "Interlac 393" by International Protection Coatings.
1. If steel is to receive high performance coating as noted in Section 099000, shop prime using primer noted in Section 099000.
- E. Bituminous Paint: Cold applied asphalt emulsion complying with ASTM D 1187.
- F. Galvanizing Repair Coating: For touching up galvanized surfaces after erection, provide repair coating that is V.O.C. compliant, equal to "Silver Galv" made by Z.R.C. Worldwide or approved equal. Apply to a dry film thickness of 1.5 to 3.0 mils.

2.2 PRIME PAINTING

- A. Scope: All ferrous metal (except galvanized steel) shall be cleaned and shop painted with one coat of specified ferrous metal primer. No shop prime paint required on galvanized steel or aluminum work.
- B. Cleaning: Conform to Steel Structures Painting Council Surface Preparation Specification SP 3 (latest edition) "Power Tool Cleaning" for cleaning of ferrous metals which are to receive shop prime coat.
 - 1. Steel to get high performance coating as noted in Section 099000 shall be cleaned as per SSPC SP.6 "Commercial Blast Cleaning."
- C. Application
 - 1. Apply shop prime coat immediately after cleaning metal. Apply paint in dry weather or under cover. Metal surfaces shall be free from frost or moisture when painted. Paint all metal surfaces including edges, joints, holes, corners, etc.
 - 2. Paint surfaces which will be concealed after shop assembly prior to such assembly. Apply paint in accordance with approved paint manufacturer's printed instructions, and the use of any thinners, adulterants or admixtures shall be only as stated in said instructions.
 - 3. Paint shall uniformly and completely cover the metal surfaces, 2.0 mils minimum dry film thickness. No work shall be shipped until the shop prime coat thereon has dried.
- D. Touch-Up: In the shop, after assembly and in the field, after installation of work of this Section, touch-up damaged or abraded portions of shop prime paint with specified ferrous metal primer.
- E. Apply one shop coat to fabricated metal items, except apply two (2) coats of paint to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

2.3 GALVANIZING

- A. Scope: All ferrous metal exposed to the weather, and all ferrous metals indicated on drawings or in specifications to be galvanized, shall be cleaned and then hot-dipped galvanized after fabrication as provided by Duncan Galvanizing or approved equal.
- B. Avoid fabrication techniques that could cause distortion or embrittlement of steel items to be hot-dip galvanized. Fabricator shall consult with hot-dip galvanizer regarding potential warpage problems or handling problems during the galvanizing process that may require adjustment of fabrication techniques or design before finalizing shop drawings and beginning of fabrication.
- C. Cleaning: Thoroughly clean metal surfaces of all mill scale, rust, dirt, grease, oil, moisture and other contaminants prior to galvanizing.
- D. Application: Hot-dip galvanizing shall conform to the following::

1. ASTM A 143: Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel.
 2. ASTM A 123: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 3. ASTM A 153: Galvanized Coating on Iron and Steel Hardware - Table 1.
 4. ASTM A 384: Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies.
 5. ASTM A 385: Practice for Providing High Quality Zinc Coatings.
 6. ASTM A 924: Galvanized Coating on Steel Sheets.
 7. Minimum weight of galvanized coating shall be two (2) oz. per square foot of surface.
- E. Fabricate joints which will be exposed to weather in a manner to exclude water or provide weep holes where water may accumulate.
- F. All galvanized materials must be inspected for compliance with these specifications and marked with a stamp indicating the name of the galvanizer, the weight of the coating, and the appropriate ASTM number.
- G. To minimize surface imperfection (eg: flux inclusions), material to be galvanized shall be dipped into a solution of Zinc Ammonium Chloride (pre-flux) immediately prior to galvanizing. The type of galvanizing process utilizing a flux blanket overlaying the molten zinc will not be permitted.
- H. After galvanizing all materials not exposed to view must be chromated by dipping material in a 0.2% chromic acid solution.
- I. Galvanized surfaces, where exposed to view, must have a smooth, level surface finish. Where this does not occur, piece shall be rejected and replaced to the acceptance of the Architect.

2.4 PROTECTIVE COATINGS

- A. Whenever dissimilar metals will be in contact, separate contact surfaces by coating each contact surface prior to assembly or installation with one coat of specified bituminous paint, which shall be in addition to the specified shop prime paint. Mask off those surfaces not required to receive protective coating.

2.5 WORKMANSHIP

- A. General
1. Miscellaneous metal work shall be fabricated by an experienced fabricator or manufacturer and installed by an experienced tradesman.
 2. Materials, methods of fabrication, fitting, assembly, bracing, supporting, fastening, operating devices, and erection shall be in accordance with drawings

and specifications, approved shop drawings, and best practices of the industry, using new and clean materials as specified, having structural properties sufficient to safely sustain or withstand stresses and strains to which materials and assembled work will be subjected.

3. All work shall be accurately and neatly fabricated, assembled and erected.
- B. Shop Assembly: Insofar as practicable, fitting and assembly of work shall be done in shop. Shop assemble work in largest practical sizes to minimize field work. It is the responsibility of the miscellaneous metal subcontractor to assure himself that the shop-fabricated miscellaneous metal items will properly fit the field condition. In the event that shop-fabricated miscellaneous metal items do not fit the field condition, the item shall be returned to the shop for correction.
- C. Cutting: Cut metal by sawing, shearing, or blanking. Flame cutting will be permitted only if cut edges are ground back to clean, smooth edges. Make cuts accurate, clean, sharp and free of burrs, without deforming adjacent surfaces or metals.
- D. Holes: Drill or cleanly punch holes; do not burn.
- E. Connections: Make connections with tight joints, capable of developing full strength of member, flush unless indicated otherwise, formed to exclude water where exposed to weather. Locate joints where least conspicuous. Unless indicated otherwise, weld or bolt shop connections; bolt or screw field connections. Provide expansion and contraction joints to allow for thermal movement of metal at locations and by methods approved by Architect.
1. Welding
 - a. Shall be in accordance with AWS D1.1 Structural Welding Code of the American Welding Society, and shall be done with electrodes and/or methods recommended by the manufacturer of the metals being welded.
 - b. Welds shall be continuous, except where spot welding is specifically permitted. Welds exposed to view shall be ground flush and dressed smooth with and to match finish of adjoining surfaces; undercut metal edges where welds are required to be flush.
 - c. All welds on or behind surfaces which will be exposed to view shall be done so as to prevent distortion of finished surface. Remove weld spatter and welding oxides from all welded surfaces.
2. Bolts and Screws: Make threaded connections tight with threads entirely concealed. Use lock nuts. Bolts and screw heads exposed to view shall be flat and countersunk. Cut off projecting ends of exposed bolts and screws flush with nuts or adjacent metal.
- F. Operating Mechanism: Operating devices (i.e. pivots, hinges, etc.) mechanism and hardware used in connection with this work shall be fabricated, assembled, installed and adjusted after installation so that they will operate smoothly, freely, noiselessly and without excessive friction.

- G. Built-In Work: Furnish anchor bolts, inserts, plates and any other anchorage devices, and all other items specified under this Section of the Specifications to be built into concrete, masonry or work of other trades, with necessary templates and instructions, and in ample time to facilitate proper placing and installation.
- H. Supplementary Parts: Provide as necessary to complete each item of work, even though such supplementary parts are not shown or specified.
- I. Coordination: Accurately cut, fit, drill and tap work of this Section to accommodate and fit work of other trades. Furnish or obtain, as applicable, templates and drawings to or from applicable trades for proper coordination of this work.
- J. Exposed Work
 - 1. In addition to requirements specified herein and shown on drawings, all surfaces exposed to view shall be clean and free from dirt, stains, grease, scratches, distortions, waves, dents, buckles, tool marks, burrs, and other defects which mar appearance of finished work.
 - 2. Metal work exposed to view shall be straight and true to line or curve, smooth arrises and angles as sharp as practicable, miters formed in true alignment, profiles accurately intersecting, and with joints carefully matched to produce continuity of line and design.
 - 3. Exposed fastenings, where permitted, shall be of the same material, color and finish as the metal to which applied, unless otherwise indicated, and shall be of the smallest practicable size.
- K. Preparation for Hot-Dip Galvanizing: Fabricator shall correctly prepare assemblies for galvanizing in consultation with galvanizer and in accordance with applicable Reference Standards and applicable AGA publications for the "Design of Products to be Hot-Dip galvanized After Fabrication." Preparation shall include but not be limited to the following:
 - 1. Remove welding flux.
 - 2. Drill appropriate vent holes and provide for drainage in inconspicuous locations of hollow sections and semi-enclosed elements. After galvanizing, plug vent holes with shaped lead and grind smooth.

2.6 MISCELLANEOUS METALS ITEMS

A. Rough Hardware

- 1. Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 Sections.

2. Fabricate items to sizes, shapes and dimensions required. Furnish malleable iron washers for heads and nuts which bear on wood connections; elsewhere, furnish steel washers.
- B. Ladders: Vertical steel ladders shall be eighteen (18) inches wide with 3/4" diameter non-slip steel rungs spaced twelve (12) inches o.c. Stringers shall be 3/8" thick by 2-1/2" wide steel bars; rungs welded to bars. Attach ladders to walls six (6) inches from top and bottom and maximum thirty-six (36) inches o.c. from these points. At the roof, gooseneck the rails back to the structure to provide secure ladder access.
1. Ladders shall be fabricated to support a live load of one hundred (100) lbs. per square foot and a concentrated load of three hundred (300) lbs. per rung; loads not to act simultaneously.
- C. Loose Steel Lintels: Provide loose structural steel lintels for openings and recesses in masonry walls and partitions as shown. Weld adjoining members together to form a single unit where indicated. Provide not less than eight (8) inches bearing at each side of openings, unless otherwise indicated.
1. Loose lintels shall conform to the following Schedule:

Opening Width (Maximum)	WALL THICKNESS		
	4 inches	6 inches	8 inches*
2'-0"	3-1/2" x 3-1/2" x 1/4"	6" x 4" x 5/16"	3-1/2" x 3-1/2" x 1/4"
3'-0"	3-1/2" x 3-1/2" x 5/16"	6" x 4" x 5/16"	3-1/2" x 3-1/2" x 5/16"
4'-0"	3-1/2" x 3-1/2" x 5/16"	6" x 4" x 5/16"	3-1/2" x 3-1/2" x 5/16"
5'-0"	4" x 3-1/2" x 3/8"	6" x 4" x 3/8"	4" x 3-1/2" x 5/16"
6'-0"	5" x 3-1/2" x 3/8"	6" x 4" x 3/8"	5" x 3-1/2" x 5/16"
7'-0"	5" x 3-1/2" x 3/8"	5" x 5" x 1/2"	5" x 3-1/2" x 3/8"
8'-0"	5" x 3-1/2" x 3/8"	5" x 5" x 5/8"	5" x 3-1/2" x 3/8"

* Two angles at all openings in eight (8) inch walls.

2. At columns or vertical surfaces where lintels cannot bear on masonry, provide clip angles sized for structural capacity of lintel.
- D. Loose Bearing and Leveling Plates: Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

E. Miscellaneous Light Steel Framing

1. Light steel framing, bracing, supports, framing, clip angles, shelf angles, plates, etc., shall be of such shapes and sizes as indicated on the drawings and details or as required to suit the condition and shall be provided with all necessary supports and reinforcing such as hangers, braces, struts, clip angles, anchors, bolts, nuts, welds, etc., as required to properly support and rigidly fasten and anchor same in place and to steel, concrete, masonry and all other connecting and adjoining work.
2. All light steel framing steel shall be furnished and erected in accordance with the applicable requirements of the "Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings" by the American Institute of Steel Construction and as specified herein.

F. Miscellaneous Steel Trim: Provide shapes and sizes for profiles shown. Except as otherwise indicated, fabricate units from structural steel shapes and plates and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings and anchorages as required for coordination of assembly and installation with other work.

G. Shelf Angles: Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4" bolts, spaced not more than 4" from ends and 16" o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2" larger than expansion or control joint.
3. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
4. Galvanize shelf angles located in exterior walls.
5. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

H. Steel Bollards: Provide six (6) inches O.D. extra strong (Schedule 80) steel pipe, concrete filled, with base of steel plate for mounting to anchor bolts in concrete foundation. Rabbet top of steel pipe and insert 1/4" steel plate cap, flush with top of pipe. Weld top of cap to pipe and grind smooth and flush.

I. Masonry Support Steel

1. Provide galvanized steel, relieving angles, plates, accessories and other steel shapes for masonry support steel; for lintels refer to Para. C. herein.
2. Fabricate masonry support steel to allow final adjustment with the closest tolerances possible. Relieving angles which require cutting to fit masonry flashing shall be straightened without deflections.

3. Coordinate masonry support system with concrete work for locations of wedge inserts.
4. Install to meet requirements of building masonry work, face brick coursing and stone placement. Coordinate final adjustments with masonry work as work progresses.

J. Sleeves in Concrete Walls and Slabs

1. Sleeves through concrete walls shall be of Schedule 40 steel pipe with i.d. two (2) inches larger than o.d. of pipe or conduit (including insulation, if any) to be accommodated. Sleeves shall project one-half (1/2) inch on each side of finished wall. Provide rectangular one-quarter (1/4) inch steel plate collar at center, continuously welded to the perimeter of the sleeve, and six (6) inches wider than the o.d.
2. Slots in slabs shall be 12 gauge steel sheet, galvanized, of dimensions indicated, with strap anchors welded in place not more than twelve (12) inches on centers.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where miscellaneous metal is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 ERECTION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, Fitting and Placement: Perform cutting, drilling and fitting required for installation of miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry, or similar construction.
- C. Fitting Connections: Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch up shop paint coat. Do not weld, cut or abrade the surfaces of exterior units which have been hot dip galvanized after fabrication, and are intended for bolted or screwed field connections.
- D. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance, and quality of welds made, and methods used in correcting welding work.

- E. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- F. Field Touch-Up of Galvanized Surfaces: Touch-up shop applied galvanized coatings damaged during handling and installation. Use galvanizing repair coating specified herein for galvanized surfaces.

END OF SECTION

SECTION 058100

EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the expansion joint covers as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:
 - 1. Floor-to-floor expansion joint cover assemblies.
 - 2. Wall-to-floor joint cover assemblies.
 - 3. Wall-to-wall joint cover assemblies.

1.3 RELATED SECTIONS

- A. Cast-in-Place Concrete - Section 033000.
- B. Unit Masonry - Division 4.
- C. Roofing - Division 7.

1.4 SUBMITTALS

- A. Submit product data for each type of expansion joint cover assembly specified, including manufacturer's product specifications, installation instructions, details of construction relative to materials, dimensions of individual components, profiles, and finishes.
- B. Submit shop drawings showing fabrication and installation of expansion joint cover assemblies, including plans, elevations, sections, details of components, joints, splices, and attachments to other units of work.
- C. Submit samples for verification purposes in full size units of each type of expansion joint cover assembly indicated; within sets for each finish, color, texture, and pattern specified, showing full range of variations expected in these characteristics. Install elastomeric material for joints, samples to verify color selected.

1.5 QUALITY ASSURANCE

- A. Joint covers shall permit unrestrained movement of joint without disengagement of cover.

- B. Floor joint cover plate assemblies shall be capable of supporting a 200 psf uniform load and a 300 lb. concentrated load with a deflection not to exceed 1/16".

1.6 DELIVERY, STORAGE AND HANDLING

- A. Provide temporary protective cover on finished surfaces.
- B. Deliver joint covers to jobsite in new, clean, unopened crates of sufficient size and strength to protect materials during transit.
- C. Store components in original containers in a clean, dry location.
- D. Handle components with equipment of sufficient size to preclude hazard to personnel or components.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Profiles and details shown on drawings are those of Balco/Metalines unless otherwise noted; subject to compliance with requirements specified, other acceptable manufacturers include Construction Specialties, MM Systems, Watson Bowman Acme, or approved equal.
 - 1. Floor-to-Floor Joints: Balco type GF-1P, GF-2P – width as required.
 - 2. Wall-to-Floor Joints: Balco type GC-2.
 - 3. Wall-to-Wall Joints: Balco GC-1.

2.2 MATERIALS

- A. Aluminum: ASTM B 221, alloy 6063-T5 for extrusions; ASTM B 209, alloy 6061-T6, sheet and plate; aluminum to have the following finishes:
 - 1. Interior and exterior walking surfaces shall have clear anodized (A41) finish.
 - 2. Exterior surfaces not subject to pedestrian traffic shall have a "Kynar 500" finish conforming to NAAMM 605.2; two (2) colors shall be required, one (1) color to match metal siding and the other color to match adjacent concrete surfaces.
 - 3. Interior surfaces not subject to pedestrian traffic shall be shop primed with rust inhibitive primer, minimum 2 mils thick, ready to receive field painted finish.
- B. Protect metal surfaces to be placed in contact with cementitious materials with a protective coating.
- C. Accessories: Manufacturer's standard anchors, fasteners, set screws, spacers, flexible moisture barrier and filler materials, drain tubes, lubricants, adhesive, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.3 EXPANSION JOINT COVER ASSEMBLIES

- A. General: Provide expansion joint cover assemblies of design, basic profile, materials, and operation indicated on drawings. Provide units comparable to those indicated or required to accommodate joint size, variations in adjacent surfaces, and dynamic structural movement without material degradation or fatigue when tested according to ASTM E 1399. Furnish units in longest practical lengths to minimize number of end joints. Provide hairline mitered corners where joint changes direction or abuts other materials. Include closure materials and transition pieces, tee-joints, corners, transition pieces, curbs, cross-connections, and other accessories as required to provide continuous joint cover assemblies.
- B. Metal Floor-to-Floor and Wall-to-Wall Joint Cover Assemblies: Provide continuous extruded metal frames of profile indicated with seating surface and raised floor rim or exposed trim strip to accommodate flooring and concealed bolt and anchors embedded in concrete. Provide assemblies formed to receive cover plates of design indicated and to receive filler materials (if any) between raised rim of frame and edge of plate. Furnish depth and configuration to suit type of construction and to produce a continuous flush wearing surface with adjoining finish floor surface.
 - 1. Flat Cover Plates: Provide cover plates of profile indicated. Extend flat plates to lap each side of joint.
 - 2. Floor Cover Plate Wearing Surfaces: Provide cover plates with plain wearing surfaces.

PART 3 EXECUTION

3.1 PREPARATION

- A. Manufacturer's Instructions: In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for phases of Work, including preparing substrate, applying materials, and protecting installed units.
- B. Coordinate and furnish anchorages, setting drawings, templates, and instructions for installation of expansion joint cover assemblies to be embedded in or anchored to concrete or to have recesses formed into edges of concrete slab for later placement and grouting-in of frames.
- C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary to secure expansion joint cover assemblies to in-place construction, including threaded fasteners with drilled-in expansion shields for masonry and concrete where anchoring members are not embedded in concrete. Provide fasteners of metal, type, and size to suit type of construction indicated and provide for secure attachment of expansion joint cover assemblies.

3.2 INSTALLATION

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting into new and existing construction as required to install expansion joint covers. Install joint cover assemblies in true alignment and proper relationship to expansion joints and adjoining finished surfaces measured from established lines and levels. Allow adequate free

movement of thermal expansion and contraction of metal to avoid buckling. Set floor covers at elevations to be flush. Locate wall, ceiling, roof, and soffit covers in continuous contact with adjacent surfaces. Securely attach in place with required accessories. Locate anchors at interval recommended by manufacturer, but not less than 3" from each end and not more than 24" o.c.

- B. Continuity: Maintain continuity of expansion joint cover assemblies with a minimum number of end joints and align metal members mechanically using splice joints. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames. Adhere flexible filler materials (if any) to frames with adhesive or pressure sensitive tape as recommended by manufacturer.

3.3 CLEANING AND PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's instructions.

END OF SECTION

SECTION 066119

ENGINEERED QUARTZ COUNTERTOPS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the engineered quartz countertops as shown on the drawings and/or specified herein including, but not limited to, the following:
 - 1. Quartz-based fabricated stone countertops.
 - 2. Stainless steel anchoring and fastening devices.

1.3 RELATED SECTIONS

- A. Architectural Woodwork - Section 064023.
- B. Plumbing - Division 22, for lavatories.

1.4 QUALITY ASSURANCE

- A. Fire Test Response Characteristics: Provide with the following Class A (Class I) surface burning characteristics as determined by testing identical products per UL 723 (ASTM E 84) or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame Spread Index: 25 or less.
 - 2. Smoke Developed Index: 450 or less.

1.5 SUBMITTALS

- A. Shop Drawings For Engineered Stone: Submit complete cutting and setting drawings to the Architect for approval. Show sizes, shapes, thicknesses, jointing, anchoring, connection with other work, typical and special anchoring details, supports, dimensions, setting numbers, and color range for stone. Clearly indicate dimensions for locating cutouts in stone. Do not fabricate any stone tops (except for samples) until shop drawings have been approved by the Architect.
- B. Samples
 - 1. Stone: Submit 3 sets of 12" x 12" samples of engineered stone. Include full range of color and texture to be expected. Architect will review for color and texture

only. Compliance with all other requirements is the exclusive responsibility of the Contractor.

2. Anchoring and Fastening Devices: Submit 3 samples of each type of anchoring and fastening device.

C. Product Data

1. Stone: Submit manufacturer's product data, fabrication and installation instructions.
2. Accessories: Submit manufacturer's product data and installation instructions.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Protect stone during storage and construction against wetting, soiling, staining and damage.
- B. Handle stone to prevent chipping, breakage, soiling or other damage. Do not use pinch or wrecking bars without protecting edges of stone with wood or other rigid materials.
- C. Store stone on wood skids or pallets, covered with non-staining, waterproof membrane. Place and stack skids and stones to distribute weight evenly and to prevent breakage or cracking of stones. Protect stored stone from weather with waterproof, non-staining covers or enclosures, but allow air to circulate around stones.

PART 2 PRODUCTS

2.1 QUARTZ STONE

- A. Provide Hanstone Quartz, color: Mystic Blue CT407, from Hanwha Surfaces, or approved equal. Thickness: 1 1/2". Finish to be polished on all exposed surfaces. Shall not be less than 51" x 118" to minimize joints. Shall be intrinsically nonporous, 100% natural hard mineral. Plastic polymer-based solid surfacing shall not be accepted. Shall be scratch, stain, mold and mildew, chip and crack, heat and burn, chemical, acid, and solvent resistant. Shall be certified according to Greenguard certification program for low-emitting products and indoor air quality. Shall meet Class A when tested to NFPA 255 and ASTM E 84.
- B. Exposed Edges and Corners:
 1. Countertops:
 - a. Edges: Square. Miter joint with 1/8" diameter eased edge profile at countertop fascia. Ease all exposed edges.
 - b. Outside Corners: Square.
 2. Backsplash:
 - a. Edges: Square, miter joint with 1/8" diameter eased edge profile.
 - b. Outside Corners: Square butt joints.

2.2 ACCESSORIES

- A. Mounting Adhesives: Provide structural-grade silicone or epoxy adhesives of type recommended by manufacturer for application and conditions of use.
 - 1. Acceptable Silicone Manufacturers:
 - a. Dow Corning.
 - b. GE Sealants and Adhesives.
 - 2. Acceptable Epoxy Manufacturers:
 - a. Akemi North America.
 - b. Bonstone Material Corporation.
 - c. Tenax USA.
 - 3. Provide spacers, if required, of type recommended by adhesive manufacturer.
 - 4. Color: Adhesive or sealant which will be visible in finished work shall be tinted to match quartz surfacing.
- B. Fasteners: Type 304, stainless steel meeting ASTM A 666.
- C. Joint Sealants: Provide anti-bacterial type.
 - 1. Acceptable Manufacturers:
 - a. Dow Corning.
 - b. GE Sealants and Adhesives.
- D. Solvent: Product recommended by adhesive manufacturer to clean surface of quartz surfacing to assure adhesion of adhesives and sealants.
- E. Cleaning Agents: Non-abrasive, soft-scrub type kitchen cleansers.
- F. Sealer: "S-32" by HMK, or equal.

2.3 FABRICATION

- A. Fabricator: Firm shall have five years' experience fabricating simulated stone and shall have water-cooled cutting tools.
- B. Shop Assembly: Observe proper safety procedures and comply with manufacturer's instructions.
- C. Layout: Layout joints to minimize joints and to avoid L-shaped pieces of quartz surfacing.
- D. Inspection: Inspect material for defects prior to fabrication.
 - 1. Color Match: Materials throughout Project shall be from the same batch and shall bear labels with same batch number. Visually inspect materials to be used for

adjacent pieces to assure acceptable color match. Inspect in lighting conditions similar to those on Project.

2. Variation in distribution of aggregates in quartz surfacing which are within manufacturer's tolerances is not a defect.
- E. Tools: Cut and polish with water-cooled power tools.
- F. Cutouts
1. Cutouts shall have 3/8" minimum inside corner radius. Inside corners shall be reinforced in an acceptable manner to prevent cracking.
 2. Exposed edges of cutout to be polished.
 3. If the remaining material outside a cutout is less than three inches wide, reinforce area by laminating it with a strip of stone.

PART 3 EXECUTION

3.1 SETTING STONE COUNTERTOPS AND COUNTER FASCIAS

- A. Cut-outs and Drilling: Provide countertops with cut-outs for sinks, faucets, etc. Cut-outs shall be carefully made in accordance with templates furnished under the Plumbing Section. Stone shall be drilled as required to receive anchoring and fastening devices.
- B. Setting: Set countertops in required pattern over steel supports using stainless steel anchors and mounting adhesive. Set countertops level, plumb and square.
- C. Stone shall be set so that adjacent sections of stone are sequence matched for veining.
- D. Joints: Maintain an even joint between units, 1/16" max. Point joints with approved elastic non-staining mastic pointing compound, color to match stone. Tool joints flush. Clean exposed surfaces carefully.

3.2 REPAIR, CLEANING AND SEALING

- A. Remove and replace stone units which are broken, chipped, stained or otherwise damaged. Where directed, remove and replace units which do not match adjoining stonework. Patching or hiding chips or cracks in stone will not be permitted. Provide new matching units, install as specified and reseal joints to eliminate evidence of replacement. Reseal defective and unsatisfactory joints to provide a neat, uniform appearance.
- B. Clean and seal stonework after completion using cleaner and sealer specified herein and as recommended by stone manufacturer; follow manufacturer's instructions.

3.3 PROTECTION

- A. After installation and cleaning, protect stone work from damage during subsequent construction activities.

- B. Provide protection for finished work such as exposed edges, corners, and all other stone liable to physical injury or staining. Protection shall include, but is not limited to, non-staining approved coverings.

END OF SECTION

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SECTION 064023

INTERIOR ARCHITECTURAL WOODWORK

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the interior architectural woodwork as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:
 - 1. Plastic laminate trim at counters.
 - 2. Wood grounds, blocking, nailers, furring as required for work of this Section.
 - 3. Drilling concrete and masonry, drilling and/or tapping metal work, as required, for the installation of work of this Section.

1.3 RELATED SECTIONS

- A. Rough Carpentry - Section 061000.
- B. Engineered Quartz Countertops - Section 066119.
- C. Caulking between architectural woodwork and any wall, floor, or ceiling joints - Section 079200.

1.4 QUALITY STANDARDS

- A. The quality standards of the Architectural Woodwork Institute, "Architectural Woodwork Standards" (AWS), 2nd Edition, dated July 1, 2016, shall apply to all workmanship, including materials and installation, for architectural woodwork, and by reference are made a part of this specification. All work shall conform to "Custom" grade requirements of the AWS unless otherwise modified herein.
- B. In the event of a dispute as to the quality grade (or grades), the Contractor shall call upon the Architectural Woodwork Institute for an inspection under AWI's Quality Certification Program which shall include a QCP Inspection and Report. The Contractor agrees to abide by the decision of this Report. The cost of said inspection and report shall be borne by the Contractor.
- C. Employ only tradesmen experienced in the fabrication and installation of architectural woodwork.

- D. Woodworking firm must be accredited by the AWI Quality Certification Program (QCP).

1.5 SUBMITTALS

A. Shop Drawings

- 1. Shop drawings shall show all jointing, joint treatment and butt jointing in plastic laminate.

B. Samples: Submit samples of each of the following items:

- 1. Plastic laminate, twelve (12) inches square, including a section of outside corner.

1.6 QUALIFICATIONS

- A. The work of this Section shall be provided by a firm having a minimum of five (5) years' experience on projects of similar size and quality to that specified and shown.

1.7 COORDINATION

- A. Coordinate the work of this Section with other appropriate Sections of the specifications to insure proper scheduling for fabrication and installation of the work specified herein.
- B. Coordinate with partition and finish trades to insure that proper provisions are made for the installation of the work specified herein.
- C. Verify all dimensions in the field prior to fabrication of all Architectural Woodwork to assure proper fit.

1.8 PRODUCT HANDLING

- A. All materials and work of this Section shall be protected from damage from time of shipment from shop to final acceptance of work. Cover, ventilate, and protect work of this Section from damage caused by weather, moisture, heat, staining, dirt, abrasions, any other causes which may adversely affect appearance or use, or which may cause deterioration of finish, warping, distortion, twisting, opening of joints and seams, delamination, loosening, etc., of work of this Section.
- B. Keep all finish carpentry, millwork, and cabinet work under cover both in transit and at the premises. Do not deliver any finish carpentry, millwork or cabinet work before it is required for installation. Protect such work to avoid damage in transit, during erection and after erection until acceptance of the building; use all such methods to provide the proper protection. Remove such protection when directed by the Architect.
- C. Deliver finish carpentry, millwork, and cabinet work in a dry stable condition; protect same against injury and dampness. Do not store or install finish carpentry, millwork or cabinet work until after the concrete, masonry and plaster work are thoroughly dry.
- D. Damaged or defective items of work of this Section are subject to rejection and replacement with new by Contractor, at no cost to Owner.

PART 2 PRODUCTS

2.1 BASIC REQUIREMENTS

- A. Wood Moisture Content: Provide kiln-dried (KD) lumber with an average moisture content range of nine (9) to twelve (12) percent for exterior work and six (6) to eleven (11) percent for interior work.
- B. Measurements: Before proceeding with woodwork required to be fitted to other construction, obtain field measurements and verify all dimensions of shop drawing details as required for accurate fit.
- C. Compatibility of Grain and Color: Architect reserves the right to select materials for best compatibility between visually related members and veneers.
- D. Machine and sand woodwork to comply with requirements of Standards for specified grade.
- E. Fabricate woodwork to dimensions, profiles and details shown. Rout or groove back of flat trim members, kerf backs of other wide flat members except plywood or veneered members.
- F. Miter joints by joining, splining and gluing to comply with requirements for the specified grade.
- G. Inspect each piece of lumber and plywood or each unit of woodwork after drying; do not use twisted, warped, bowed or otherwise damaged or defective wood.

2.2 GENERAL - MATERIALS

- A. Softwood lumber shall conform to the requirements of the latest edition of American Lumber Standards Simplified Practice Recommendation R-16. Grades shall conform to the grading rules of the Association having jurisdiction, and shall bear the official grade and trademark of the Inspection Bureau of the Association and a mark of mill identification.
- B. Framing and Rough Lumber: No. 1 KD grade Southern Pine or Dense Construction grade Douglas Fir, having extreme fiber in bending stress of at least 1700 psi, surfaced four sides (S4S). Provide fire retardant treatment meeting requirements of Section 062000.
- C. Grounds, Blocking, Nailers, Furring: Southern Pine, Douglas Fir or Sitka Spruce, grade to suit particular purpose and to be straight, square edged, straight grained, surfaced four sides (S4S), and which will retain nails and screws without splitting. Provide fire retardant treatment.
- D. Plywood: AWS Section 4; veneer core, medium-density fiberboard or plywood core unless otherwise specified, and with the following requirements:
 - 1. Hardwood: Custom Grade, face veneers as shown or specified.

2. Medium-Density Fiberboard (MDF): Conforming to ANSI A208.2, Grade 130 and ANSI MR10 moisture-resistant properties on 5/8" or thicker board. MDF shall be certified to meet EPP CPA 3-08 formaldehyde emission limit of 0.21 ppm, and contain no added formaldehyde resins.
 - a. Product: Subject to compliance with requirements, provide Medite II by Medite Corp.
3. Edges: Banded with hardwood in accordance with Premium Grade Standards.

2.3 PLASTIC LAMINATE (LAM2)

- A. Face Sheets: Provide Formica Navy Blue 969-58 matte finish plastic laminate, or approved equal.
- B. Backing Sheets: Non-decorative, high-pressure plastic laminate, NEMA LD3, Grade BK20, 0.02" thick.
- C. Edges: Finish with plastic laminate to match face and applied before face sheets are applied, unless otherwise shown or specified.

2.4 MISCELLANEOUS PRODUCTS

- A. Adhesives
 1. For Laminating Plastic Laminate Surfaces: Urea resin, Type II, as recommended by fabricator.

2.5 PLASTIC LAMINATE TRIM

- A. Grade: Premium Grade.
- B. Construction
 1. Cut openings for equipment to be installed. Comply with equipment manufacturer's requirements, but provide internal corners of 1/8" minimum radius. Smooth saw cut and ease edges.
 2. Seal cut edges of counter at openings for sinks and other "wet" equipment, using waterproofing compound recommended by plastic manufacturer and compatible with laminating adhesive.

2.6 FABRICATION

- A. Provide lumber framing for architectural woodwork, complete with all bracing and fastening devices as required for a rigid installation, and as required to sustain the imposed loads.
- B. Do all fabrication from field measurement with provision for scribing as required to meet built-in conditions.
- C. Coordinate the work of this Section with the work of other trades.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where architectural woodwork is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 FRAMING

- A. Use specified framing lumber, sizes and spacing as indicated on drawings and as required to support loads.
- B. Framing shall be cut square on bearings, closely fitted, accurately set to required lines and levels, rigidly secured in place at bearings and connection with nails, lag screws and/or bolts as required by conditions.

3.3 GROUNDS, BLOCKING, NAILERS AND FURRING

- A. Provide all wood grounds, blocking, nailers, furring, and the like for work of this Section, where shown and where required, dressed to size indicated or required to suit the condition. Install grounds, blocking, nailers, furring, etc., rigidly, in proper alignment, trued with a long straight edge.

3.4 GENERAL INSTALLATION

- A. Wall anchorage and general installation procedures for cabinetry work shall conform to AWS Section 10, Article entitled "EXECUTION," Sub-Article 6.1, with all related sub-paragraphs.
- B. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level (including countertops), and with 1/16" maximum offset in flush adjoining surfaces, 1/8" maximum offset in revealed adjoining surfaces.
- C. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation.
 - 1. Plastic laminate, shall have plastic laminate shop applied to 3/4" thick core, with plastic laminate backing sheet on underside or back of trim. Plastic laminate shall be pressure laminated to core with laminate at external corners.

3.5 CLEAN UP AND PROTECTION

- A. Clean Up: At regular intervals during the course of the work, all debris and excess material shall be cleaned up and removed from the site. Upon completion of installation, clean all spaces of debris caused by woodwork installation.

- B. Protection: Protect all woodwork from marring, defacement of other damage until final completion and acceptance of the project by the Owner. Repair or replace all defective units prior to final inspection as directed by the Architect. Any units that cannot be satisfactorily repaired in the opinion of the Architect shall be replaced with new units of same original design, at no additional cost to the Owner.

END OF SECTION

SECTION 061000

ROUGH CARPENTRY

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the carpentry work as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Blocking and miscellaneous wood.
 - 2. Plywood backing panels for telephone and electrical closets.
 - 3. Rough hardware.
 - 4. Installation only of finish hardware.
 - 5. Installation only of doors and hollow metal frames.

1.3 RELATED SECTIONS

- A. Interior Architectural Woodwork - Section 064020.
- B. Roofing - Section 075423.
- C. Steel Doors and Frames - Section 081113.
- D. Wood Doors - Section 081416.
- E. Finish Hardware - Section 087100.

1.4 QUALITY ASSURANCE

- A. Lumber Standard: Comply with PS 20.
- B. Plywood Standard: Comply with PS 1 and American Plywood Assoc. (APA).

- C. Shop fabricate carpentry work to the extent feasible and where shop fabrication will result in better workmanship than feasible for on-site fabrication.
- D. Grade Marks: Identify lumber and plywood by official grade mark.
 - 1. Lumber: Grade stamp to contain symbol of grading agency certified by Board of Review, American Lumber Standards Committee, mill number or name, grade of lumber, species grouping or combination designation, rules under which graded where applicable, and condition of seasoning at time of manufacture.
 - a. S-Dry: Maximum nineteen (19) percent moisture content as per ASTM D 2016.
- E. Installation of doors, frames and hardware shall conform to the minimum standards of "Installation Guides for Doors and Hardware" of the Door and Hardware Institute.

1.5 SUBMITTALS

- A. Pressure Treatment: Include certification by treating plant stating chemicals and process used, net amount of salts retained and conformance with applicable standards.
- B. Fire-Retardant Treatment: Include certification by treating plant that treatment material complies with governing ordinances and that treatment will not bleed through finished surfaces.

1.6 PRODUCT HANDLING

- A. Deliver carpentry materials to the site ready to use with each piece of lumber clearly marked as to grade, type and mill, and place in an area protected from the elements.
- B. Deliver rough hardware in sealed kegs and/or other containers which shall bear labels as to type and kind.
- C. Pile lumber for rough usage, when delivered to the site in stacks to insure drainage and with a minimum clearance of six (6) inches above grade. Cover stacks with tarpaulins or other watertight coverings. Store grounds and similar small sized lumber inside the building as soon as possible after delivery.
- D. Do not store seasoned lumber in wet or damp portions of the building.

- E. Protect fire retardant treated materials against high humidity and moisture during storage and erection.
- F. Remove delivered materials which do not conform to specified grading rules or are otherwise not suitable for installation from the job site and replace with acceptable materials.
- G. All items specified in Section 087100 of this specification entitled "Finish Hardware" shall be received, accounted for, stored and applied under this Section.
- H. Hardware shall be sorted and stored in space assigned by Contractor and shall be kept at all times under lock and key. The safety and preservation of all items delivered will be the responsibility of the Contractor.

1.7 JOB CONDITIONS

- A. Installer must examine the substrates and supporting structure and the conditions under which the carpentry work is to be installed, and notify the Contractor in writing of conditions detrimental to the work. Do not proceed with the installation until unsatisfactory conditions have been corrected in a manner acceptable to the Installer and the Architect.
- B. Coordination: Fit carpentry work to other work; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds and similar supports to allow proper attachment of other work.

PART 2 PRODUCTS

2.1 WOOD MATERIAL

- A. General
 - 1. All wood shall be sound, flat, straight, well seasoned, thoroughly dry and free from all defects. Warped or twisted wood shall not be used.
 - 2. For miscellaneous wood blocking, grounds, furring as required, use Utility Grade Coastal Douglas Fir or Southern Pine, free from knots, shakes, rot or other defects, straight, square edges and straight grain, air seasoned with maximum moisture content of nineteen (19) percent. Wood shall be S4S, S-Dry, complying with PS-20.
 - 3. Plywood and rough carpentry for telephone and electrical closets, provide 3/4" thick C-D EXT-APA plywood, fire retardant treated as specified herein.
- B. Wood Treatment

1. All interior wood material specified herein shall be fire retardant treated to comply with the AWP standard U1 to achieve a flame spread rating of not more than 25 (UL Class "FR-S") when tested in accordance with UL Test 723 or ASTM E 84. The fire retardant chemicals used to treat the lumber must comply with FR-1 of AWP Standard P49 and be free of halogens, sulfates and ammonium phosphate.
 - a. After treatment, kiln dry to a moisture content of fifteen (15) percent; if wood is to be painted or finished, kiln dry to a moisture content of twelve (12) percent. Treatment shall be equal to "Dricon" made by Arch Wood Protection Inc. or approved equal. Provide UL approved identification on treated materials.
2. For exterior blocking, roofing and sheet metal, pressure treat wood with copper azole, Type B (CA-B); ammoniacal copper quat (ACQ) or similar preservative product that contains no arsenic or chromium. Preservative shall comply with AWP Standard U1, (.25 lbs./cubic foot of chemical in wood).
 - a. After treatment, kiln dry to a maximum moisture content of fifteen (15) percent. Treatment shall be equal to "Wolmanized Natural Select" made by Arch Wood Protection Inc. or approved equal.
3. Treated wood which is cut or otherwise damaged shall be further treated in accordance with the AWP Standard M-4.

2.2 HARDWARE

- A. Rough Hardware for Treated Woods and Exterior Use: Hot-dipped galvanized or Type 304 stainless steel.
- B. Nails: Common steel wire, untreated for interior work as per ASTM F 1667.
- C. Bolts: Standard mild steel, square head machine bolts with square nuts and malleable iron or steel plate washers or carriage bolts with square nuts and cut washers conforming to the following:
 1. Bolts: ASTM A 307, Grade A.
 2. Nuts: ASTM A 563.
 3. Lag Screws and Bolts: ASME B 18.2.1.
- D. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times

the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 2. Material Provide Schedule 40: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.
- E. Wood Screws: ASME B 18.6.1.
- F. Concrete and Masonry Anchors: Standard expansion-shield self-drilling type concrete anchors where so shown or noted on the drawings, or where approved by the Architect.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where carpentry is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION OF FINISH HARDWARE

- A. Hardware shall be carefully fitted and securely attached, in accordance with these specifications and the instructions of the various manufacturers.
- B. Unless otherwise noted, mount hardware units at heights established in Section 081113.
- C. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, install each item completely and then remove and store in a secure place during the finish application. After completion of the finishes, re-install each item. Do not install surface-mounted items until finishes have been completed on the substrate.
- D. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units which are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

- F. Cut and fit threshold and floor covers to profile of door frames, with mitered corners and hair-line joints. Join units with concealed welds or concealed mechanical joints. Cut smooth openings for spindles, bolts and similar items, if any.
- G. All keys used shall be construction keys which are to be tagged with fiber discs as approved, clearly labeled with identifying inscriptions and then neatly arranged in a temporary cabinet. All construction keys shall be returned to the Owner.
- H. Adjusting and Cleaning
 - 1. Adjust and check each operating item of hardware and each door, to ensure proper operation and function of every unit. Lubricate moving parts with type lubrication recommended by manufacturer (graphite type if no other recommended). Replace units which cannot be adjusted and lubricated to operate freely and smoothly as intended for the application made.
 - 2. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make a final check and adjustment of all hardware items in such space or area. Clean and re-lubricate operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

3.3 INSTALLATION OF DOORS AND FRAMES

A. Preparation

- 1. Remove welded-in shipping spreaders installed at factory.
- 2. Prior to installation and with installation spreaders in place, adjust and securely brace standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

3. Drill and tap doors and frames to receive non-templated mortised and surface-mounted door hardware.

B. Installation

1. General: Provide doors and frames of sizes, thicknesses, and designs indicated. Install steel doors and frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
2. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. Install frames in accordance with ANSI 250.11-20001, Recommended Erection Instructions for Steel Frames, unless more stringent requirements are specified herein.
 - b. At fire-protection-rated openings, install frames according to NFPA 80.
 - c. Where frames are fabricated in sections due to shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - d. Install frames with removable glazing stops located on secure side of opening.
 - e. Frames set in masonry walls shall have door silencers installed in frames before grouting.
 - f. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - g. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
3. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with post-installed expansion anchors.
 - a. Floor anchors may be set with powder-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.
4. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames conforming to the requirements of Section 072100, "Thermal Insulation."

5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar; refer to Section 042000 "Unit Masonry" for installation of frames in masonry walls.
6. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. In-Place Gypsum Board Partitions: Secure frames in place with post-installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
8. Ceiling Struts: Extend struts vertically from top of frame at each jamb to supporting construction above, unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction above. Provide adjustable wedged or bolted anchorage to frame jamb members.
9. Installation Tolerances: Adjust steel door frames for squareness, alignment, twist, and plumb to the tolerance given in HMMA 841 of ANSI/NAAMM, current edition.
10. Steel Doors: Fit hollow metal doors accurately in frames to the tolerances given in HMMA 841 of ANSI/NAAMM, current edition.
 - a. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
11. Glazing: Comply with installation requirements in Division 8 Section "Glass and Glazing" and with standard steel door and frame manufacturer's written instructions.
 - a. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c., and not more than 2 inches o.c. from each corner.

C. Wood Doors

1. Condition doors to average prevailing humidity in installation area prior to hanging.
2. Install doors in accordance with manufacturer's instructions.
3. Fit door to frames and machine for hardware to whatever extent not previously worked at factory as required for proper fit and uniform clearance at each edge.

4. Clearances: Install doors to meet clearance requirements specified in Section 081416.
 5. Fire-Rated Doors: Install in corresponding fire-rated frames in accordance with the requirements of NFPA No. 80. Provide clearances complying with the limitations of the authority having jurisdiction.
- D. Adjustments: Check and readjust operating finish hardware items just prior to final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames which are warped, bowed or otherwise unacceptable.

3.4 BLOCKING AND MISCELLANEOUS WOOD

A. General

1. Erect rough carpentry true to line, levels and dimensions required; squared, aligned, plumbed, and securely fastened in place.
2. Shim where required to true up furring, blocking and the like. Use wood or metal shims only.
3. Do all cutting, fitting, drilling and tapping of other work as required to secure work in place and to perform the work included herein. Do all the cutting and fitting of carpentry work, for the work of other trades as required.

B. Blocking and Miscellaneous Wood

1. Furnish and install all wood grounds, furring, blocking, curbs, bucks, nailers, etc., that may be necessary and required in connection with the carpentry and with the work described for any other trades and including required carpentry for electrical fixtures. All blocking and nailers shall be continuous wherever required, whether or not so indicated.
2. Blocking shall be as required for the proper installation of the finished work and for items in mechanical sections as required. Blocking, edgings, stops, nailing strips, etc., shall be continuous, unless distinctly noted otherwise. Provide blocking as required to install all equipment. Provide blocking and nailers where shown or required to fasten interior sheet metal work.
3. Fastening for wood grounds, furring and blocking shall be of metal and of type and spacing as best suited to conditions. Hardened steel nails, expansion screws, toggle bolts, self-clinching nails, metal plugs, inserts or similar fastenings shall be used, of suitable type and size to draw the members into place and securely hold same.

C. Rough Lumber for Roofing and Sheet Metal

1. Furnish and install all wood nailing strips and wood blocking required in connection with respective types of roofing, fans, flashings, and sheet metal work, using preservative treated wood as herein before specified.
2. Wood blocking shall be of sizes and shapes as indicated on the drawings and/or designed for the reception of curb flashings for roof ventilators and similar items.
3. All nailing strips and blocking shall be carried out in accordance with the printed installation instructions, and/or recommendations of the accepted manufacturer of the roofing materials, and in coordination and cooperation with the sheet metal work trades.
4. All blocking and nailing strips shall be firmly secured in place using counter bored bolt and nut fastenings, or secured by any other proposed flush surfaced fastenings.
5. Wood nailing strips or blocking required to be embedded in concrete work shall be furnished in time due for placing, prior to start of concrete operations. Locations and spacings of nailing strips or blocking shall be performed in coordination with the concrete trades, as required for respective installations.

3.5 TELEPHONE AND ELECTRICAL EQUIPMENT MOUNTING BOARDS

- A. Furnish and install 3/4" thick plywood panels to the walls of the telephone and electrical equipment rooms in accordance with the requirements of the local utility company.
- B. Secure to wall using proper devices for substrates encountered, spaced twelve (12) inches o.c., maximum around the edges, 1-1/2" from corners, and in three (3) rows of three (3) each in the field. Recess fastening devices flush with the plywood surface. Adjacent panels shall be butted with 1/16" space between without lapping.

3.6 ROUGH HARDWARE

- A. Securely fasten rough carpentry together. Nail, spike, lag screw or bolt as required by conditions encountered in the field and the Contract Documents.
- B. Provide rough or framing hardware, such as nails, screws, bolts, anchors, hangers, clips, inserts, miscellaneous fastenings, and similar items of the best quality and of the proper size and kind to adequately secure the work together and in place, in a rigid and substantial manner.

- C. Secure rough carpentry to masonry with countersunk bolts in expansion sleeves or other acceptable manner, with fastenings not more than sixteen (16) inches apart. Secure woodwork to hollow masonry with toggle bolts spaced not more than sixteen (16) inches apart.
- D. Countersink bolts in nailers and other rough woodwork and include washers and nuts. Cut bolts off flush with surfaces and peen as may be required to receive finished work.
- E. Inserts to secure wood nailers to concrete shall be malleable iron threaded inserts with 3/8" diameter bolts of length to allow for countersinking. Locate at end of each nailer and at intervals not exceeding thirty (30) inches o.c.
- F. Furnish to the mason for building into the work, or attaching the work which is to be built in, anchors, bolts, wall plates bolted to masonry, corrugated wall plugs, nailing blocks, etc., which are required for the proper fastening and installation for the work or other items as called for in this Section.
- G. Detailed instructions with sketches of necessary requirements, shall be given to the masonry trade showing the location and other details of such nailing devices.

3.7 CLEANING UP

- A. General: Keep the premises in a neat, safe and orderly condition at all times during execution of this portion of the work, free from accumulation of sawdust, cut-ends and debris.
- B. Sweeping
 - 1. At the end of each working day, or more often if necessary, thoroughly sweep all surfaces where refuse from this portion of the work has settled.
 - 2. Remove the refuse to the area of the job site set aside for its storage.
 - 3. Upon completion of this portion of the work, thoroughly broom clean all surfaces.

END OF SECTION

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SECTION 071326

SHEET MEMBRANE WATERPROOFING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the sheet membrane waterproofing as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:
 - 1. Sheet membrane waterproofing for underslab conditions.
 - 2. Sheet membrane waterproofing for foundation wall surfaces.

1.3 RELATED SECTIONS

- A. Cast-in-Place Concrete - Section 033000.
- B. Crystalline Waterproofing - Section 071616.
- C. Earthwork - Section 312000.

1.4 QUALITY ASSURANCE

- A. Preinstallation Conference: Approximately 2 weeks prior to scheduled commencement of waterproofing installation, meet at Project site with Waterproofing Installer; preparer of substrate to receive waterproofing; installers of other work in and around waterproofing that must precede, follow, or penetrate waterproofing (including Mechanical and Electrical Installers as applicable); Architect; Owner; and waterproofing manufacturer's representative to review materials, procedures, schedules, and other requirements and conditions related to installing waterproofing.
- B. Qualifications of Subcontractors
 - 1. Subcontractors: All work of this Section shall be performed by a subcontractor who is approved by the manufacturer of the waterproofing material.
 - 2. Qualifications of Subcontractors: Subcontractors shall submit evidence of being bona fide waterproofing subcontractors, for a period of not less than five (5) years, and that they are approved by the manufacturer of the waterproofing material for the installation of the manufacturer's material in accordance with the requirements of this Section.

- a. Subcontractor shall submit a letter from manufacturer of waterproofing material stating that subcontractor is approved by the manufacturer for the application of the waterproofing systems specified and accepted for use on the Project.
- b. Letter shall certify that the subcontractor has previously and satisfactorily applied the waterproofing systems specified herein on jobs of similar size and scope, under manufacturer's supervision.
- c. Letter shall be on manufacturer's letterhead and shall be signed by an officer of the company, not by a local sales representative.

C. Manufacturer's Representative/Contractor's Certification

1. Representative of the waterproofing material manufacturer shall be required to provide field instructions and supervision for the installation of the waterproofing systems at the start of the work of this Section.
2. The manufacturer's representative shall be required to make sure that the workmen for waterproofing systems on the site of the Project are fully instructed and trained in the handling and application of all the materials, and shall see that all the materials are correctly installed.
3. Upon completion of the Installation, submit to the Architect written certification that the representative of the manufacturer of the waterproofing material has supervised the work of this Section and that all materials were correctly installed.

1.5 SUBMITTALS

- A. Shop Drawings: Typical installation details, showing details at flashings, at terminations, at joints, at intersection of horizontal and vertical surfaces, and at penetrations in membrane system.
- B. Samples - Submit
 1. Membrane, 6" x 6" samples of each membrane.
 2. 6" x 6" sample of flashing.
 3. 6" x 6" sample of drainage board.
- C. Manufacturer's Literature: Submit manufacturer's technical, safety data sheets, and installation literature for all materials of this Section. Submit Independent Test data indicating that membrane meets properties specified herein.
- D. General Contractor's Certification: Submit per Article 1.10.

1.6 STORAGE OF MATERIALS

- A. All materials shall be stored in their original tightly sealed containers or unopened packages; shall be clearly labeled with the manufacturer's name, brand name and number, and batch number of the material with expiration date where appropriate.

- B. Materials shall be stored in a neat and safe manner so as not to exceed the allowable live load of the storage area.
- C. Material shall be stored out of the weather in a clean, dry area.
- D. Liquid materials, such as adhesives, thinners and primers, shall be stored in areas away from sparks, open flames and excessive heat.

1.7 JOB CONDITIONS

- A. No application of waterproofing shall commence or proceed during inclement weather, or the threat of imminent precipitation.
- B. All surfaces to receive the system shall be thoroughly dry and free of dew or frost.
- C. Materials shall be stored until time of mixing at temperatures above 60 deg. F. to maintain a consistency suitable for mixing. Do no work below 40 deg. F.
- D. Prior to and during application, all dirt and dust shall be removed from surfaces either by vacuuming, sweeping, blowing with compressed air, or similar methods.
- E. Surfaces not designated to receive the system shall be properly masked or otherwise protected against accidental spillage or application of the material to those areas.

1.8 PROTECTION

- A. Against Loads: Protect work of this Section against concentrated loads and any other loads or equipment that would damage the materials or work.
- B. Against Traffic: Do not permit traffic on horizontally installed work of this Section, except for workmen doing the work, during the installation, and after the installation until membrane systems are covered with protective boards or with the specified finishing materials.
- C. Against Damage: Protect vertically installed work of this section from damage by reinforcing and placement.
 - 1. Take and maintain necessary preventive measures to protect work of this Section from damage until Project is accepted.
 - 2. Rejection of Damaged Work
 - a. Damaged materials or work will be rejected.
 - b. Rejected materials or work must be immediately removed and replaced with new materials.

1.9 FIELD QUALITY CONTROL

- A. Construction Traffic
 - 1. Limit construction traffic over completed membrane.

2. General Contractor shall provide 1/2" plywood protection layer, where construction traffic is unavoidable.
- B. Inform Architect in writing on a daily basis of any of the following events. State specific location of each occurrence.
1. Buckling to the Waterproofing and other deformations as a result of ground water events.
 2. Leakage through the finished waterproofing installation.
 3. Damage by other trades.
- C. Provide Manufacturer's Representative's report (prior to backfill) stating that the waterproofing has been inspected and is acceptable and eligible for manufacturer's warranty.

1.10 WARRANTY

- A. The manufacturer of the waterproofing system executed under this Section warrants the waterproofing system to be watertight and free from defects in materials and workmanship for a period of ten (10) years from date of acceptance of this Contract, and that he, at his own expense, repair and/or replace all other work which may be damaged as a result of such defective work, and which becomes defective during the warranty period.
- B. Contractor's Two-Year Workmanship Warranty: Provide a written guarantee for all work of this Section, stating that if, within two years after the Date of Substantial Completion of the Work, any of the work is found to be defective or not in accordance with the Contract Documents, the Contractor shall correct it promptly after receipt of a written notice from the Owner to do so. The guarantee shall state that the Contractor shall bear all costs incurred by the Owner, including reasonable attorney's fees, to enforce compliance with the obligations of this Guarantee, and will replace any material or system that requires repeated maintenance or repair to function effectively. The obligation of this Guarantee shall run directly to the Owner, and may be enforced by the Owner against the Contractor, shall survive the termination of the Contract and shall not be limited by Conditions other than this Contract.

PART 2 PRODUCTS

2.1 WATERPROOFING MEMBRANE

- A. Trade names used herein for membrane waterproofing are those of GCP Applied Technologies (hereinafter "Grace"). Other acceptable manufacturers include WR Meadows, Carlisle Coatings and Waterproofing, and Henry Company, provided the manufacturer substitutes equivalent products.
- B. For foundation walls, provide "Bituthene 4000" sheet waterproofing membrane, 60 mils thick, and "Bituthene Liquid Membrane," 60 mils thick, for flashing, as manufactured by Grace, or approved equal.

- C. At underslab conditions, provide adhesive-coated HDPE Composite Sheet "Preprufe 300R Plus" system by Grace, or approved equal.
- D. HDPE membrane shall have a protective layer to protect the membrane from the weather and U.V. for up to 30 days before casting concrete against it.
- E. Primer/Conditioner: "Bituthene 4000" latex/water-based primer specifically formulated to provide adhesion of Bituthene Waterproofing Membranes.
 - 1. If water-based primer does not provide sufficient adhesion to substrate, substitute Bituthane Primer B-2 solvent-based primer.
- F. Bituthene Elastomeric Mastic: Rubberized asphalt base mastic.
- G. Tape: Double sided synthetic adhesive tape equal to "Preprufe LT" and "HC."
- H. Protection Board: 1/4" thick semi-rigid protection board, "Bituthene Asphaltic Hardboard."
- I. Bituthene Liquid Membrane: Two-component 100% solids trowel grade asphalt modified urethane.
- J. Drainage Board/Composite: "Hydroduct 220" prefabricated dimpled polystyrene drainage core with a non-woven filter fabric on one side and a polymer film on the reverse side, by Grace.
 - 1. At horizontal applications, use "Hydroduct 660."

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where membrane waterproofing is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work. Starting of work implies acceptance of substrate.

3.2 PREPARATION OF SURFACES TO RECEIVE WATERPROOFING

- A. Conform to the requirements of Bituthene Techletter No. BTL 82-02, published by W. R. Grace if using W.R. Grace products.
- B. Earth or crushed stone substrates shall be compacted to produce an even, sound substrate. Loose aggregate, sharp protrusions and standing water shall be removed.

3.3 INSTALLATION AT FOUNDATION WALLS

- A. General: Conform to recommendations and published specifications of the manufacturer' including environmental requirements and preparation requirements to receive waterproofing.

B. Foundation Walls

1. General: The membrane, when in place must withstand a minimum static ground water pressure of 150 feet.
2. Priming: Application of primer shall be limited to what can be covered with Bituthene Waterproofing Membrane in a given work day. Primed areas not covered by membrane during the work day will be reprimed. Apply primer by spray, roller or brush at a rate of 250 - 350 sq. ft. per gallon. Roller shall be natural material such as lamb's wool, having a nap of approximately one inch. Primer shall be applied to a clean, dry, frost-free and dust-free surface. Sufficient primer must be used on the day surface to condition it to a dust-free state suitable for the application of Bituthene Waterproofing Membranes.
 - a. Bituthene 4000 Surface Conditioner should not be applied below 25 deg. F. on vertical surfaces. Allow primer to dry 30 minutes. Conditioner is considered dry when the substrate returns to its original color.
 - b. Re-prime areas that become dusty or dirty prior to membrane installation.
3. Membrane Installation: Apply Bituthene Waterproofing Membrane vertically in sections of 8' in length or less. On higher walls apply two or more sections with the upper overlapping the lower by a least 2-1/2". Press all membrane in place with heavy hand pressure or rollers during application.
4. Sealing Edges: Bituthene Waterproofing Membrane shall be applied over the edge of the slab or over the top of the foundation or parapet wall. If the membranes are terminated on the vertical surface, a reglet or counter flashing may be used, or the membrane may be terminated directly on the vertical surface by pressing very firmly to the wall. Press edges with a metal or hardwood tool such as a hammer or knife handle. Apply a troweled bead of Bituthene Mastic to all vertical and horizontal terminations. Bituthene Liquid Membrane can be used as an alternative method at the General Contractor's option.
5. Sealing Seams: All edges and end seams must be overlapped at least 2-1/2". Apply succeeding sheets with a minimum 2-1/2" overlap and stagger end laps. Roll or press the entire membrane firmly and completely as soon as possible. Patch misaligned or inadequately lapped seams with Bituthene Membrane. Slit any fish mouths, overlap the flaps, and repair with a patch of Bituthene and press or roll in place. The edges of the patch shall be sealed with a troweling of mastic. Laps within 12" of all corners shall be sealed with a troweling of mastic.
6. Corner Forming: Outside corners must be free of sharp edges. Inside corners shall receive a fillet formed with Liquid Membrane, latex modified cement mortar equal to Daraweld C made by Grace mixed with cement mortar or epoxy mortar. Do not use fiber or wood cants. One of two methods may be used for treating corners at the General Contractor's option:
 - a. Apply Bituthene Liquid Membrane 6" in each direction from the corner and form a fillet with a minimum 3/4" face.

- b. Install an 11" minimum strip of Bituthene Membrane centered on the corner. Install Bituthene Membrane over the treated inside and outside corners.
- 7. Over waterproofing, apply drainage composite board by adhering board to cured membrane using tape or adhesive per manufacturer's recommendations; lap all edges 4" and conform to the following:
 - a. Install drainage layer directly over the membrane. Start at the low points on the wall and shingle all laps to the flow of water.
 - b. Splice drainage panels together by butting longitudinal edges of adjacent sheets and peeling back fabric to expose the cores of the panels. Install precut "lock strips" consisting of 4 dimple x 5 dimple sections of the drainage panel centered on the joint between the panels and spaced every 10 dimples along the length of the joint. Snap dimples of "lock strip" to dimples of each panel and reattach fabric over the panel joint.
 - c. Cut the core of the drainage panels around penetrations and cut an 'X' in the filter fabric and tape the fabric to the sides of the penetration.
 - d. Cover all terminal edges of the drainage composite with an integral fabric flap by tucking the fabric around the edge of the core and adhering the fabric to the bottom of the core.

3.4 INSTALLATION OF BELOW-GRADE, UNDERSLAB WATERPROOFING

- A. General: Install adhesive coated HDPE composite sheet according to waterproofing manufacturer's written instructions.
- B. Preparation
 - 1. Surfaces to receive blind side membranes must be smooth and sound, with no gaps or voids in excess of 1/2 in. Earth and stone substrates must be compacted to produce an even, solid substrate. If required by membrane manufacturer, provide an additional layer of underlayment protection board over sharp or angular stone substrates. Surfaces to receive waterproofing shall be thoroughly dry and free of moisture.
 - 2. Comply with manufacturer's instructions for preparing surface including joint or crack treatment.
 - 3. Apply primer to substrate surfaces at rate recommended by manufacturer of primary waterproofing materials. Prime only area that will be covered by waterproofing membrane in same working day. Reprime areas not covered by waterproofing membrane within 24 hrs.
- C. Underslab Applications
 - 1. Apply Hydroduct 660 drainage composite board as recommended by manufacturer over the compacted sub-grade.
 - 2. Apply the membrane over the drainage composite board with the HDPE side facing the drainage composite board and the treated white coating surface facing the concrete to be poured. The membrane may be installed at any convenient

length. Apply succeeding sheets by overlapping previous sheets 3" along the self-adhesive edge of the membrane. Remove the silicone coated release liner covering the membrane and roll the side lap to assure a tight seal.

3.5 SEAM REINFORCEMENT FOR HDPE COMPOSITE SHEETS ONLY

- A. Provide a 6 in. strip of modified bituminous sheet membrane (Bituthene 4000) centered behind all laps.
- B. At locations where a salvage edge is not present and at end laps, lap sheets 6 in., apply a 1/8 in. thick by 6 in. wide application of liquid membrane between sheets, to provide a 6 in. wide seal.
- C. Integration of old onto new pre-applied sheet membrane.
 - 1. Integration of Sheet Membrane onto Sheet Membrane that has been installed in excess of 30 days prior
 - a. Lap sheets 12 in., apply a 1/8 in. thick by 12 in. wide application of fluid membrane between sheets, to provide a 12 in. wide seal at this location.
 - b. Install Waterproofing Tape centered at edge of lap and roll firmly into place with an approved roller.
 - c. Install additional Waterproofing Tape to cover white film that has been installed over 30 days prior.
 - 2. Repair of pre-applied sheet membrane
 - a. Scratch on white coating exposing underlying black surface of Sheet Membrane. Install Waterproofing Tape at areas where the white coating of the membrane is damaged, including boot scuff marks and abrasions by rebar.
 - b. Damage or Puncture of Sheet Membrane: Install Patch of short Membrane set in Liquid Membrane. Patch must extend 3 in. in every direction around extent of damaged area. Install Waterproofing Tape centered over the edge of the patch. If the damaged area does not have 5 in. of sound material around it, inject Liquid Membrane into puncture until Liquid Membrane backs out, and proceed with patch as space allows.

3.6 CLEAN-UP

- A. Upon completion of the waterproofing system, the General Contractor shall remove all equipment, material and debris from the work and storage area, and leave those areas in an undamaged and acceptable condition.

END OF SECTION

SECTION 071616

CRYSTALLINE WATERPROOFING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the crystalline waterproofing as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:
 - 1. Crystalline waterproofing system for inside surface of foundation walls and interior surfaces of concrete pits and trenches, including elevator pits.

1.3 RELATED SECTIONS

- A. Cast-in-Place Concrete - Section 033000.

1.4 SUBMITTALS

- A. Shop Drawings: Submit shop drawings showing details at terminations, at joints, at intersection of horizontal and vertical surfaces, and at penetrations in waterproofing system.
- B. Product Data: Submit manufacturer's technical information and installation instructions for all materials of this Section.
- C. Contractor's Certification: Submit per Article 1.6.
- D. Subcontractor's Qualifications: Submit per Article 1.7.

1.5 STORAGE OF MATERIALS

- A. All materials shall be stored in their original tightly sealed containers or unopened packages; shall be clearly labeled with the manufacturer's name, brand name and number, and batch number of the material where appropriate.
- B. Materials shall be stored in a neat and safe manner so as not to exceed the allowable live load of the storage area.
- C. Material shall be stored out of the weather in a clean, dry area.

1.6 MANUFACTURER'S REPRESENTATIVE

- A. Contractor shall require representative of manufacturer of the waterproofing material to provide field instructions and supervision of the installation of the complete waterproofing system.
- B. Contractor shall require the manufacturer's representative to make sure that the subcontractor's workmen are fully instructed and trained in the handling and application of all the materials, and shall see that all the materials are correctly installed.
- C. Upon completion of the installation, the Contractor shall submit to the Architect a written certification that the representative of the manufacturer of the waterproofing material has supervised the work of this Section and that all materials are correctly installed.

1.7 QUALIFICATIONS OF SUBCONTRACTORS

- A. Subcontractors: All work of this Section shall be performed by a subcontractor who is approved by the manufacturer of the waterproofing material.
- B. Qualifications of Subcontractors: Subcontractors, in order to obtain Architect's acceptance for doing work of this Section, shall submit evidence of being bona fide waterproofing subcontractors, and that they are approved by the manufacturers of the waterproofing material for the installation of their material in accordance with the requirements of this Section. Subcontractor shall submit letter from manufacturer of waterproofing material stating that the subcontractor is approved by the manufacturer for the application of the waterproofing system specified for the Project. Letter shall certify that the subcontractor has satisfactorily applied the waterproofing system specified herein under manufacturer's supervision. Letter shall be on manufacturer's letterhead and shall be signed by an officer of the company.

1.8 WARRANTY

- A. The Contractor and manufacturer shall jointly warrant the waterproofing system executed under this Section to be watertight and free from defects in materials and workmanship for a period of ten (10) years from date of acceptance of this Contract, and that he, at his own expense, repair and/or replace all other work which may be damaged as a result of such defective work, and which becomes defective during the warranty period.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Waterproofing materials shall be a cement bond compound, free from chloride and iron oxide, which waterproofs by crystalline growth through the capillary tracts and shrinkage cracks in the concrete substrate equal to "Aqua-Fin IC," as manufactured by Aqua-Fin Inc., or comparable product by Xypex Chemical Corp., Anti-Hydro Co., or approved equal.
- B. Mixing Water: Potable.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where crystalline waterproofing is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. Temperature Requirements: Surrounding temperatures shall be a minimum thirty-five (35) degrees F. for forty-eight (48) hours before, during and after installation.
- B. Preparation of Surfaces
 - 1. Surfaces to be waterproofed shall be clean and free of form scale, mold, laitance, oil, form release agents, curing compounds, hardeners, and any other materials likely to affect the bond penetration or performance of the waterproofing materials.
 - 2. Materials shall not be applied to frozen or frosted surfaces, nor during rain or snow.
 - 3. The presence of moisture in the concrete substrates is essential at the time of the waterproofing application. Should this not be the case, soak thoroughly all surfaces with water a day prior to the waterproofing, and remove all free laying water.
 - 4. All cracks in the concrete structure exceeding 0.01" in width and construction joints which have not been treated before with crystalline waterproofing, shall be routed out to a minimum depth of 3/4".
 - 5. Areas that have become dirty and concrete pours which have resulted in an extremely smooth surface shall be acid etched or, at the Contractor's option, may be sand blasted. Surfaces to be acid etched shall be dampened with clean water. Etching shall be done with a fifteen (15) percent hydrochloric (muriatic) acid. One gallon of acid should cover about fifty (50) to seventy-nine (79) square feet. Allow the acid to stand at least three (3) minutes and when bubbling ceases, flush off with water immediately. Do not let the acid stay on the surface for a prolonged period. When completed, the surface shall have a finish similar to fine or medium sandpaper. Surfaces which retain a smoothness or dirty condition shall be re-etched until the desired effect is obtained.
 - 6. Fill Form: Tie holes with "Aqua-Fin Mortar" of mortar consistency.
 - 7. Vertical Concrete Surfaces
 - a. Grind off all fins and other projections.
 - b. Extremely smooth surfaces must be etched or sand blasted.
 - c. Form ties with insets shall be removed. Chip back concrete approximately one (1) inch where form ties are without insets.

- d. Honeycombed Pockets and Faulty Construction Joints: Rout out all faulty materials back to sound concrete; clean and rinse thoroughly with water all surfaces to be treated; check by rubbing hand over the surfaces. Hand should not become wet.

C. Mixing of Crystalline Waterproofing Materials

1. Slurry Consistency: The crystalline waterproofing materials shall be delivered in powder consistency in original undamaged containers with manufacturer's labels and seals intact.
 - a. Separate container shall be used for measuring by volume the powdery crystalline waterproofing and the water.
 - b. Measure two (2) parts of crystalline waterproofing and 0.7 - 0.9 parts of water (depending on water or absorption of concrete).
2. Mortar Consistency for Seal Strips and Coves
 - a. Add water to crystalline waterproofing and/or crystalline waterproofing reinforcing proportion 1:2 and/or 1:3 and mix thoroughly until stiff consistency is reached.
 - b. Prepare only as much mortar as can be applied within ten (10) minutes.

D. Installation of Crystalline Waterproofing Materials

1. Slurry Application
 - a. Concrete surfaces to be treated with crystalline waterproofing shall be moist, not wet.
 - b. Crystalline waterproofing slurry coatings shall be applied with a stiff masonry brush or stiff broom and worked into every irregularity of the concrete surfaces.
 - c. Prior to the specified final application of crystalline waterproofing slurry coatings on the concrete surface, the following initial applications and repairs to the concrete structure have to be completed.
2. Construction Joints
 - a. Construction joints shall receive a slurry coating of crystalline waterproofing 2.5 lbs. per square yard immediately prior to each concrete pour. In areas where inaccessibility is difficult, apply 2.5 lbs. per square yard of crystalline waterproofing by dry sprinkle method immediately prior to the following pour or rout out to a minimum depth of 3/4".
 - b. Apply slurry coating of crystalline waterproofing 1.5 lbs. per square yard to routed out areas of cracks and construction joints and fill remaining depth with crystalline waterproofing and crystalline waterproofing reinforcing 1:6 in mortar consistency in two (2) laminating layers after each layer has reached its initial set (approximately 20-30 minutes).

3. Installation of Crystalline Waterproofing Coves (Junction Horizontal Surfaces and Walls): Apply slurry coating of crystalline waterproofing 1.5 - 2.0 lbs. per square yard, six (6) inches in width, and install a cove with crystalline waterproofing and crystalline waterproofing reinforcing 1:3 in mortar consistency.
 4. Honeycombed Pockets in Wall Areas: Rout out all faulty materials back to sound concrete. Apply slurry coating of crystalline waterproofing 1.5 lbs. per square yard over routed out area and fill with sand and cement mortar 1:3. If necessary (owing to depth) apply layers of mortar not exceeding 5/8" in thickness after each layer has hardened and repeat crystalline waterproofing slurry coating.
 5. Foundation and Pit Walls - Interior Face
 - a. Moisture treat vertical concrete surfaces thoroughly one day prior to application. Construction joints and form tie holes shall be filled with crystalline waterproofing and crystalline waterproofing reinforcing 1:6 in mortar consistency.
 - b. Apply two (2) slurry coatings on entire surface, consisting of "Aqua-Fin IC" crystalline waterproofing 1.25 lbs. per square yard per coating, to levels and on surfaces indicated. The second coating shall be applied while the first coating is green, normally within an hour or the application of first coating.
 6. Concrete Slabs – Pits: Apply Aqua-Fin IC at the rate of 2.5 lbs./sq. yd. in slurry consistency to concrete slab surfaces in one coat.
- E. Curing of Crystalline Waterproofing Application
1. Crystalline waterproofing applications while setting shall be protected from rain, frost and from drying out. During extreme hot weather, light water fog spraying may be necessary during time of application.
 2. Moisture treat crystalline waterproofing treated areas for minimum period of three (3) days starting the day following the completion of the crystalline waterproofing application with fog water spray. Surfaces shall have moist and later wet appearance for the duration of the curing period.
 3. Treated surfaces shall not be exposed to aggressive water, chemicals or acids until the applications have reached full strength (normally after 14 days).
- F. Crystalline Waterproofing with Painted Finish: All crystalline waterproofing surfaces to receive paint shall be neutralized with a solution of muriatic acid and water 1:8 (or vinegar salt water solution) after the crystalline waterproofing application has aged for a minimum period of two (2) weeks.
1. Rinse thoroughly with water all treated surfaces.

END OF SECTION

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SECTION 071900

WATER REPELLENTS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the water repellents as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

- 1. Water repellent coating applied to cast stone masonry walls.

1.3 RELATED SECTIONS

- A. Masonry - Division 4.

1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Water repellents shall meet performance requirements indicated without failure due to defective manufacture, fabrication, or installation.
- B. Water Absorption: Minimum 90 percent reduction of water absorption after 24 hours in comparison of treated and untreated specimens.
 - 1. Cast Stone: ASTM C 1195.
 - 2. Clay Brick: ASTM C 67.
- C. Water Penetration and Leakage through Masonry: Minimum 90 percent reduction in leakage rate in comparison of treated and untreated specimens, according to ASTM E 514.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's specifications, installation instructions and general recommendations for water repellents. Include data substantiating that materials are recommended by manufacturer for applications indicated and comply with requirements.
- B. Samples: Submit sixteen (16) inch square samples of each substrate indicated to receive liquid water repellent, with repellent treatment as specified applied to half of each sample.

1.6 QUALITY ASSURANCE

- A. Installer: A firm with not less than three (3) years of successful experience in application of water repellents of types required on substrates similar to those of this project.

1.7 PROJECT CONDITIONS

- A. Water and Substrate Conditions: Do not proceed with application of water repellent (except with written recommendation of manufacturer, when ambient temperature is less than fifty (50) degrees F., or when substrate surfaces have cured for less than a period of two (2) months, or when rain or temperatures below forty (40) degrees F. are predicted for a period of twenty-four (24) hours, or earlier than three (3) days after surfaces became wet from rainfall or other moisture sources, or when substrate is frozen, or at surface temperatures of less than forty (40) degrees F.

1.8 WARRANTY

- A. Provide written warranty from the product manufacturer stating that materials and workmanship shall be free of defects (no water penetration due to failure of coating) for a period of ten (10) years from date of acceptance of the Project, and the manufacturer shall remedy any defects in the work that occur within this time limit.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Silane/Siloxane-Blend, Penetrating Water Repellent: Clear, silane and siloxane blend with 400 g/L or less of VOCs.
 - 1. Products: Subject to compliance with requirements, provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Prime-A-Pell H20; Chemprobe Corp.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where water repellents are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PREPARATION

- A. Test Application: Prior to performance of water repellent work, including bulk purchase/delivery of products, prepare a sample application in an unobtrusive location and in a manner acceptable to Architect, for purpose of demonstrating final effect

(visual and physical/chemical) of planned installation. Proceed with work only after Architect's acceptance of test application.

- B. Clean substrate of substances which might interfere with penetration/adhesion of water repellents. Test for moisture content, to ensure that surface is sufficiently dry.
- C. Coordination with Sealants: Delay application of water repellents until installation of sealants has been completed in joints adjoining surfaces to be coated with repellent.
- D. Protect adjoining work from spillage or blow over of water repellent. Cover adjoining and nearby surfaces of aluminum and glass where there is possibility of water repellent being deposited on surfaces. Cover live plant materials with drop cloths. Clean water repellent from adjoining surfaces immediately after spillage. Comply with manufacturer's recommendations for cleaning.

3.3 INSTALLATION

- A. Apply a heavy saturation spray coating of water repellent on surfaces indicated for treatment using low pressure spray equipment. Comply with manufacturer's instructions and recommendations, using airless spraying procedure unless otherwise indicated.
- B. Apply a second saturation spray coating, repeating first application if required by manufacturer to meet warranty requirements. Comply with manufacturer's instructions for limitations on drying time between coats and after rainstorm wetting of surfaces between coats.

END OF SECTION

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SECTION 072100

THERMAL INSULATION

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the thermal insulation as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Cavity-wall insulation.
 - 2. Glass-fiber blanket insulation.
 - 3. Attachment devices.

1.3 RELATED SECTIONS

- A. Unit Masonry - Section 042000.
- B. Firestops and Smoke seals - Section 078413.
- C. Gypsum Drywall - Section 092900, for acoustical insulation.

1.4 SUBMITTALS

- A. Submit product data for each type of product indicated, including re-cycled content.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulation products.

1.5 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- B. Vertical and Lateral Fire Propagation Test Characteristics: The exterior wall assembly is required to comply with NFPA 285 "Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components." The base wall, stud cavity insulation, wall sheathing, air barrier, continuous wall rigid insulation and exterior cladding are components that are required to be evaluated as part of this specific assembly test. The basis of design

product listed herein is a component of the design test assembly selected by the Architect.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site ready for use in the manufacturer's original and unopened containers and packaging, bearing labels as to type and brand. Delivered materials shall be identical to approved samples.
- B. Store materials under cover in a dry and clean location, off the ground. Remove materials which are damaged or otherwise not suitable for installation and replace with acceptable materials.
- C. Take every precaution to prevent the insulation from becoming wet, cover with tarps or other weather/watertight sheet goods.

PART 2 PRODUCTS

2.1 CAVITY WALL INSULATION WITHIN MASONRY CAVITY

- A. Provide mineral-wool fiberboard insulation equal to "CavityRock DD" manufactured by Roxul Inc., or approved equal, conforming to ASTM C 612, Type IVB, with a maximum flame spread index of 0 and smoke developed index of 5 per ASTM E 84.
 - 1. Boards shall be 16" wide x 96" long, and of thickness noted on the drawings.
 - 2. Insulation shall have an aged R value/inch @ 75 deg F of not less than 4.3 hr./ft²/deg F/Btu per ASTM C 518 (C 177).
 - 3. Board insulation shall have density of 4.5 lbs./cu. ft. per ASTM C 303.

2.2 BLANKET INSULATION

- A. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I, with maximum flame-spread index and smoke-developed indices of 25 and 50 respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics; as manufactured by CertainTeed Corporaton, Johns Manville, Owens Corning, or approved equal.
- B. Kraft-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type II (non-reflective faced), Category 1 (membrane is a vapor barrier); as manufactured by CertainTeed Corporaton, Johns Manville, Owens Corning, or approved equal.

2.3 ACCESSORIES

- A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of specified thickness securely in position indicated with self-locking washer in place. Provide "Series T TACTOO Insul-Hangers" by AGM Industries, Inc., "Spindle Type" by Gemco, or approved equal.
 - 1. Plate: Perforated, galvanized carbon-steel sheet, 0.030" thick by 2" square.

2. Spindle: Copper-coated, low-carbon steel; fully annealed; 0.105" in diameter; length to suit depth of insulation indicated.
 3. Affix plate with stainless steel staple or screw.
- B. Adhesive for Bonding Insulation: The type recommended by the insulation manufacturer, and complying with fire-resistance requirements.
1. For bonding rigid polystyrene insulation to masonry or concrete, provide adhesive equal to "Foamgrab PS" made by Dacor Products Co. or equal made by ChemRex Inc. or Miracle Adhesives.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where thermal insulation is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION, GENERAL

- A. Clean substrates of substances that are harmful to insulation including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.
- B. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- C. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- D. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF CAVITY-WALL INSULATION

- A. Install pads of adhesive spaced approximately 24" o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 042000 "Unit Masonry."

3.4 INSTALLATION OF BLANKET INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 4. For metal-framed wall cavities where cavity heights exceed 96", support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
 5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
 - a. Exterior Walls: Set units with facing placed toward interior of construction as indicated on Drawings.

3.5 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 072419

EXTERIOR INSULATION AND FINISH SYSTEM

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the exterior insulation and finish system as shown on the drawings and/or specified herein, including, but not limited to, the following:

- 1. EIFS applied over CMU.

1.3 RELATED SECTIONS

- A. Unit Masonry - Section 042000.
- B. Firestops and Smoke seals - Section 078413.
- C. Joint Sealers - Section 079200.

1.4 QUALITY ASSURANCE

A. Manufacturer

- 1. All Contract Documents shall be reviewed by the exterior insulation system manufacturer for conformity to acceptable details, recommendations and specifications for the system. This includes review and approval, in writing, of sealant specified in Section 079200.
 - a. If the manufacturer requires changes necessary to issue warranty, those changes will be made with the approval of the Architect and at no additional cost to the Owner.
- 2. The exterior insulation and finish system manufacturer's representative shall at least weekly inspect the work in progress and final inspection shall be performed by the representative. Written inspection reports shall be filed with the Architect verifying that system meets approval of the manufacturer.

B. Applicator

- 1. Application of the system shall be by an applicator approved by the manufacturer of the system.
- 2. Follow manufacturer's latest printed application instructions and specifications.

- C. As a minimum product or system used must meet the same criteria as the latest published data of Dryvit for the following categories:
 - 1. Resistance to the elements.
 - 2. Resistance to wind loads as noted on Structural Drawings.
 - 3. Resistance to impact.
 - 4. Resistance to chemicals.
 - 5. Adhesive strength.
 - 6. Flexural strength.
 - 7. Fire test data.
- D. System shall be capable of resisting wind loads of 35 psf positive and negative, unless greater required for project.
- E. Vertical and Lateral Fire Propagation Test Characteristics: The exterior wall assembly is required to comply with NFPA 285 "Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components." The base wall, stud cavity insulation, wall sheathing, air barrier, continuous wall rigid insulation and exterior cladding are components that are required to be evaluated as part of this specific assembly test. The basis of design product listed herein is a component of the design test assembly selected by the Architect.

1.5 SUBMITTALS

- A. Product Data: Submit
 - 1. Materials list of items proposed to be provided under this Section.
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements including conforming to standards referenced herein.
 - 3. Shop drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this section with the work of adjacent trades, including flashing details.
 - 4. Manufacturer's recommended installation procedures which, when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.
 - 5. Shop drawings shall contain the following statement: "Materials and methods of installation have been reviewed by the manufacturer and meet manufacturer's recommendations."
 - 6. Confirmation that system meets wind load criteria.
- B. Submit 24" x 24" samples of colors and textures available. Samples to be made utilizing tools and techniques proposed for installation.

- C. Submit written certification from the manufacturer stating that the applicator has the manufacturer's approval.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver products in original unopened containers with legible manufacturer's identification.
- B. Store products in a cool dry place out of direct sunlight, protected from the elements and from damage.
 - 1. Store at a temperature of not less than 40 deg. F.

1.7 JOB CONDITIONS

- A. Environmental Requirements
 - 1. Application of the system shall be in ambient temperatures of at least 40 deg., and on unfrozen surfaces.
 - 2. A minimum ambient temperature of 40 deg. F. shall be maintained for at least 24 hrs. after the system installation.
- B. Protection
 - 1. Protect surrounding areas and surfaces to preclude damage during application of the system.
 - 2. Protect finished work when stopping for the day or when completing an area in order that water will not penetrate behind the system, or damage finished work.
- C. Coordination
 - 1. The work of this Section requires close coordination between related Sections.
 - 2. All joints requiring sealant shall be sealed immediately after the installation of the system.

1.8 EXTRA STOCK

- A. Upon completion of the work, deliver to the Owner at the job site a maintenance kit including, but not necessarily limited to:
 - 1. Printed maintenance instructions.
 - 2. Ten gallons of the approved adhesive.
 - 3. Ten gallons of the approved finish for each color installed, and from the same batch as the installed finish.
 - 4. One hundred sq. ft. of the approved reinforcing fabric.
 - 5. One hundred sq. ft. of the approved insulation board.

- B. Package the containers securely to prevent deterioration and damage, and label each item clearly as to contents and where used.

1.9 WARRANTY

- A. Provide manufacturer's ten (10) year material and installation warranty. Warranty shall include the entire wall system including the sealant (as noted in Section 07900). Warranty shall cover the watertight characteristic of the wall system as well as cracking, delamination, fading and other defects.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURER

- A. The specification is written based on "Outsulation Plus MD System" made by DryVit Systems Inc. Provide basis-of-design product or comparable product by Sto, Parex or Senergy.

2.2 MATERIALS

A. Air Barrier Components

1. DryVit Backstop: A 100% acrylic product, field mixed with Portland cement in a 1:1 ratio by weight.
2. DryVit Grid Tape: An open-weave fiberglass tape with pressure sensitive adhesive.
3. DryVit Flashing Tape: A high-density polyethylene film backed with rubberized asphalt.
4. DryVit Flashing Tape Surface Conditioner: A water-based surface conditioner and adhesion promoter for the DryVit Flashing Tape.

- B. Adhesive Material: Genesis, fiber-reinforced, acrylic-modified product, field-mixed with Portland cement in a 1:1 ratio by weight.

C. I.S. Insulation Board

1. Thickness of the insulation board shall be a minimum 1".
2. The back side of the I.S. Insulation Board shall have factory cut vertical grooves measuring 1/4" deep by 1" wide, spaced 12" o.c.

D. I.S. Insulation Board Closure Blocks

1. The I.S. Insulation Board Closure Blocks shall be aged, expanded polystyrene with a nominal density of 1.0 pcf but not less than 0.95 pcf.
2. The I.S. Insulation Board Closure Blocks shall measure a minimum 6" in width.

- E. DryVit Starter Strip: 2" x 6" x 4" piece of aged expanded polystyrene configured to receive the DryVit Track and Vent Track. It is required at the base of all walls, at base of horizontal compartments, and heads of windows and other openings.

- F. DryVit Vent Assembly: 2" x 6" x 10" piece of aged expanded polystyrene, which is configured to contain a formed aggregate matrix material and receive the DryVit Vent Track. It is required at the base of walls and the base of horizontal compartments and is capable of draining water.
- G. DryVit Vent Track: 'J' shaped track complying with ASTM D 1784 and ASTM C 1063 containing a slot for venting and drainage and located above the DryVit Vent Assembly, along with base of walls and horizontal compartments.
- H. DryVit Track: 'J' shaped track complying with ASTM D 1784 and ASTM C 1063 located above the DryVit Starter Strip.
- I. DryVit AP Adhesive: Moisture cure, urethane-based adhesive used to attach the DryVit Track and Vent Track to the Dryshield Air Barrier.
- J. DryVit Reinforcing Mesh: Balanced, open weave glass fiber fabric treated for compatibility with other system components.
 - 1. Standard Plus Reinforcing Mesh: Shall weigh a minimum of 6 oz./yd² and have an EIMA Impact Classification of Level 2.
 - 2. Panzer 20 Mesh: Shall weigh a minimum of 20 oz./yd² and have an EIMA Impact Classification of level 4.
 - a. Panzer mesh shall be used in conjunction with Standard Plus mesh for all EIFS within 8'-0" of finish grade.
 - 3. Corner Mesh: Shall weigh a minimum of 7.2 oz./yd² and have a minimum tensile strength of 274 lbs./in. of width.
 - 4. Detail Mesh: Shall weight a minimum of 4.3 oz./yd² and have a minimum tensile strength of 150 lbs./in of width.
- K. DryVit Base Coat: I.S. Base, an acrylic based product, field mixed with Portland cement in a 2:1 ratio by weight.
- L. DryVit Finish: Reflectit, 100% acrylic coating providing a pearlescent appearance.
- M. At all penetrations, including windows, provide open cell polyurethane foam with water stabilized polymer modified acrylic equal to "EIFSTAPE" manufactured by Emseal, or approved equal.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where exterior insulation and finish system is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. The system shall be installed in accordance with the Dryvit Outsulation Plus System Application Instructions, DS218.
- B. The overall minimum base coat thickness shall be sufficient to fully embed the mesh. The recommended method is to apply the base coat in two (2) passes.
- C. Sealant shall not be applied directly to textured finishes or base coat surfaces. Dryvit Outsulation Plus System surfaces in contact with sealant shall be coated with Demandit or Color Prime.
- D. High impact meshes shall be installed as specified at ground level, high traffic areas and other areas exposed to or susceptible to impact damage.
- E. Sealant: At other penetrations and at control joints, provide back-up rod and sealant conforming to the requirements of Section 079200.

3.3 SPECIAL INSPECTION

- A. The contractor shall be responsible for the proper application of the Outsulation Plus materials.
- B. Dryvit assumes no responsibility for on-site inspections or application of its products.
- C. If required, the contractor shall certify in writing the quality of work performed relative to the substrate system, details, installation procedures, workmanship and as to the specific products used.
- D. If required, the EPS supplier shall certify in writing that the EPS meets Dryvit's specifications.
- E. If required, the sealant contractor shall certify in writing that the sealant application is in accordance with the sealant manufacturer's and Dryvit's recommendation.
- F. Provide special inspections for all EIFS applications per Code.
- G. The special inspection shall include verification of: compliance with approved construction documents for attachment to structure, installation of waterproofing membranes, weeps, drains, mold prevention features and conformance with the manufacturers' installation guidelines.

END OF SECTION

SECTION 072726

FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the vapor permeable air barrier liquid membrane as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:
 - 1. Vapor retarder/air barrier applied over concrete unit masonry.
 - 2. Materials and installation to bridge and seal the following air leakage pathways and gaps:
 - a. Connections of the walls to the roof.
 - b. Connections of the walls to the foundations.
 - c. Seismic and expansion joints.
 - d. Openings and penetrations of window frames, storefront, curtain wall.
 - e. Door frames.
 - f. Piping, conduit, duct and similar penetrations.
 - g. Masonry ties, screws, bolts and similar penetrations.
 - h. All other air leakage pathways in the building envelope.

1.3 RELATED SECTIONS

- A. Unit Masonry - Section 042000.

1.4 SUBMITTALS

- A. Provide evidence to the Architect of licensing and certification under the Air Barrier Association of America's (ABAA's) Quality Assurance Program.
- B. Submit shop drawings showing locations and extent of air/vapor barrier and details of all typical conditions, intersections with other envelope systems and materials, membrane counter-flashings, and details showing how gaps in the construction will be bridged, how inside and outside corners are negotiated and how miscellaneous penetrations such as conduits, pipes electric boxes and the like are sealed.
- C. Submit manufacturer's product data sheets for each type of membrane, including manufacturer's printed instructions for evaluating, preparing, and treating substrate, temperature and other limitations of installation conditions, technical data, and tested physical and performance properties.

- D. Submit manufacturer's data showing solids content of fluid applied membranes and coverage rates and wet film thickness upon application in order to achieve minimum dry film thickness required by this specification.
- E. Submit manufacturer's installation instructions.
- F. Submit certification by air/vapor barrier manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- G. Submit certification of compatibility by air/vapor barrier manufacturer, listing all materials on the project that it connects to or that come in contact with it, including sealant as specified in Section 054000 for caulking joints between sheathing panels.
- H. Submit samples, 3 by 4 inch minimum size, of each air/vapor barrier material required for Project.
- I. Test results of air permeability testing of primary air barrier material (ASTM E 2178-01).
- J. Test results of assembly in accordance with ASTM E 2357.

1.5 PERFORMANCE REQUIREMENTS

- A. Provide air/vapor barrier constructed to perform as a continuous air/vapor barrier, and as a liquid water drainage plane flashed to discharge to the exterior any incidental condensation or water penetration. Membrane shall accommodate movements of building materials by providing expansion and control joints as required, with accessory air seal materials at such locations, changes in substrate and perimeter conditions.
- B. Provide an air barrier assembly that has been tested in accordance with the Air Barrier Association of America's (ABAA's) approved testing protocol to provide air leakage results not to exceed 0.01 cfm/sf @ 1.57 psf.
- C. Connections to Adjacent Materials: Provide connections to adjacent materials at the following locations and show same on shop drawings:
 - 1. Foundation and walls, including penetrations, ties and anchors.
 - 2. Walls, windows, curtain walls, storefronts, louvers or doors.
 - 3. Different wall assemblies, and fixed openings within those assemblies.
 - 4. Wall and roof connections.
 - 5. Floors over unconditioned space.
 - 6. Walls, floor and roof across construction, control and expansion joints.
 - 7. Walls, floors and roof to utility, pipe and duct penetrations.
 - 8. Seismic and expansion joints.
 - 9. All other leakage pathways in the building envelope.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:

1. The air barrier contractor shall be, during the bidding period as well as for the duration of the installation, officially recognized as a Licensed Contractor by the Air Barrier Association of America (ABAA). The contractor shall carry liability insurance and bonding.
2. Each worker who is installing air barriers must be either a Certified Applicator or an installer who is registered with ABAA.
3. Each Lead Certified Applicator can supervise a maximum of five registered installers. The Certified Applicator shall be thoroughly trained and experienced in the installation of air barriers of the types being applied. Lead Certified Applicators shall perform or directly supervise all air/vapor barrier work on the project.

B. Single-Source Responsibility: Obtain air/vapor barrier materials from a single manufacturer regularly engaged in manufacturing the product.

C. Provide products which comply with all state and local regulations controlling use of volatile organic compounds (VOCs).

D. Field-Constructed Mock-Ups: Prior to installation of air/vapor barrier, apply air/vapor barrier as follows to verify details under shop drawing submittals and to demonstrate tie-ins with adjoining construction, and other termination conditions, as well as qualities of materials and execution:

1. Construct typical exterior wall panel, 8 feet long by 8 feet wide (one of CMU and one of sheathed areas, incorporating back-up wall, cladding, window and doorframe and sill, insulation, flashing, building corner condition, and typical penetrations and gaps; illustrating materials interface and seals.

E. Test mock-up in accordance with ASTM E 783 and ASTM E 1105 for air and water infiltration.

F. Manufacturer shall be on-site at least once a week to observe installation and provide written report within 3 days.

G. Manufacturer shall confirm all termination details and compatibility with materials being terminated to.

H. Vertical and Lateral Fire Propagation Test Characteristics: The exterior wall assembly is required to comply with NFPA 285 "Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components." The base wall, stud cavity insulation, wall sheathing, air barrier, continuous wall rigid insulation and exterior cladding are components that are required to be evaluated as part of this specific assembly test. The basis of design product listed herein is a component of the design test assembly selected by the Architect.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.
- B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air/vapor barrier manufacturer. Protect stored materials from direct sunlight.
- C. Avoid spillage. Immediately notify Owner, Architect if spillage occurs and start clean up procedures.
- D. Clean spills and leave area as it was prior to spill.

1.8 WARRANTY

- A. System Warranty: Provide the manufacturer's three (3) year system warranty, including the primary air/vapor barrier and installed accessory sealant and membrane materials which fail to achieve air tight and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Fluid-Applied, Vapor-Retarding Membrane Air Barrier: Elastomeric, modified bituminous membrane equal to "Textroflash Liquid" by Hohmann & Barnard, Inc., "Air-Shield LM" by W. R. Meadows, Inc., or approved equal.
 - 1. Physical Properties
 - a. Vapor Permeance: Maximum 0.03 Perms; ASTM E 96.
 - b. Ultimate Elongation: Minimum 1500 percent; ASTM D 412.
- B. Accessory Materials
 - 1. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier material.
 - 2. Primer: Liquid primer recommended for substrate by air-barrier material manufacturer.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where the above grade waterproof membrane is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected to permit proper installation of the work.

3.2 SURFACE PREPARATION

- A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.
- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- E. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 FLUID AIR-BARRIER MEMBRANE INSTALLATION

- A. General: Apply fluid air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions. Apply fluid air-barrier material within manufacturer's recommended application temperature ranges.
 - 1. Apply primer to substrates at required rate and allow it to dry.
 - 2. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.
 - 3. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.
- B. Membrane Air Barriers: Apply a continuous unbroken air-barrier membrane to substrates according to the following thickness. Apply air-barrier membrane in full contact around protrusions such as masonry ties.
 - 1. Vapor-Retarding Membrane Air Barrier: Total dry film thickness as recommended in writing by manufacturer to meet performance requirements, but not less than 45-mil dry film thickness.
- C. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.
- D. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner may, at his option, engage a qualified testing agency to perform tests and inspections.
- B. Inspections: Air-barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air-barrier system has been achieved throughout the building envelope with no gaps or holes.
 2. Continuous structural support of air-barrier system has been provided.
 3. Site conditions for application temperature and dryness of substrates have been maintained.
 4. Maximum exposure time of materials to UV deterioration has not been exceeded.
 5. Surfaces have been primed, if applicable.
 6. Laps in strips and transition strips have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
 7. Termination mastic has been applied on cut edges.
 8. Strips and transition strips have been firmly adhered to substrate.
 9. Compatible materials have been used.
 10. Transitions at changes in direction and structural support at gaps have been provided.
 11. Connections between assemblies (air-barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
 12. All penetrations have been sealed.
- C. Air barriers will be considered defective if they do not pass tests and inspections.
1. Apply additional air-barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.
 2. Remove and replace deficient air-barrier components for retesting as specified above.
- D. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

3.5 PROTECTING AND CLEANING

- A. Protect air/vapor barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.
- C. Protect air/vapor barrier from exposure to the elements as required by the manufacturer.
- D. Remove any masking materials after installation. Clean any stains on materials that would be exposed in the completed work using procedures as recommended by manufacturer.

1. Schedule work to ensure that the air and vapor barrier system is covered as soon as possible after installation. Protect air and vapor barrier system from damage during subsequent operations. If the air and vapor barrier system cannot be permanently covered within 30 days after installation, apply temporary UV protection such as dark plastic sheet or tarpaulins.

END OF SECTION

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SECTION 073213

CLAY ROOF TILES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 WORK INCLUDED

- A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the clay roof tile, and sheet metal work as shown on the drawings and specified herein, including, but not limited to, the following:
 - 1. Clay roof tile.
 - 2. Accessories.
 - 3. Sheet metal flashing.

1.3 RELATED WORK

- A. TPO Membrane Roofing - Section 075423.
- B. Sheet Metal Flashing - Section 076200.

1.4 QUALITY ASSURANCES

- A. Installer: A firm with not less than 5 years of successful experience in installation of roofing tiles similar to those required for this project and which is acceptable to or licensed by the manufacturer of the primary roofing materials.
- B. Comply with all local building codes, including wind uplift and hurricane requirements.
- C. Mock-Up: Prior to installing clay tile, construct 500 sq. ft. mock-up to demonstrate aesthetic effects, relationship to adjacent to construction as well as quality of materials and execution. Build mock-ups to comply with the following requirements, using materials indicated for final Work.
 - 1. Locate mock-ups on site in the location as directed by Architect.
 - 2. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 3. Obtain Architect's approval of mock-ups before start of final unit of Work.
 - a. When directed, demolish and remove mock-ups from Project site.

D. Mock-Ups - Tests

1. Testing laboratories shall be specifically qualified to conduct laboratory and field performance tests required by these specifications.
2. All testing as described shall be performed on a 10' x 10' mock-up of the roof assembly, including all accessories. The testing laboratory shall be responsible for conducting and reporting the tests and state in the report whether or not the test specimen conforms to all requirements of the Contract Documents, and shall specifically note any deviations therefrom. Necessary corrections shall be performed by the Contractor at no additional cost to the Owner.
3. Test Sequence: Make the following tests of the mock-up, in the order listed, and in accordance with performance criteria specified herein:
 - a. Test for Water Penetration (Static Pressure): ASTM E 331-86. Test to 10 psf.
 - b. Test for Uniform Load (Deflection): ASTM E 330-90 to design hurricane wind load, positive and negative, with no deflection of any member in excess of $L/360$ whichever is less.
 - c. Repeat static water penetration test.
 - d. Test for Structural Performance at 1.5 Time Design Pressures (Deflection): ASTM E 330 "Test for Structural Performance." Perform test for both positive and negative pressure. Increase pressure until test specimen reaches 1.5 times design pressure. Record any permanent deformation, fastener failure, component disengagement or breakage.
 - e. Correct any deficiencies and repeat tests as may be required to show compliance with the Contract Documents. Resubmit any calculations affected by these corrections.
4. Personnel assembling mock-ups at the laboratory shall be the personnel that will perform this work at the project site.
5. Remedial measures which may be necessary on the mock-ups or the building shall maintain standards of quality and durability and are subject to approval by the Architect.
6. Upon completion of testing, the Contractor shall immediately provide "as-built" mock-up drawings showing any modifications or additions required to meet the performance requirements.
7. The Contractor shall be liable for any failure to meet test requirements, without adjustment to the Contract Sum or the Contract Schedule.
8. Mock-up materials and assemblies as tested and approved will govern materials and assemblies furnished for field erection. Contractor shall revise all shop drawings to conform to the approved mock-up and resubmit for approval.

1.5 SUBMITTALS

- A. The samples and certificates listed below are required to be submitted by the Contractor to the Architect, for review. An omission of an item or items, does not relieve the Contractor from this responsibility, and for compliance with the Contract Documents, of which this is a part.

1. Samples

<u>Item No.</u>	<u>Size</u>	<u>Description</u>
S1	6" x 6"	Underlayment
S2	6" x 6"	Flashing materials

- B. Submit complete shop drawings showing details, dimensions, fabrication and fastening elements for each condition encountered, layout of each sheet noting seam locations, perimeter and penetration flashing and other details where roofing abuts other materials and/or conditions (including hurricane clips and wind locks).
- C. Submit copies of pre-roofing conference records.

1.6 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site ready for use in the manufacturer's original and unopened containers and packaging, bearing labels as to type, and brand. Delivered materials shall match approved samples. Fire classification labels shall be intact and visible.
- B. Store materials under cover in a dry and clean location, off the ground and remove materials which are damaged, torn or otherwise not suitable for installation and replace with acceptable materials.
- C. Keep tiles and underlayment dry, before and during installation. Remove wet materials from project site.
- D. Store roofing materials on platforms or pallets, above ground on roof level and cover with tarpaulins or on other suitable watertight covering. Store tiles, and handle, in such a way as to prevent damage to edges or ends.

1.7 PREROOFING CONFERENCE

- A. Prior to ordering of materials, a pre-roofing conference will be held to discuss the specified roofing system, and its proper application. Conference shall include installer, roofing manufacturer, installers of related work, Architect and representatives of Owner. Record discussions and agreements and furnish copy to each participant. Provide at least 72 hours advance notice to participants prior to convening conference.
- B. Coordinate application of the roofing system in such a manner that the complete installation is weather-tight and in accordance with guarantee requirements.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Work shall not be installed when the roof deck is damp, wet or spotted with frost or if the ambient temperature is 35 deg. F. and falling or if there is a forecast for inclement weather which will be adverse to the proper installation of the roofing system.

1.9 WARRANTY

- A. Provide warranty for the roofing work as specified in this section. Guarantee shall state that installed work shall be free from defects of materials and workmanship for thirty (30) years from date of substantial completion.
- B. Warranty shall be in a form acceptable to the Architect and shall be duly executed by officers or principals of the trade contractor and/or the manufacturer.
- C. Contractor shall inform the Architect if conditions exist which will interfere with issuance of the specified warranty. Start of work shall imply that the warranty as specified above will be issued.

1.10 EXTRA MATERIALS

- A. Furnish and deliver to Owner quantity of full size roofing tiles equal to 5 percent of amount installed.

PART 2 PRODUCTS

2.1 ROOF TILES

- A. Clay Tile: Molded clay roofing tile units of shape and configuration indicated to match existing, kiln-fired to vitrification, and free from surface imperfections. Include specially-shaped, color-matched units as indicated or required for eaves, rakes, ridges, hips, valleys, and other conditions. Provide with fastening holes pre-punched at factory before firing.
 - 1. Manufacturers: Ludowici Roof Tiles, or approved equal.
 - 2. Colors, Blends and Patterns: To match existing roof at Bolin Science Building and adjacent areas with clay tile roofs. Prior buildings have used the following blend but must be verified at the site:
 - a. 14% SO/M10/M23 "Weathered Mist."
 - b. 32% SO/296-04M/MS "Weathered Mist."
 - c. 54% SO/428-04M "Weathered Mist."
 - 3. Standard: ASTM C 1167, molded- or extruded-clay roof tile units.
 - 4. Durability: Grade 1.

2.2 ACCESSORIES

- A. Roof Felt Underlayment: ASTM D 2626, asphalt-saturated and -coated organic felt, dusted with fine mineral surfacing on both sides, unperforated.

- B. Self-Adhering Sheet Underlayment, Polyethylene Faced: ASTM D 1970, minimum of 40 mils thick; slip-resisting, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer for adjoining concrete or masonry surfaces to receive underlayment. W. R. Grace & Co.; Grace Ice and Water Shield or approved equal.
- C. Asphalt Plastic Cement: Non-asbestos fibrated asphalt cement complying with ASTM D 4586, designed for trowel application.
- D. Snow Guards: Fabricated copper units, designed to be installed without penetrating roof tiles, and complete with predrilled holes or hooks for anchoring.
- E. Storm Clips: Stainless steel strap-type, 0.04" x 1/2", L-shaped retainer clips designed to secure side edges of clay roof tiles. Provide with two fastener holes in base flange.
- F. Flashing: See Section 076200.
- G. Mortar: Comply with ASTM C 270, proportion specifications for Type M mortar mix. Provide colored pigment to produce mortar which matches color of tile selected.
- H. Tile Fasteners: Provide Type 316 stainless steel as manufactured by Newport Fastener, Inc., The Wire Works, Inc., or approved equal.

2.3 ANCHORING SYSTEM

- A. Provide stainless steel, Type 316, anchor system as recommended by clay tile manufacturer including wind locks, hurricane clips, etc. Show same on shop drawings.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrate for compliance with requirements for substrates, installation tolerances, and other conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application. Cover knotholes or other minor voids in substrate with sheet metal flashing secured with non-corrosive roofing nails.
- B. Coordinate installation with flashing, gutters and other adjoining work to ensure proper sequencing. Do not install roofing materials until all vent stacks and other penetrations through roof sheathing have been installed and are securely fastened against movement.

3.3 INSTALLATION

- A. Comply with manufacturer's installation instructions and recommendations, but not less than recommended by "The NRCA steep Roofing Manual."

- B. Double-Layer Roof Felt Underlayment: Install perpendicular to roof slope in parallel courses. Install a 19-inch-wide starter course at eaves and completely cover with full-width second course. Install succeeding courses lapping previous courses 19 inches in shingle fashion. Lap ends a minimum of 6 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with felt underlayment nails.
- C. Self-Adhering Sheet Underlayment: Install wrinkle free, complying with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at eaves, rakes, hips, ridges and at roof penetrations, lapped in direction to shed water. Lap sides not less than 3-1/2 inches. Lap ends not less than 6 inches, staggered 24 inches between succeeding courses. Roll laps with roller. Cover underlayment within seven days.
- D. Roof Tile Installation: Beginning at eaves, install roof tiles in accordance with manufacturer's recommendations and with details and recommendations of "The NRCA Steep Roofing Manual." Unless otherwise indicated, provide minimum 3" lap between succeeding courses of tile. Drive screws to clear the tile so that the tile hangs from the screws and is not drawn up.
 - 1. Install with color blend approved by Architect. Install matching, specially shaped units at rakes, ridges, and hips.
 - 2. Set ridge and hip tile in a full bed of mortar and strike mortar flush with face of hip or ridge cover tile.
 - 3. Cut and fit tile at roof vents and other roof penetrations. After tiles are laid, fill any voids with mortar.
- E. Installation of Accessories: Install eave closures, wind locks, snow guards, hurricane clips, tile vents, closures, and other accessory items in coordination with roofing tile installation and in strict accordance with installation instructions and specified requirements.
- F. Flashing: Install metal flashing as indicated and in accordance with details and specified requirements.
 - 1. Where flashings occur perpendicular to slope, return sheet metal at least 3" under tile and turn metal up at least 2".
 - 2. At eave edges, provide built in gutters within cornice.

3.4 ADJUSTING

- A. Replace damaged materials installed under this Section with new materials meeting specified requirements.

END OF SECTION

SECTION 075423

THERMOPLASTIC POLYOLEFIN (TPO) MEMBRANE ROOFING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the thermoplastic membrane roofing as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Single-ply TPO sheet membrane roofing, fully adhered installation.
 - 2. Roof insulation and cover board.
 - 3. Walkway pads.

1.3 RELATED SECTIONS

- A. Concrete deck - Section 033000.
- B. Rough Carpentry - Section 061000, for wood nailers, curbs, and blocking.
- C. Sheet Metal Flashing - Section 076200.
- D. Drains and vents - Division 22.

1.4 DESCRIPTION OF THE SYSTEM

- A. The membrane roofing system specified herein shall consist of factory fabricated large sections of sheet membrane fully adhered over the rigid roof insulation. Provide flashing at roof penetrations and vertical surfaces.

1.5 QUALITY ASSURANCE

- A. Qualifications
 - 1. The membrane roofing system specified herein shall be the product of a manufacturer who can furnish supporting evidence of experience in the manufacture of the membrane roofing system and of having been regularly engaged in this business for not less than 5 years. Such experience shall be in projects similar to the requirements for this project.
 - 2. The details and specifications are based on a particular manufacturer. It is not the intention of this specification to restrict competition; if a manufacturer other than

the one specified is selected, it shall be his obligation and responsibility to modify and adjust his materials to suit the encountered conditions and to consult and coordinate his work with other trade Contractors to assure that the installation will be watertight and function for use intended and that the guarantee will be issued to the Owner.

- B. Installer: A firm with not less than 5 years of successful experience in installation of roofing systems similar to those required for this project and which is acceptable to or licensed by the manufacturer of the primary roofing materials.
- C. UL Listing: Provide system which has been tested and listed by UL for application indicated and which has a "Class A" rating.
- D. Membrane roofing system shall be ENERGY STAR compliant (highly reflective) and high emissivity roofing (emissivity of at least 0.9 when tested in accordance with ASTM E 408).
- E. High Albedo Roofing Materials: Roofing shall have a Solar Reflectance index (SRI) of 79 or above.

1.6 SUBMITTALS

- A. Product Data: Submit manufacturer's product information, including published specifications, which completely describe the preparation of surfaces and application of roofing systems.
- B. Shop Drawings: Submit complete shop drawings showing details, dimensions, fabrication and fastening elements for each condition encountered, layout of each sheet noting seam locations, perimeter and penetration flashing and other details where roofing abuts other materials and/or conditions.
- C. Samples: Submit the following for review:
 - 1. Membrane w/splice, 6" x 6".
 - 2. Rigid insulation, 6" x 6".
 - 3. Flashing materials, 6" x 6".
 - 4. Notarized Certificates of Compliance.
 - 5. Submit a letter from membrane manufacturer issuing sample guarantee and approving the applicator, prior to pre-application conference.
- D. Submit copies of pre-roofing conference records.
- E. Submit a letter signed by the manufacturer and Contractor acknowledging that the submitted roofing system complies with ASCE-7 and FM 1-90, for wind speed code requirements based on height and geographic location of project.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the site ready for use in the manufacturer's original and unopened containers and packaging, bearing labels as to type, and brand. Delivered materials shall match approved samples. Fire classification labels shall be intact and visible.
- B. Store materials under cover in a dry and clean location, off the ground and remove materials which are damaged, torn or otherwise not suitable for installation and replace with acceptable materials.
- C. Keep insulation and membrane dry, before and during installation. Remove wet materials from project site.
- D. Store roofing materials on platforms or pallets, above ground on roof level and cover with tarpaulins or on other suitable watertight covering. Store membrane, and handle, in such a way as to prevent damage to edges or ends.

1.8 PREROOFING CONFERENCE

- A. Prior to ordering of materials, a preroofing conference will be held to discuss the specified roofing system, and its proper application. Conference shall include installer, roofing manufacturer, installers of related work, Architect and representatives of Owner. Record discussions and agreements and furnish copy to each participant. Provide at least 72 hours' advance notice to participants prior to convening conference.
- B. Coordinate application of the roofing system in such a manner that the complete installation is weather-tight and in accordance with guarantee requirements.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Work shall not be installed when the roof deck is damp, wet or spotted with frost or if the ambient temperature is 35 deg. F. and falling or if there is a forecast for inclement weather which will be adverse to the proper installation of the roofing system.

1.10 WARRANTY

- A. Provide warranty for the roofing work as specified in this section. Warrantee shall state that installed work shall be free from defects of materials and workmanship for manufacturer's 20 years from date of Substantial Completion.
- B. Warranty shall be in a form acceptable to the Architect and shall be duly executed by officers or principals of the manufacturer.
- C. Contractor shall inform the Architect if conditions exist which will interfere with issuance of the specified warranty. Start of work shall imply that the warranty as specified above will be issued.
- D. In addition to manufacturer's warranty, provide roofing Installers warranty for a period of 2 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 TPO SHEET ROOFING MEMBRANE

- A. Fabric-Reinforced TPO Sheet: ASTM D 6878, internally fabric- or scrim-reinforced, uniform, flexible TPO sheet.
 - 1. Thickness: 60 mils.
 - 2. Exposed Face Color: White.
 - 3. Manufacturers: Provide "Sure-Weld" as manufactured by Carlisle SynTec Incorporated, or comparable product by Firestone Building Products, GAF Materials Corp., Johns Manville, or an approved equal acceptable to the Architect.

2.2 ACCESSORY MATERIALS

- A. Membrane Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 60 mils thick minimum, of same color as membrane.
- B. Bonding Adhesives, Mastics and Splicing Cement: Compatible with the materials with which they will come in contact; solvent based.
- C. Lap Sealant: For sealing the exposed edge of the splices and as otherwise required shall be of a consistency recommended by the manufacturer.
- D. Prefabricated Pipe Seal Assemblies: Provide assemblies to accommodate vents, pipe penetrations and other similar roof penetrations.
- E. Sealers: Provide sealers and other similar accessory materials as recommended by the manufacturer.
- F. Materials: The materials provided shall be part of a roofing system developed by the approved manufacturer and shall in every respect be compatible with each other and with the substrates and conditions encountered in the field.
- G. Cant Strips, Tapered Edge Strips, and Flashing Accessories: Types recommended by membrane manufacturer, including adhesive tapes, flashing cements, and sealants.
- H. Membrane Adhesive: As recommended by membrane manufacturer for particular substrate and project conditions, formulated to withstand ASCE 7-98 and 1-90 wind uplift force requirements of the geographic area of the building.
 - 1. Provide adhesives that comply with local requirements limiting amounts of volatile organic compounds.
- I. Substrate Board: ASTM C 1177, glass-mat, water-resistant gypsum substrate, thickness as indicated; provide "Dens-Deck Prime" by Georgia-Pacific Corporation, or equal.
- J. Roof Insulation: Minimum 4" total thickness, minimum 2" boards, flat and tapered (1/4" per foot) polyisocyanurate board roof insulation conforming to ASTM C 1289

faced with proper facing to allow membrane to be adhered to it without delamination. Roof insulation must have an LTTR R-Value of 6.0/inch at 75 deg. F. when tested in accordance with ASTM C 1303.

1. Manufacturer of roofing system must pre-approve use of insulation in writing.
 2. Surface Burning Characteristics: Maximum flame spread of 25.
 3. Provide high-density insulation, minimum 60 psi compressive strength, at areas where paver and pedestal systems are to be installed.
- K. Walkway Pads: Factory-formed, non-porous, heavy-duty, solid rubber, slip resisting, surface textured walkway pads approximately 3/16" thick and acceptable to roofing system manufacturer, same color as roof membrane.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where roofing is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

A. Nailers

1. Continuous pressure treated nailers shall be firmly anchored to resist a force of 75 pounds per lineal foot in any direction. The thickness of the nailer shall be such that the top of the nailer is flush with the surface to which the membrane is attached at the horizontal plane.
2. Nailers shall be installed continuous at perimeters and around all roof penetrations unless otherwise noted.

- B. Install substrate board with long joints in continuous straight lines, perpendicular to roof slopes with end joints staggered between rows. Tightly butt substrate boards together.

C. Insulation

1. Clean the deck prior to installing the insulation. Mechanically attach insulation to deck using FM approved fasteners in pattern to meet FM 1-90 minimum and ASCE 7-98 wind uplift requirements, including greater requirements for corners and perimeters as required. For tapered insulation, follow pattern of taper to insure correct pitch.
2. Moderately butt end joints over flutes, stagger joints in adjacent boards. Do not install more insulation in any one day than can be covered by the membrane roof sheets.

3. Where two layers of insulation are required, stagger joints 2 feet in length and width in both directions.
 4. Neatly cut around all projections encountered and at abutting vertical surfaces. Where large gaps occur fill with a urethane foam pack.
- D. Sheet Membrane Application (Fully Adhered): Where required by manufacturer, install membrane by unrolling over prepared substrate, lapping adjoining sheets. Apply adhesive to surfaces to be bonded and roll into place when adhesive has properly cured. Treat seams with cleaner and prime finish with 4" seam tape and apply sealant to exposed sheet edges, tapering application as recommended by manufacturer. Install mechanical fasteners, flashings and counterflashings, and accessories at locations and as recommended by manufacturer.
- E. Splicing
1. Fold the top sheet back about 12" and clean both mating surfaces at the splice area using clean rags with membrane manufacturer's recommended cleaner.
 2. Apply the in-seam tape primer with a synthetic scrub pad at a rate of 375 lineal feet of 5" splice per gallon. Allow tape primer to dry to the touch.
 3. Roll the top sheet toward the splice area until the cemented area is nearly touching the cement on the bottom sheet along the entire length of the splice. Allow the top sheet to fall freely into place avoiding stretching and wrinkling. Roll the splice with a 2" wide steel roller, using positive pressure, toward the outer edge of the splice.
 4. Solvent clean the splice edge, extending at least 1" onto the top and bottom membranes. Apply a bead of lap sealant completely covering the splice edge, feathering the lap sealant with a preformed putty knife or trowel.
 5. Lap sealant application shall be completed on all splices by the end of each working day.
- F. Membrane Flashing
1. Perimeter flashing and flashing around vents and other roof penetrations shall be preformed using the recommended flashing, compatible with the approved roofing system and utilizing the longest pieces practicable.
 2. The splice between the flashing and the main roof sheet should be completed before bonding the flashing to the vertical surface. Seal this splice at least 3" beyond the fasteners which attach the membrane to the horizontal nailer.
 3. Bonding adhesive shall be applied to both the flashing and the surface to which it is being bonded. After the adhesive has dried to the point where it does not string or stick to a dry finger touch, roll the flashing into the adhesive. Take care to assure that the flashing is not bridging where there is any change of direction of the flashing (e.g., where the parapet meets the roof deck).

4. Nail the flashing at the top every 12" on center maximum under metal counterflashing or cap. Metal counter is specified under Section 076200.

G. Pipe Flashing

1. Flashing for pipes, conduits and other similar items which are scheduled to penetrate (pass through) the membrane shall be provided with factory prefabricated elements when such use is possible. When prefabricated devices are not possible field fabricated seals shall be used.
2. Bases of the pipe seals shall be spliced to the membrane roofing sheet as specified above for sheet laps and the top portion shall be secured to the pipe with a stainless steel clamping ring and continuously sealed with sealant in a watertight manner.
3. Field fabricated pipe seals shall be fabricated with base and cap membrane flashing which shall be spliced to the membrane and to itself and continuously sealed with sealant in a watertight manner.

- H. Drains: At drain locations, where the insulation is tapered to form a smooth transition from roof surface to membrane, the membrane sheet shall be accurately cut-out so as to fit the encountered clamping ring, and shall be secured to the ring with the addition of the approved mastic in a secure, neat and watertight manner.

I. Curbs, Corners

1. Field fabricated outside corners shall consist of approved membrane flashing which shall have not less than 6" horizontal legs which shall be spliced to the roof membrane and vertical legs as required which shall be nailed at 12" o.c. maximum. Corners shall be lapped a minimum of 3" and be secured by splicing to each flashing section
2. Field fabricated inside corners shall consist of approved membrane flashing with 6" horizontal legs which shall be spliced to the roof membrane, with vertical legs as required which shall be nailed at 12" o.c. maximum. Corners shall be lapped a minimum 6" and secured by splicing to each flashing section.
3. Install lap type sealant along all seams to insure a watertight installation.

- J. Daily Seal: Care should be exercised to ensure that the water does not flow beneath any completed sections of roof. Temporarily seal loose edge of membrane with sealant when weather is threatening.

1. Mix the two components thoroughly according to the instructions on the label.
2. Apply the sealant at a rate of 100 lineal feet per gallon, (on smooth surface) 12" back from edge of sheet onto exposed substrate surface. If necessary, use a trowel to spread material in order to achieve complete seal.
3. After embedding membrane in sealant, check for continuous contact. Then weight the edge, providing continuous pressure over the length of the cutoff. The

recommended weight for the continuous pressure is a 10-foot length of 2-1/2" tubing filled with dry sand.

4. When work is resumed, pull sheet free before continuing installation.

K. Walkway Installation: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.3 CLEANING AND PROTECTION

A. From time to time during the progress of the work and at the completion of the work, remove all rubbish, debris, dirt, equipment and unused materials from the site. Clean adjoining surfaces which may have been soiled by roofing work.

B. Protect installed roofing from damage and abuse by other trades. Repair damages to watertight conditions at no additional cost to the Owner.

C. Exercise care to protect installed work. Work which does become damaged in any way or is not watertight, shall be repaired and/or replaced as directed to the satisfaction of Architect and/or Owner at no additional cost or time.

END OF SECTION

SECTION 076200

SHEET METAL FLASHING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the sheet metal flashing as indicated on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Stainless steel cap metal flashing.
 - 2. Stainless steel through-wall flashing.
 - 3. Field fabricating (including bending, cutting, soldering, etc.), if required, of stainless steel flashing.
 - 4. Stainless steel flashing elsewhere, where metal flashing is indicated on drawings.
 - 5. Separation of contacting surfaces of dissimilar metals.

1.3 RELATED SECTIONS

- A. Unit Masonry - Section 042000.
- B. Roofing - Division 7.

1.4 SUBMITTALS

- A. Shop Drawings: Submit, showing all materials, finishes, fastenings, joint details, fabrication, construction and relation to adjoining construction.
- B. Samples: Submit 12" x 12" samples of flashing materials and finishes.

1.5 WARRANTY

- A. The Contractor shall warrant that all Metal Flashing Work executed under this Section will be free from defects in materials and workmanship for a period of ten (10) years from date of acceptance of the Project, and he shall remedy any defects in the Metal Flashing Work.

1.6 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary at no additional cost to the Owner.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Stainless Steel Flashing Materials
 - 1. Stainless Steel Flashing: ASTM A 240, Type 304, stainless steel, with 2D finish, dead soft temper, fully annealed, as manufactured by International Nickel Co., Republic Steel Corp., United States Steel, or Washington Steel Corp. Thickness of stainless steel shall be as listed below.
 - a. Concealed Flashings: 0.012" thick, thirty (30) gauge (U.S. Standard).
 - b. Exposed Flashings: 0.015" thick, twenty-eight (28) gauge (U.S. Standard).
 - c. Edge Strips: 0.025" thick, twenty-four (24) gauge (U.S. Standard).
 - 2. Through-wall flashing shall have sawtooth ribs at three (3) inch intervals, as manufactured by Keystone Flashing Co., or approved equal.
 - 3. Accessories and Fastenings: AISI, Types 302 and 304 stainless steel.
 - 4. Solder: Composed of sixty (60) percent block tin and forty (40) percent pig lead, except that solder at seams exposed to public view shall be eighty (80) percent tin and twenty (20) percent lead.
 - 5. Flux: An acid type flux manufactured specifically for soldering stainless steel, as approved.
- B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type non-corrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where sheet metal flashing is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 METAL FLASHING INSTALLATION

- A. Reference Standard: Conform to the requirements of 7th Edition of the Sheet Metal and Air Conditioning Contractors Association (SMACNA) Architectural Sheet Metal Manual.
- B. General: Fabricate and install metal flashing work in accordance with details and specifications of above Reference Standard, with manufacturer's instructions, and as herein specified, to provide a watertight installation. Apply metal flashing to smooth, even, sound, clean, dry surfaces free from defects. Make provisions to allow for expansion and contraction of metal flashing work. Wherever practicable, shop form all metal flashing work and deliver ready for installation. Form metal flashing work accurately to required profiles, with flat surfaces, straight edges and corners, free from defects. Fold exposed metal edges back not less than 1/2" and form drip.
- C. Nailing: Confine to sheets twelve (12) inches or less in width. Confine nailing to one edge only, locate nails where concealed. Use No. 12 x 1" long flat headed, annular threaded, Type 302 stainless steel nails for nailing to wood blocking; use one (1) inch long masonry nails for nailing to concrete. Space nails four (4) inches o.c. maximum.
- D. Cleating: Use cleats where sheets are more than twelve (12) inches in width. Space cleats approximately twelve (12) inches o.c. Cleats two (2) inches wide by three (3) inches long, of the same material and weight as the metal flashing being installed. Secure one end of the cleat with two (2) nails and fold edge back over the nail heads. Lock other end into seam or into folded edge of metal flashing sheets. Pre-tin cleats for soldered seams.
- E. Joining: Join metal flashings with one (1) inch locked and soldered seams except at slip joints. Mallet seams flat and solder full length of seam as specified below.
- F. Soldering: Clean and pre-tin edges of metal flashing to be soldered before soldering is begun with solder on both sides for a width of not less than 1-1/2". Solder slowly with well heated metal surfaces. Use ample solder. Show not less than one full inch of evenly flowed solder on seam. Seams shall have a liberal amount of flux brushed in before soldering is commenced. Where soldering paste or killed acid is employed as a flux, soldering shall follow immediately after application of the flux. Upon completion of soldering, clean surfaces of all flux.
- G. Slip Joints: Locate slip joints not more than twenty-four (24) feet apart and not more than eight (8) feet from corners. Form slip joints as three (3) inch wide joints with cover piece behind flashing, and fill locked ends neatly with sealant.
- H. Cap Flashing: Install over base flashings, in eight (8) to ten (10) foot lengths, lapped six (6) inches at ends. Cap flashing shall be increased longitudinally to produce spring action to hold bottom edge of cap flashing firmly against base flashing. Cap flashing shall lap base flashing at least four (4) inches, with exposed bottom edge at a forty-five (45) degree angle downward and folded back on underside at least 1/2" to form drip. Make cap flashing continuous at corners and angles.

- I. Miscellaneous Flashing: Provide all other miscellaneous metal flashing not specifically mentioned herein, but indicated on drawings and/or required to provide a watertight installation.
- J. Separation of Dissimilar Materials: Back paint surfaces of metal flashing in contact with dissimilar metals or with concrete or masonry with bituminous paint.
- K. Reglets
 - 1. Provide watertight reglets in masonry and concrete work to receive cap flashing. Form reglets of stainless steel using same thickness as stainless steel sheet metal specified.
 - 2. In masonry work use open or closed slot reglets with slot at least one (1) inch deep and 3/16" wide. Provide hook dams or turn-ups for anchoring securely into mortar joints. Insert cap flashing into slot full depth using button punch or lead wedges to lock in place.
 - 3. In concrete work, use open or closed slot reglets with slot sloped upward at forty-five (45) degrees, at least one (1) inch deep and 3/16" wide. For fastening reglets to concrete forms use double-head stainless steel nails spaced twelve (12) inches apart maximum.
 - 4. Insert cap flashing full depth into reglet slot, and wedge in place using lead strips spaced on twelve (12) inch centers maximum or lead caulking rope. When lead strips are used for continuous caulked reglets, use approved weather-resistant fibrous compounds.
- L. Through-Wall Flashings: Provide through-wall flashings as shown. Form bonding features so as not to puddle water on surface. Lap cross joints to interlock design pattern at least three (3) inches. Stop typical flashings in mortar joint 1/2" from exterior face of wall.

END OF SECTION

SECTION 077100

ROOF SPECIALTIES AND ACCESSORIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the roof specialties and accessories as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:

- 1. Copper conductor heads and downspouts.

1.3 RELATED SECTIONS

- A. Roofing - Division 7.
- B. Sheet Metal Flashing - Section 076200.

1.4 SUBMITTALS

- A. Before any roof specialties and accessories are delivered to the job site, submit shop drawings showing profiles and anchoring devices.

1.5 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 COPPER CONDUCTOR HEADS AND DOWNSPOUTS

- A. Downspouts shall be manufactured in 10'-0" lengths, rectangular closed-face with mitered elbows, factory offset on one end to provide for a 3/4" telescope joint. Downspout shall contain a factory mounted back, non-sealed to allow seepage of water in overflow conditions.
 - 1. Elbows for downspouts shall be of welded construction, with matching finish applied after welding. Such finish shall be of quality equal to finish for non-

welded parts. Grinding and spray painting of parts to match will not be permitted. Elbows shall be provided with a factory offset on its lower end to allow a 3/4" telescope joint.

2. Provide wall brackets of compatible material to downspout with matching finish and color.
 3. Provide concrete splash blocks where indicated.
- B. Conductor Heads: Manufactured conductor heads with flanged back and stiffened top edge and of dimensions and shape indicated complete with outlet tubes, exterior flange trim, and built-in overflows.
- C. Copper Finish: Match existing.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where roof specialties and accessories are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. General: Comply with manufacturer's instructions and recommendations. Coordinate with installation of roof deck and other substrates to receive accessory units, and with roof insulation, roofing and flashing; as required to ensure that each element of the work performs properly, and that combined elements are waterproof and weathertight. Anchor units securely to supporting structural substrates, adequate to withstand lateral and thermal stresses as well as inward and outward loading pressures.
- B. Isolation: Where metal surfaces of units are to be installed in contact with non-compatible metal or corrosive substrates, including wood, apply bituminous coating on concealed metal surfaces, or provide other permanent separation.
- C. Downspouts
1. Install downspouts with brackets 24" o.c.; attach brackets to structure, use non-corrosive screw anchors.
 2. Join sections with manufacturer's standard telescoping joints. Provide fasteners designed to hold downspouts securely 1" away from walls, locate fasteners at top and bottom and at approximately 60" o.c. in between. Provide elbows at base of downspout to direct water away from building.
- D. Conductor Heads: Anchor securely to wall with elevation of conductor head rim 1 inch below scupper discharge.

3.3 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces in accordance with manufacturer's instructions. Touch up damaged metal coatings.

END OF SECTION

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SECTION 078413

FIRESTOPS AND SMOKESEALS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the firestops and smoke seals as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
 - 2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
 - 3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.
 - 4. Sealant joints in fire-resistance-rated construction.
 - 5. Penetrations at each floor level in shafts and/or stairwells.
 - 6. Construction joints, including those between top of fire rated walls and underside of floors above.

1.3 RELATED SECTIONS

- A. Cast-in-Place Concrete - Section 033000.
- B. Masonry - Division 4.
- C. Joint Sealers - Section 079200.
- D. Gypsum Drywall - Section 092900.
- E. Piping penetrations - Division 22.
- F. Duct penetrations - Division 23.
- G. Cable and conduit penetrations - Division 26.

1.4 REFERENCES

- A. ASTM E 814 "Standard Method of Fire Tests of Through-Penetration Firestops."
- B. UL 1479, UBC 7-5 (Both are same as A. above).
- C. ASTM E 119 "Standard Method of Fire Tests of Building Construction and Materials."
- D. UL 263, UBC 7-1 (Both are same as C. above).
- E. UL 2079 "Tests For Fire Resistance of Building Joint Systems."
- F. ASTM E 1399 "Test For Dynamic Movement Conditions."
- G. ASTM E 1966 (Same as E. above).
- H. ASTM G 21 "Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi."
- I. Test Requirements: ASTM E 2307, "Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus."
- J. Inspection Requirements: ASTM E 2174, "Standard Practice for On-site Inspection of Installed Firestops."
- K. Published Through-Penetration Systems by recognized independent testing agencies.
 - 1. UL Fire Resistance Directory, Volume II of current year.
 - 2. Warnock Hersey Certification Listings, current year.
 - 3. Omega Point Laboratories, current year.
- L. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments.

1.5 SUBMITTALS

- A. Submit manufacturer's product literature for each type of firestop material to be installed. Literature shall indicate product characteristics, typical uses, performance, limitation criteria, test data and indication that products comply with specified requirements.
- B. Submit shop drawings detailing materials, installation methods, and relationships to adjoining construction for each firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspection agency evidencing compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, for proposed UL listed (or equal) firestop and smoke seal assembly required for the Project.

- C. Material Safety Data Sheets: Submit MSDS for each firestop product.
- D. Submit qualifications of firestop installer, including letter from firestop manufacturer of products proposed to be installed, wherein manufacturer approves or recognizes as trained/ or certifies installer for installation of that manufacturer's products.
- E. Engineering Judgment: For those firestop applications that exist for which no qualified tested system is available through a manufacturer, an engineering judgment derived from similar qualified tested system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment documents must follow requirements set forth by the International Firestop Council.

1.6 QUALITY ASSURANCE

- A. General: Provide firestopping systems that are produced and installed to resist the spread of fire and the passage of smoke and other gases.
- B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single sole source firestop specialty contractor.
- C. Firestopping materials shall conform to Flame (F) and Temperature (T) ratings as required by local building code and as tested by nationally accepted test agencies per ASTM E 814 or UL 1479. The F-rating must be a minimum of one (1) hour, but not less than the fire resistance rating of the assembly being penetrated. T-rating, when required by code authority, shall be based on measurement of the temperature rise on the penetrating item(s). The fire test shall be conducted with a minimum positive pressure differential of 0.01 inches of water column.
 - 1. Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.
 - a. F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
 - b. T-Rating: When penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
 - c. W-Rating: Class 1 rating in accordance with water leakage test per UL 1479.
 - 2. Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.
 - a. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at both ambient and elevated temperatures.
- D. Firestopping products shall be asbestos free and free of any PCBs.
- E. Do not use any product containing solvents or that requires hazardous waste disposal.
- F. Do not use firestop products which after curing, dissolve in water.

- G. Do not use firestop products that contain ceramic fibers.
- H. Firestopping Installer Qualifications: Firestop application shall be performed by a single firestopping contractor who specializes in the installation of firestop systems, whose personnel to be utilized have received specific training and certification or approval from the proposed respective firestop manufacturer, and firestop installer shall have a minimum of three years' experience (under present company name) installing firestop systems of the type herein specified.
- I. Mock-Up: Prepare job site mock-ups of each typical Firestop System proposed for use in the project. Approved mock-ups will be left in place as part of the finished project and will constitute the quality standard for the remaining work.
- J. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
 - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 - 2. For floor penetrations with annular spaces exceeding 4 inches or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means.
 - 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- K. Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of less than or equal to 1 as determined by ASTM G 21.
- L. Firestopping Materials are either "cast-in-place" (integral with concrete placement) or "post-installed." Provide cast-in-place firestop devices prior to concrete placement.
- M. Firestop systems do not reestablish the structural integrity of load bearing partitions or assemblies, or support live loads and traffic. Installer shall consult the Structural Engineer prior to penetrating any load bearing assembly.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials in manufacturer's original unopened containers with manufacturer's name, product identification, lot numbers, UL or Warnock Hersey labels, and mixing and installation instructions, as applicable.
- B. Store materials in the original, unopened containers or packages, and under conditions recommended by manufacturer.
- C. All firestop materials shall be installed prior to expiration of shelf life.

1.8 PROJECT CONDITIONS

- A. Verify existing conditions and substrates before starting work
- B. Do not use materials that contain solvents, show sign of damage or are beyond their shelf life.

- C. During installation, provide masking and drop cloths as needed to prevent firestopping products from contaminating any adjacent surfaces.
- D. Conform to ventilation requirements if required by manufacturer's installation instructions or Material Safety Data Sheet.
- E. Weather Conditions: Do not proceed with installation of firestop products when temperatures are in excess or below the manufacturer's recommendations.
- F. Schedule installation of firestop products after completion of penetrating item installation but prior to covering or concealing of openings.
- G. Coordinate this work as required with work of other trades.

1.9 SEQUENCING AND SCHEDULING

- A. Pre-Installation Conference: Convene a pre-installation conference to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
- B. Sequence: Perform work of this and other sections in proper sequence to prevent damage to the firestop systems and to ensure that their installation will occur prior to enclosing or concealing work.
- C. Install all firestop systems after voids and joints are prepared sufficiently to accept the applicable firestop system.
- D. Do not cover firestop systems until they have been properly inspected and accepted by the authority having jurisdiction.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Subject to compliance with requirements, provide products of one of the following manufacturers:
 - 1. Tremco
 - 2. Bio-Fireshield
 - 3. 3M
 - 4. Specified Technologies Inc.
 - 5. U.S. Gypsum Co.
 - 6. Nelson
 - 7. Hilti, Inc.
 - 8. Grace Flame Safe

2.2 FIRESTOPPING, GENERAL

- A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.
- B. Accessories: Provide components for each firestopping system that are needed to install fill materials. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:
 - 1. Permanent forming/damming/backing materials including the following:
 - a. Semirefractory fiber (mineral wool) insulation.
 - b. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
 - c. Fire-rated form board.
 - d. Joint fillers for joint sealants.
 - 2. Temporary forming materials.
 - 3. Substrate primers.
 - 4. Collars.
 - 5. Steel sleeves.
- C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.
- D. Smoke seals at top of partitions shall be flexible to allow for partition deflection.
- E. Polypropylene Sleeves (PP) (for cast-in device options)

2.3 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

- A. Endothermic, Latex Compound Sealant: Single-component, endothermic, latex formulation.
- B. Intumescent, Latex Sealant: Single-component, Intumescent, latex formulation.
- C. Intumescent Putty: Non-hardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.
- D. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum or polyethylene foil on one side.
- E. Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E 136, with flame-spread and smoke-developed ratings of zero per ASTM E 84.

- F. Mortar: Prepackaged dry mix composed of a blend of inorganic binders, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.
- G. Pillows/Bags: Re-usable, heat-expanding pillows/bags composed of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.
- H. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed, expands and cures in place to produce a flexible, non-shrinking foam.
- I. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and non-sag formulation for openings in vertical and other surfaces requiring a non-slumping/gunnable sealant, unless firestop system limits use to non-sag grade for both opening conditions.
- J. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic or polypropylene sleeve lined with an intumescent strip, an extended rectangular flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- K. Fire Rated Cable Management Devices: Factory-assembled round metallic sleeve device for use with cable penetrations, containing an integrated smoke seal fabric membrane that can be opened and closed for re-penetration.
- L. Drop-In Firestop Devices: Factory-assembled devices for use with combustible or noncombustible penetrants in cored holes within concrete floors. Device shall consist of galvanized steel sleeve lined with an intumescent strip, an extended rectangular flange attached to one end of the sleeve for fastening to concrete floor, and neoprene gasket.
- M. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- N. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.
- O. Blocks/Plugs: Intumescent flexible block/plug suitable for reuse in re-penetration of openings. Blocks shall allow up to 12" of unreinforced annular space.
- P. Tub Box Kit: Cast-in place pre-formed plastic tub box kit with three support legs for use with drain piping assembly associated with bathtub installations.

2.4 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated that complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.

1. Sealant Colors: Color of exposed joint sealants as selected by the Architect.
 - B. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.
 1. Additional Movement Capability: Provide sealant with the capability to withstand 33 percent movement in both extension and compression for a total of 66 percent movement.
 - C. Multi-Component, Non-Sag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O.
 1. Additional Movement Capability: Provide sealant with the capability to withstand 40 percent movement in extension and 25 percent in compression for a total of 65 percent movement in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, and remain in compliance with other requirements of ASTM C 920 for uses indicated.
 - D. Single-Component, Non-Sag, Urethane Sealant: Type S; Grade NS; Class 25; and Uses NT, M, A, and (as applicable to joint substrates indicated) O.
- 2.5 MINERAL FIBER/CERAMIC WOOL NON-COMBUSTIBLE INSULATION (FIRE SAFING)
- A. Provide min. 4 pcf Thermafiber as manufactured by Thermafiber Co., min. 4 pcf FBX Safing Insulation as manufactured by Fibrex, or approved equal to suit conditions and to comply with fire resistance and firestop manufacturer's requirements.
 - B. Material shall be classified non-combustible per ASTM E 119.
- 2.6 MIXING
- A. For those products requiring mixing prior to application, comply with firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce firestopping products of uniform quality with optimum performance characteristics for application indicated.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions with Installer present, for compliance with requirements for opening configuration, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:
 - 1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
 - 2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form release agents from concrete.
- B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing seal of firestopping with substrates.

3.3 CONDITIONS REQUIRING FIRESTOPPING

- A. Building Exterior Perimeters
 - 1. Where exterior facing construction is continuous past a structural floor, and a space (i.e. construction joint) would otherwise remain open between the inner face of the wall construction and the outer perimeter edge of the structural floor, provide firestopping to equal the fire resistance of the floor assembly.
 - a. If mineral wool is part of firestop system, the mineral wool must be completely covered by appropriate thickness of UL or Warnock Hersey listed firestop sealant or spray.
 - b. Refer to Article 3.6 herein for description of fire safing insulation.
 - 2. Firestopping shall be provided whether or not there are any clips, angles, plates, or other members bridging or interconnecting the facing and floor systems, and whether or not such items are continuous.
 - 3. Where an exterior wall passes a perimeter structural member, such as a girder, beam, or spandrel, and the finish on the interior wall face does not continue up to close with the underside of the structural floor above, thus interrupting the fire-resistive integrity of the wall system, and a space would otherwise remain open between the interior face of the wall and the structural member, provide firestopping to continuously fill such open space.
- B. Interior Walls and Partitions

1. Construction joints between top of fire rated walls and underside of floors above, shall be firestopped.
 2. Firestop system installed shall have been tested by either UL or Omega Point, including exposure to hose stream test and including for use with steel fluted deck floor assemblies.
 3. Firestop system used shall allow for deflection of floor above.
- C. Penetrations
1. Penetrations include conduit, cable, wire, pipe, duct, or other elements which pass through one or both outer surfaces of a fire rated floor, wall, or partition.
 2. Except for floors on grade, where a penetration occurs through a structural floor or roof and a space would otherwise remain open between the surfaces of the penetration and the edge of the adjoining structural floor or roof, provide firestopping to fill such spaces in accordance with ASTM E 814.
 3. These requirements for penetrations shall apply whether or not sleeves have been provided, and whether or not penetrations are to be equipped with escutcheons or other trim. If penetrations are sleeved, firestop annular space, if any, between sleeve and wall of opening.
- D. Provide firestopping to fill miscellaneous voids and openings in fire rated construction in a manner essentially the same as specified herein before.

3.4 INSTALLING THROUGH PENETRATION FIRESTOPS

- A. General: Comply with the through penetrations firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for through penetration firestop systems by proven techniques to produce the following results:
1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.5 INSTALLING FIRE RESISTIVE JOINT SEALANTS

- A. General: Comply with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install joint fillers to provide support of sealants during application and at position required to produce the cross sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire resistance rating required.
- C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.
- D. Tool no sag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.6 INSTALLING FIRESAFING INSULATION

- A. Install fire safing insulation utilizing welded or screw applied galvanized steel impaling pins and retaining clips; space clips or pins 24" o.c. maximum.
- B. Completely fill voids in areas where safing insulation is required. At spandrel conditions/floor edges, depth of insulation top to bottom shall be at least four (4) inches.
- C. Cover top of all safing insulation with firestop sealant or spray.

3.7 FIELD QUALITY CONTROL

- A. Inspecting agency employed and paid by the Owner will examine completed firestopping to determine, in general, if it is being installed in compliance with requirements.
- B. Inspecting agency will report observations promptly and in writing to Contractor, Owner and Architect.
- C. Do not proceed to enclose firestopping with other construction until reports of examinations are issued.
- D. Where deficiencies are found, Contractor must repair or replace firestopping so that it complies with requirements.

3.8 CLEANING

- A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.

- B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to product firestopping complying with specified requirements.

END OF SECTION

SECTION 079200

JOINT SEALERS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. The Work of this Section includes all labor, materials, equipment and services necessary to complete the joint sealers work as shown on the drawings and/or specified herein, including but not necessarily limited to the following:
 - 1. Flashing reglets and retainers.
 - 2. Coping joints.
 - 3. Exterior wall joints not specified to be sealed in other Sections of work.
 - 4. Interior wall joints not specified to be sealed in other Sections of work, including caulking to fill between architectural woodwork and any wall, floor and/or ceiling imperfections.
 - 5. Control and expansion joints in walls.
 - 6. Joints at wall penetrations.
 - 7. Joints between items of equipment and other construction.
 - 8. All other joints required to be sealed to provide a positive barrier against penetration of air and moisture.

1.3 RELATED SECTIONS

- A. Masonry - Division 4.
- B. Roofing - Division 7.
- C. Firestop sealants - Section 078413.
- D. Glazing sealants - Section 088000.
- E. Sealant within drywall construction - Section 092900.
- F. Sealant at tile work - Section 093013.

1.4 QUALITY ASSURANCE

- A. Qualification of Installers: Use only personnel who are thoroughly familiar, skilled and specially trained in the techniques of sealant work, and who are completely familiar with the published recommendations of the sealant manufacturer.
- B. Pre-Construction Field Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to project joint substrates according to the method in ASTM C 794 and C 1521 that is appropriate for the types of Project joints.
- C. Perform testing per ASTM C 1248 on interior and exterior sealants to determine if sealants or primers will stain adjacent surfaces. No sealant work shall start until results of these tests have been submitted to the Architect and he has given his written approval to proceed with the work.

1.5 SUBMITTALS

- A. Shop Drawings: Submit shop drawings showing all joint conditions, indicating relation of adjacent materials, all sealant materials (sealant, bond breakers, backing, primers, etc.), and method of installation.
 - 1. Submit joint sizing calculations certifying that movement capability of sealant is not being exceeded.
- B. Samples: Submit the following:
 - 1. Color samples of sealants, submit physical samples (not color chart).
 - 2. Sealant bond breaker and joint backing.
- C. Product Data: Submit manufacturer's technical information and installation instructions for:
 - 1. Sealant materials, indicating that material meets standards specified herein.
 - 2. Backing rods.
- D. Submit manufacturer's certification as required by Article 1.6 herein.
- E. Submit results of testing required in Article 1.4 herein.

1.6 MANUFACTURER'S RESPONSIBILITY AND CERTIFICATION

- A. Contractor shall require sealant manufacturer to review the Project joint conditions and details for this Section of the work. Contractor shall submit to the Architect written certification from the sealant manufacturer that joints are of the proper size and design, that the materials supplied are compatible with adjacent materials and backing, that the materials will properly perform to provide permanent watertight, airtight or vaportight seals (as applicable), and that materials supplied meet specified performance requirements.

1.7 ENVIRONMENTAL CONDITIONS

- A. Temperature: Install all work of this Section when air temperature is above forty (40) degrees F. and below eighty (80) degrees F., unless manufacturer submits written instructions permitting sealant use outside of this temperature range.
- B. Moisture: Do not apply work of this Section on surfaces which are wet, damp, or have frost.

1.8 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this Section, before, during, and after installation, and to protect the installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.
- C. Storage
 - 1. Store sealant materials and equipment under conditions recommended by their manufacturer.
 - 2. Do not use materials stored for a period of time exceeding the maximum recommended shelf life of the material.
 - 3. Material shall be stored in unopened containers with manufacturers' name, batch number and date when shelf life expires.

1.9 WARRANTY

- A. Provide a written, notarized warranty from the manufacturer stating that the applied sealants shall show no material failure for a period of ten (10) years.
- B. Contractor to provide a written, notarized, warranty stating that the applied sealants shall show no failure due to improper installation for a period of five (5) years.
- C. Warranty shall be in a form acceptable to the Owner and executed by an authorized individual.
- D. Include in warranty provision, agreement to repair and/or replace, at Contractor's expense, sealant defects which develop during warranty period, because of faulty labor and/or materials.

PART 2 PRODUCTS

2.1 SEALANT MATERIALS

- A. Exterior Wall Sealant: Provide one (1) part non-sag sealant equal to No. 790 or 795 made by Dow Corning, "Silpruf SCS 2000" or "LM SCS 2700" made by G.E., "Spectrem 1" or "Spectrem 3" made by Tremco, or "Sonolastic 150" by Sonneborn conforming to the minimum standards of ASTM C 920, Type S, Grade NS, Class 50.

- B. Interior Sealant: Provide a one (1) part acrylic based sealant conforming to ASTM C 834, equal to "AC-20+ Silicone" made by Pecora, or equal made by Tremco.
- C. Colors: Colors selected from manufacturer's standard selection.

2.2 MISCELLANEOUS MATERIALS

- A. Back-Up Materials: Provide back-up materials and preformed joint fillers, non-staining, non-absorbent, compatible with sealant and primer, and of a resilient nature, equal to "HBR" made by Nomaco Inc. or approved equal, twenty-five (25) percent wider than joint width. Materials impregnated with oil, bitumen or similar materials shall not be used. Provide back-up materials only as recommended by sealant manufacturer in writing.
- B. Provide bond breakers, where required, of polyethylene tape as recommended by manufacturer of sealant.
- C. Provide primers recommended by the sealant manufacturer for each material to receive sealant. Note that each exterior joint must be primed prior to sealing.
- D. Provide solvent, cleaning agents and other accessory materials as recommended by the sealant manufacturer.
- E. Materials shall be delivered to the job in sealed containers with manufacturer's original labels attached. Materials shall be used per manufacturer's printed instructions.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where joint sealers are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. Sealant Installation Standard: Comply with instructions and recommendations of the manufacturer and in accordance with ASTM C 1193 for use of joint sealants as applicable to materials, applications and conditions required by this Project where more stringent installation requirements are specified herein, such requirements shall apply.
- B. Sample Section of Sealant
 - 1. During sealant installation work in exterior wall, the manufacturer of sealant shall send his representative to the site, under whose supervision a section of the wall (used as "control section") shall be completed for purposes of determining performance characteristics of sealant in joints. Architect shall be informed of time and place of such installation of control section.

2. Control section shall be installed according to specification given herein and shall not be considered as acceptable until written acceptance is provided by the Architect.
 3. Accepted control section shall be standard to which all other sealant work must conform.
- C. Supervision: The Contractor shall submit to the Architect written certification from the sealant manufacturer that the applicators have been instructed in the proper application of their materials. The Contractor shall use only skilled and experienced workmen for installation of sealant.
- D. Apply sealant under pressure with a hand or power actuated gun or other appropriate means. Gun shall have nozzle of proper size and provide sufficient pressure to completely fill joints as detailed. Neatly point or tool joint to provide the contour as indicated on the drawings.
- E. Preparation and Application
1. Thoroughly clean all joints, removing all foreign matter such as dust, oil, grease, water, surface dirt and frost. Sealant must be applied to the base surface. Previously applied film must be entirely removed.
 2. Stone, masonry and concrete surfaces to receive sealant shall be cleaned where necessary by grinding, water blast cleaning, mechanical abrading, or combination of these methods as required to provide a clean, sound base surface for sealant adhesion.
 - a. Do not use any acid or other material which might stain surfaces.
 - b. Remove laitance by grinding or mechanical abrading.
 - c. Remove loose particles present or resulting from grinding, abrading, or blast cleaning by blowing out joints with compressed air, oil and water free, or vacuuming joints prior to application of primer or sealant.
 3. Clean non-porous surfaces such as metal and glass chemically. Remove protective coatings on metallic surfaces by solvent that leaves no residue and is compatible with sealant. Use solvent and wipe dry with clean, dry lint free paper towels. Do not allow solvent to air dry without wiping. Clean joint areas protected with masking tape or strippable films as above after removal of tape film.
 4. Do not seal joints until they are in compliance with drawings, or meet with the control section standard.
 5. Joint Size and Sealant Size: Joints to receive sealant shall be at least 1/4" wide. In joint 1/4" to 3/8" wide, sealant shall be 1/4" deep. In joints wider than 3/8" and up to 1" wide, sealant depth shall be one half the joint width. For joints wider than 1", sealant depth shall be as recommended by the sealant manufacturer. Depth of joint is defined as distance from outside face of joint to closest point of the filler.

6. Primer: Thoroughly clean joints and apply primer to all surfaces that will receive sealant. Apply primer on clean, dry surfaces, and prior to installation of joint backing. Completely wet both inner faces of the joint with primer. Mask adjacent surfaces of joint with non-staining masking tape prior to priming. Apply primer with clean brush and only when temperature is above 45 deg. F.
7. Joint Backing: In joints where depth of joint exceeds required depth of sealant, install joint backing (after primer is dry) in joints to provide backing and proper joint shape for sealant. Proper shape for sealant is a very slight "hourglass" shape, with back and front face having slight concave curvature. Use special blunt T-shaped tool or roller to install joint backing to the proper and uniform depth required for the sealant. Joint backing shall be installed with approximately twenty-five (25) percent compressions. Do not stretch, twist, braid, puncture, or tear joint backing. Butt joint backing at intersections.
8. Bond Breaker: Install bond breaker smoothly over joint backing so that sealant adheres only to the sides of the joint and not backing.
9. Sealant Application: Apply sealant in accordance with the manufacturer's application manual and manufacturer's instructions, using hand guns or pressure equipment, on clean, dry, properly prepared substrates, completely filling joints to eliminate air pockets and voids. Mask adjacent surfaces of joint with non-staining masking tape. Force sealant into joint in front of the tip of the "caulking gun" (not pulled after it) and force sealant against sides to make uniform contact with sides of joint and to prevent entrapped air or pulling of sealant off of sides. Fill sealant space solid with sealant.
10. Tooling: Tool exposed joints to form smooth and uniform beds, with slightly concave surface conforming to joint configuration per Figure 4A in ASTM C 1193. Finished joints shall be straight, uniform, smooth and neatly finished. Remove masking tape immediately after tooling of sealant and before sealant face starts to "skin" over. Neatly remove any excess sealant from adjacent surfaces of joint, leaving the work in a neat, clean condition.
11. Replace sealant which is damaged during construction process.

END OF SECTION

SECTION 081113

STEEL DOORS AND FRAMES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the steel door and frame work as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Interior and exterior hollow metal doors and frames for fire-rated and unrated door openings.
 - 2. Interior hollow metal vision panels.
 - 3. Preparation of metal doors and frames to receive finish hardware, including reinforcements, drilling and tapping, as necessary.
 - 4. Preparation of hollow metal doors to receive glazing where required.
 - 5. Steel louvers for hollow metal doors.
 - 6. Furnishing anchors for building into drywall.
 - 7. Factory prime painting of work of this Section.

1.3 RELATED SECTIONS

- A. Carpentry - Section 062000, for installation of doors and frames.
- B. Wood Doors - Section 081416.
- C. Finish Hardware - Section 087100.
- D. Glass and Glazing - Section 088000.
- E. Gypsum Drywall - Section 092900.
- F. Painting and Finishing - Section 099000.

1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, compliance with standards referenced herein, sound and fire-resistance ratings, and finishes for each type of door and frame specified.

- B. Shop Drawings: Show fabrication and installation of doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, reinforcement for surface applied hardware, dimensions of profiles and hardware preparation, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessories.
- C. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Drawings.
 - 1. Coordinate glazing frames and stops with glass and glazing requirements.
- D. Oversize Construction Certification: For door assemblies required to be fire rated and exceeding limitations of labeled assemblies, submit certification of a testing agency acceptable to authorities having jurisdiction that each door and frame assembly has been constructed to comply with design, materials, and construction equivalent to requirements for labeled construction.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing custom steel doors and frames 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.
- B. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.
- C. Source Limitations: Obtain custom steel doors and frames through one source from a single manufacturer.
- D. Fire-Rated Door and Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated.
 - 1. Test Pressure: Test according to NFPA 252 or UL 10C. After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40" or less above the sill.
 - 2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with standard construction requirements for tested and labeled fire-protection-rated door assemblies except for size.
 - 3. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating as required by prevailing Building Code in 30 minutes of fire exposure.
- E. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled, by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite.

- F. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames palletted, wrapped, or crated to provide protection during transit and Project site storage. Do not use nonvented plastic.
- B. Inspect doors and frames, on delivery, for damage. Minor damage may be repaired provided refinished items match new work and are approved by Architect; otherwise, remove and replace damaged items as directed.
- C. Store doors and frames under cover at building site. Conform to the requirements of ANSI A 250-11-2001 for site storage unless more stringent requirements are noted herein. Place units on minimum 4-inch high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to permit air circulation.

PART 2 PRODUCTS

2.1 FABRICATION - GENERAL

- A. Fabricate hollow metal units to be rigid, neat in appearance and free from defects, warp or buckle. Accurately form metal to required sizes and profiles. Weld exposed joints continuously, grind, dress, and make smooth, flush and invisible. Metallic filler to conceal manufacturing defects is not acceptable.
- B. Unless otherwise indicated, provide countersunk flat Phillips or Jackson heads for exposed screws and bolts.
- C. Prepare hollow metal units to receive finish hardware, including cutouts, reinforcing, drilling and tapping in accordance with Finish Hardware Schedule and templates provided by hardware suppliers. Comply with applicable requirements of ANSI A115 "Specifications for Door and Frame Preparation for Hardware."
- D. Locate finish hardware as shown on final shop drawings in accordance with locations noted herein.

2.2 MANUFACTURERS

- A. Provide products manufactured by Steelcraft, Curries, Ceco Door Products, or approved equal meeting these specifications.

2.3 FRAMES

- A. Materials
 - 1. Frames for exterior openings shall be made of commercial grade cold-rolled steel conforming to ASTM A 1008, Type B not less than 14 ga., and shall have a hot dipped galvanized coating conforming to ASTM A 924 and A 653 with A60

coating. The zinc-alloy coating shall be a dull matte surface treated for paint adhesion.

2. Frames for interior openings shall be either commercial grade cold-rolled steel conforming to ASTM A 1008, Type B or commercial grade hot-rolled steel conforming to ASTM A 1011, Commercial Steel, Type B. Metal thickness shall be not less than sixteen (16) ga. for frames in openings 4'-0" or less in width; not less than fourteen (14) ga. for frames in openings over 4'-0" in width.

B. Design and Construction

1. All frames shall be welded units with integral trim, of the sizes and shapes shown on approved shop drawings. Unless otherwise noted, knock-down frames will not be accepted.
2. All finished work shall be strong and rigid, neat in appearance, square, true and free of defects, warp or buckle. Molded members shall be clean cut, straight and of uniform profile throughout their lengths.
3. Jamb depths, trim, profile and backbends shall be as shown on drawings.
 - a. Frames at drywall partitions shall be formed with double return backbends to prevent cutting into drywall surface.
4. Welded frames shall have corners mitered and reinforced and faces of welded frames shall be continuously back welded full depth and width of frame conforming to NAAMM Standard HMMA-820; face joints shall be hairline.
5. Minimum depth of stops shall be 5/8".
6. Frames for multiple or special openings shall have mullion and/or rail members which are closed tubular shapes having no visible seams or joints. All joints between faces of abutting members shall be securely welded and finished smooth.
 - a. Mullions shall have 16 ga. internal steel stiffeners welded not less than 4" o.c.
7. Hardware Reinforcements
 - a. Frames shall be mortised, reinforced, drilled and tapped at the factory for fully-templated mortised hardware only, in accordance with approved hardware schedule and templates provided by the hardware supplier. Where surface-mounted hardware is to be applied, frames shall have reinforcing plates.
 - b. Minimum thickness of hardware reinforcing plates shall be as follows:
 - 1). Hinge and pivot reinforcements - seven (7) ga., 1-1/4" x 10" minimum size.
 - 2). Strike reinforcements - twelve (12) gauge
 - 3). Flush bolt reinforcements - twelve (12) gauge
 - 4). Closer reinforcements - twelve (12) gauge
 - 5). Reinforcements for surface mounted hardware - twelve (12) gauge.

8. Floor Anchors
 - a. Provide adjustable floor anchors, providing not less than two (2) inch height adjustment.
 - b. Minimum thickness of floor anchors shall be fourteen (14) gauge.
 9. Jamb Anchors: Frames for installation in stud partitions shall be provided with steel anchors of suitable design, not less than eighteen (18) gauge thickness, securely welded inside each jamb as follows:
 - a. Frames up to 7'-6" height - four (4) anchors.
 - b. Frames 7'-6" to 8'-0" height - five (5) anchors.
 - c. Frames over 8'-0" height - five (5) anchors plus one additional for each 2'-0" or fraction thereof over 8'-0".
 10. Ceiling Struts: Minimum 3/8" thick x 2" wide steel.
 11. All frames shall be provided with a steel spreader temporarily attached to the feet of both jambs to serve as a brace during shipping and handling.
 12. Loose glazing stops shall be of cold rolled steel, not less than twenty (20) gauge thickness, butted at corner joints and secured to the frame with countersunk cadmium-or zinc-plated screws. Interior frames may be provided with snap-on glazing stops.
 13. Except on weatherstripped frames, drill stops to receive three (3) silencers on strike jambs of single door frames and two (2) silencers on heads of double-door frames.
- C. Finish: After fabrication, all tool marks and surface imperfections shall be removed, and exposed faces of all welded joints shall be dressed smooth. Frames shall then be chemically treated to insure maximum paint adhesion and shall be coated on all surfaces with one coat of rust-inhibitive baked-on alkyd primer standard with the manufacturer which is fully cured before shipment to a dry film thickness of 2.0 mils.

2.4 HOLLOW METAL DOORS

- A. Materials: Doors shall be made of commercial quality, level, cold rolled steel conforming to ASTM A 1008, Commercial Steel, Type B and free of scale, pitting or other surface defects. Face sheets for interior doors shall be not less than eighteen (18) gauge. Face sheets for exterior doors shall be not less than sixteen (16) gauge and shall have a hot dipped galvanized coating conforming to ASTM A 924 and A 653, A60 coating. The zinc alloy coating shall be a dull matte surface treated for paint adhesion.
- B. Design and Construction
 1. All doors shall be of the types and sizes shown on the approved shop drawings, and shall be fully welded seamless construction with no visible seams or joints on their faces or vertical edges. Minimum door thickness shall be 1-3/4".

2. All doors shall be strong, rigid and neat in appearance, free from warpage or buckles. Corner bends shall be true and straight and of minimum radius for the gauge of metal used.
3. Face sheets shall be stiffened by continuous vertical formed steel sections spanning the full thickness of the interior space between door faces. These stiffeners shall be not less than twenty two (22) gauge spaced not more than six (6) inches apart and securely attached to face sheets by spot welds not more than five (5) inches o.c. Spaces between stiffeners shall be sound deadened and thermal insulated the full height of the door with an inorganic non-combustible batt type material.
4. Door faces shall be joined at their vertical edges by a continuous weld extending the full height of the door. All such welds shall be ground, filled and dressed smooth to make them invisible and provide a smooth flush surface.
5. Top and bottom edges of all doors shall be closed with a continuous recessed steel channel not less than fourteen (14) gauge, extending the full width of the door and spot welded to both faces. Exterior doors shall have an additional flush closing channel at their top edges and, where required for attachment of weatherstripping, a flush closure also at their bottom edges. Openings shall be provided in the bottom closure of exterior doors to permit the escape of entrapped moisture.
6. Edge profiles shall be provided on both vertical edges of doors as follows:
 - a. Single-Acting Swing Doors: Beveled 1/8" in two (2) inches.
 - b. No square edge doors permitted.
7. Hardware Reinforcements
 - a. Doors shall be mortised, reinforced, drilled and tapped at the factory for fully templated hardware only in accord with the approved hardware schedule and templates provided by the hardware supplier. Where surface-mounted hardware (or hardware, the interrelation of which is to be adjusted upon installation - such as top and bottom pivots, floor closers, etc.) is to be applied, doors shall have reinforcing plates.
 - b. Minimum gauges for hardware reinforcing plates shall be as follows:
 - 1). Hinge and pivot reinforcement - seven (7) gauge.
 - 2). Reinforcement for lock face, flush bolts, concealed holders, concealed or surface mounted closers - twelve (12) gauge.
 - 3). Reinforcements for all other surface mounted hardware - sixteen (16) gauge.
8. Glass Moldings and Stops
 - a. Where specified or scheduled, doors shall be provided with hollow metal moldings to secure glazing by others in accordance with glass opening sizes shown on drawings.
 - b. Fixed moldings shall be securely welded to the door on the security side.

- c. Loose stops shall be not less than twenty (20) gauge steel, with mitered corner joints, secured to the framed opening by cadmium or zinc-coated countersunk screws spaced eight (8) inches o.c. Snap-on attachments will not be permitted. Stops shall be flush with face of door.
- 9. Louvers shall be sixteen (16) gauge sheet steel, stationary type, closely spaced inverted "V" blade design, flush with face sheets of door, integral with and welded to door. Fifty (50) percent free area, unless indicated otherwise on drawings.
- C. Finish: After fabrication, all tool marks and surface imperfections shall be dressed, filled and sanded as required to make all faces and vertical edges smooth, level and free of all irregularities. Doors shall then be chemically treated to insure maximum paint adhesion and shall be coated, on all exposed surfaces, with manufacturer's standard rust-inhibitive alkyd primer as specified for frames which shall be fully cured before shipment.
- D. Flatness: Doors shall maintain a flatness tolerance of 1/16" maximum, in any direction, including in a diagonal direction.

2.5 LABELED DOORS AND FRAMES

- A. Labeled doors and frames shall be provided for those openings requiring fire protection ratings as scheduled on drawings. Such doors and frames shall be labeled by Underwriters' Laboratories or other nationally recognized agency having a factory inspection service.
- B. If any door or frame specified by the Architect to be fire-rated cannot qualify for appropriate labeling because of its design, size, hardware or any other reason, the Architect shall be so advised before fabricating work on that item is started.

2.6 HARDWARE LOCATIONS

- A. The location of hardware on doors and frames shall be as noted in "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames" of the Door Hardware Institute unless otherwise required by prevailing Handicapped Codes.

2.7 CLEARANCES

- A. Fabricate doors and frames to meet edge clearances as follows:
 - 1. Jambs and Head: 1/8" plus or minus 1/16".
 - 2. Meeting Edges, Pairs of Doors: 1/8" plus or minus 1/16".
 - 3. Bottom: 3/8" at threshold; 3/4" if no threshold.
- B. Fire rated doors shall have clearances as required by NFPA 80.

2.8 MANUFACTURING TOLERANCES

- A. Manufacturing tolerance shall be maintained within the limits given in HMMA 841 of ANSI/NAAMM, current edition.

2.9 PREPARATION FOR FINISH HARDWARE

- A. Prepare door and frames to receive hardware:
 - 1. Hardware supplier shall furnish hollow metal manufacturer approved hardware schedule, hardware templates, and samples of physical hardware where necessary to insure correct fitting and installation.
 - 2. Preparation includes sinkages and cut-outs for mortise and concealed hardware.
- B. Provide reinforcements for both concealed and surface applied hardware:
 - 1. Drill and tap mortise reinforcements at factory, using templates.
 - 2. Install reinforcements with concealed connections designed to develop full strength of reinforcements.

2.10 REJECTION

- A. Hollow metal frames or doors which are defective, have hardware cutouts of improper size or location, or which prevent proper installation of doors, hardware or work of other trades, shall be removed and replaced with new at no cost.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where steel doors and frames are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. Refer to Section 062000 for installation procedures for all work of this Section.

END OF SECTION

SECTION 081416

WOOD DOORS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the wood doors as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Solid core flush wood doors.
 - 2. Fire-rated flush wood doors.

1.3 RELATED SECTIONS

- A. Carpentry - Section 062000, for installation of wood doors.
- B. Steel Doors and Frames - Section 081113, for hollow metal frames.
- C. Finish Hardware - Section 087100.
- D. Glass and Glazing - Section 088000.
- E. Painting and Finishing - Section 099000, for field painting of wood doors.

1.4 SUBMITTALS

- A. Product Data: Submit door manufacturer's product data, specifications and installation instructions for each type of wood door.
 - 1. Include details of core and edge construction and trim for openings.
 - 2. Include factory finish specifications.
 - 3. Include certifications to show compliance with specifications.
 - 4. Include certification to show compliance with AWI and WDMA requirements specified herein.
- B. Shop Drawings: Submit shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for finishing and other pertinent data.
 - 1. Include requirements for veneer matching.

- C. Submit samples of factory finishes applied to actual door face materials, approximately 8 by 10 inches for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards Illustrated"; latest edition "Premium" grade and WDMA "Extra Heavy Duty" Performance Level.
 - 1. Only manufacturers that are certified and listed by AWI to be QCP qualified are acceptable for this project.
 - 2. Provide letter of licensing for Project indicating that doors comply with requirements of grade specified.
- C. Fire Rated Wood Doors: Doors complying with Category A, Positive Pressure or Neutral Pressure testing standards per UBC 7-2-1997 and UL 10-C (UBC 7-2-1994 and UL 10B) that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated on Door Schedule, based on testing according to NFPA 252.
 - 1. Conform to prevailing Code requirements to determine which pressure standard (Positive or Neutral) is required.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) in excess of permitted standard noted in Article 2.2 herein, or show telegraphing of core construction in face veneers.

1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
2. Warranty shall be in effect for the life of the installation starting from date of Substantial Completion.

PART 2 PRODUCTS

2.1 SOLID CORE FLUSH WOOD DOORS

- A. Provide AWI PC-5 Premium Grade hot pressed 5-ply solid core particleboard doors, 1-3/4" thick, conforming to standards specified herein. Subject to meeting standards specified herein, the following manufacturers are acceptable: Marshfield Door Systems, Inc., Algoma Hardwoods Inc., or Eggers Industries.
 1. Core shall consist of a formed flat panel consisting of wood particles bonded together with synthetic resins or other added binder, with an average density of 30 to 32 lbs. per cubic foot. The material shall meet or exceed the requirements of ANSI A208.1, Grade 1-LD-2 covering mat formed particleboard with face screw holding of 124 lbs., modulus of rupture of minimum 700 psi and modulus of elasticity of not less than 148,000 psi.
 2. Core shall be capable of satisfying this WDMA TM-7 cycle slam test for 1 million slams for surface mounted hardware. Where the manufacturer's core does not meet this criterion, stiles and rails must measure a minimum of 5-1/2" and must be fabricated of hardwood.
 - a. Surface mounted hardware must be installed with minimum 1-1/4" screw penetrations using threaded to the head screws; coordinate with Section 087100.
- B. Cross Bands: Shall be 1/16" thick hardwood extending full width of door and laid with grain at right angles to face veneers. Cross bands and faces shall be laminated to the core with Type I MF or PVA glue.
- C. Stiles, Rails: Stile and rail shall be a minimum of 1-3/8" solid hardwood or structural composite lumber (after trimming) laminated to the core. Stiles and rails must be securely glued to the core with no voids allowed. Stiles and rails must be capable of screw holding of 550 lbs. per WDMA TM-10.
- D. Transparent Finish: Finish in the shop with clear satin catalyzed polyurethane finish conforming to AWI System "Catalyzed Polyurethane Transparent."
 1. Doors with transparent finish to have center balanced, slip matched, quarter sliced, Select veneer of wood species selected by the Architect. Veneer to conform to AWI, "AA" grade veneer with 3" wide leaf. Minimum veneer thickness shall be not less than 1/50" after sanding.
 2. Veneers shall be continuous or end matched at transoms.

- E. Opaque Finish: For doors to be field painted, shop prime on all surfaces with one coat of alkyd wood primer applied to a dry film thickness of 1.5 mils.
 - 1. Doors to be field painted shall have MDO or hardboard face.
- F. Where glass lites are noted, factory cut openings. Trim openings with solid hardwood moldings of same type of wood as face veneer. Lite openings in 20-minute rated doors shall have manufacturer's 20-minute approved hardwood system.
- G. Doors shall have hinge-loading capacity of 500 lbs. per WDMA TM-8.
- H. Vertical door edge must be capable of screw holding of 550 lbs. per WDMA TM-10; horizontal door edge must be capable of screw holding of 400 lbs. per WDMA TM-10.
- I. Fire-Rated Wood Doors: Provide mineral core 1-3/4" thick solid core wood doors conforming to standards specified herein, manufactured by one of the manufacturers noted above. Stile construction on both stiles shall conform to the following:
 - 1. Stile edge screw withdrawals when tested in accordance with ASTM D 1037-78 shall exceed 650 lbs. This applies to both stiles.
 - 2. Stile edge split resistance when tested in accordance with ASTM D 143-52 (78) Modified must exceed 950 lbs. This applies to both stiles.
 - 3. Door to have face finish as specified above.
 - a. Where the core is free of urea formaldehyde, provide a layer of veneer over the substrate prior to application of finish veneer to prevent telegraphing of patterns from the adhesive.
 - 4. Blocking: For surface mounted hardware only, provide composite blocking designed to maintain fire resistance of door but with improved screw-holding capability of same thickness as core and with minimum dimensions as follows:
 - a. 5-inch top rail blocking.
 - b. 5-inch bottom rail blocking.
 - c. 1 – 5" x 18" lock block at cylinder or mortise locksets.
 - d. 2 – 5" x 18" lock blocks at exit devices.
 - 5. Pairs: Provide fire-rated pairs with fire-retardant stiles that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals.

2.2 FABRICATION

- A. Prefit and premachine wood doors at the factory.
- B. Comply with the tolerance requirements specified herein. Machine doors for hardware requiring cutting of doors. Comply with final hardware scheduled and door frame shop drawings, and with hardware templates and other essential information required to ensure proper fit of doors and hardware.

- C. Take accurate field measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with machining in the factory.
- D. Doors shall be factory sized to door opening so that trimming and fitting are not required in the field.
- E. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances unless otherwise indicated.
 - 1. Three-degree bevel or bevel to suit frame sizes indicated, with 3/16" prefit in width, +0/-1/32" tolerances. Prefit top of door 1/8" + 1/16"/-0" and undercut as required by floor condition. Undercut shall not exceed 1/8" from bottom of door to top of finished floor; where threshold occurs undercut shall not exceed 1/8" from bottom of door to top of threshold.
 - 2. Comply with requirements in NFPA 80 for fire-rated doors.
- F. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3 unless otherwise noted. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
 - 1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
 - 2. Provide concealed intumescent seals at fire-rated pairs of doors meeting the requirements of U.L. 10 C.
- G. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kinds of doors required.
- H. Once doors are installed, maximum allowable warp, bow, cut or twist in doors shall be 1/16" as measured by the 1/16-inch feeler gauge and a straight-edge extending from corner to corner of the door face at stiles, top and bottom rails and along both diagonals.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Refer to Section 062000 for installation of wood doors.

END OF SECTION

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SECTION 083113

ACCESS DOORS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the access doors as indicated on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Frameless recessed panel access doors at drywall ceilings and walls.
 - 2. Framed flush panel access doors at masonry and tile walls.
 - 3. Provide access doors and frames for access from occupied spaces to the following, where indicated or required, and as directed by the trades of Divisions 23 and 26.
 - a. All shutoff or balancing valves.
 - b. Fire dampers, as required.
 - c. Points of duct access.
 - d. Pull boxes.
 - e. Controls of mechanical and electrical items.
 - f. Masonry shafts for pipes and conduits, as required.
 - g. Pipe spaces, if required.
 - h. Inlets of fans.
 - i. Fusible link and splitter damper at filter bank.
 - j. Automatic damper and motor.
 - k. Equipment not otherwise accessible.

1.3 RELATED SECTIONS

- A. Masonry - Division 4.
- B. Gypsum Drywall - Section 092900.
- C. Ceramic Tiling - Section 093013.
- D. Valves and connections - Division 23.

1.4 QUALITY ASSURANCE

- A. For actual installation of the work of this Section, use only personnel who are thoroughly familiar with the manufacturer's recommended methods of installation and who are completely trained in the skills required.
- B. Fire-Resistance Ratings: Wherever a fire-resistance classification is shown, or for construction where access doors are installed, provide required access door assembly with panel door, frame, hinge and latch from manufacturers listed in Underwriters' Laboratories, Inc. "Classified Building Materials Index" for the rating shown.
 - 1. Provide UL label on each access panel.
 - 2. Provide flush, key operated cylinder lock.
- C. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units which may vary slightly from sizes shown or scheduled.

1.5 SUBMITTALS

- A. Before any materials of this Section are delivered to the job site, submit complete manufacturer's literature to the Architect. Submit plans and schedules showing size and location of each and every access door for Architect's acceptance prior to installation.

1.6 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

PART 2 PRODUCTS

2.1 MATERIALS AND FABRICATION

- A. Provide access door assembly manufactured by Milcor Inc, Nystrom Inc., Karp Associates, Inc., or approved equal. Assembly shall be an integral unit complete with all parts and ready for installation.
- B. Fabricate units of continuous welded steel construction. Grind welds smooth and flush with adjacent surfaces. Provide attachment devices and fasteners of the type required to secure access panels to the types of supports shown.
- C. Frames for Masonry and Tile Wall Only (Flush Panel Units): Fabricate frame from sixteen (16) gauge steel. Provide frame with exposed flange not less than one (1) inch wide around perimeter of frame for exposed masonry and tile finishes.
 - 1. For installation in masonry construction, provide frames with adjustable metal masonry anchors.

- D. Frameless Units for Drywall Surfaces (Recessed Panel Units): Provide access doors without exposed frames for drywall adhered to recessed panel.
- E. Panels: Fabricate from fourteen (14) gauge steel, with concealed spring hinges set to open to 175 degrees. Provide removable pin type hinges of the quantity required to support the access panel sizes used in the work. Finish with manufacturer's factory applied baked enamel prime coat applied over phosphate protective coating on steel.
- F. Locking Devices
 - 1. For non-rated access doors, provide flush, screwdriver operated cam locks of number required to hold door in flush, smooth plane when closed.
 - 2. For fire rated doors, provide locks as described in paragraph 1.4, B. herein.
- G. Inserts and Anchorage: Furnish inserts and anchoring devices which must be built into masonry for the installation of access panels. Provide setting drawings, templates, instructions, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where access doors are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 COORDINATION

- A. Coordinate all work with the mechanical trades to insure proper locations and in a timely manner to permit orderly progress of the total work.
- B. Set frames accurately in position and securely attach to supports with face panels plumb or level in relation to adjacent finish surfaces.
- C. Adjust hardware and panels after installation for proper operation.
- D. Remove and replace panels or frames which are warped, bowed, or otherwise damaged.

END OF SECTION

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SECTION 087100
DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Mechanical door hardware for the following:
 - a. Swinging doors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Details of electrified door hardware, indicating the following:
 - 1. Wiring Diagrams: For power, signal, and control wiring and including the following:
 - a. Details of interface of electrified door hardware and building safety and security systems.
 - b. Schematic diagram of systems that interface with electrified door hardware.
 - c. Point-to-point wiring.
 - d. Risers.
 - e. Elevations doors controlled by electrified door hardware.
 - 2. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.
- C. Other Action Submittals:
 - 1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - a. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
 - b. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule." Double space entries, and number and date each page.

- c. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
- d. Content: Include the following information:
 - 1) Identification number, location, hand, fire rating, size, and material of each door and frame.
 - 2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - 4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.
 - 5) Fastenings and other pertinent information.
 - 6) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 7) Mounting locations for door hardware.
 - 8) List of related door devices specified in other Sections for each door and frame.
- 2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and Architectural Hardware Consultant.
- B. Product Certificates: For electrified door hardware, from the manufacturer.
 - 1. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
- C. Product Test Reports: For compliance with accessibility requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.
- D. Warranty: Special warranty specified in this Section.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 - 1. Warehousing Facilities: In Project's vicinity.
 - 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.

3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as follows:
 1. For door hardware, an Architectural Hardware Consultant (AHC).
- C. Source Limitations: Obtain each type of door hardware from a single manufacturer as much as possible.
 1. Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- D. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.
- E. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
 1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg of water.
- F. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- G. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and Texas Accessibility Guidelines.
 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
 - b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
 4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.
- H. Keying Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." In addition to Owner, Construction Manager, Contractor, and Architect, conference participants shall also include supplier's Architectural Hardware Consultant and Owner's security consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 2. Preliminary key system schematic diagram.
 3. Requirements for key control system.
 4. Requirements for access control.
 5. Address for delivery of keys.
- I. Preinstallation Conference: Conduct conference at Project site.
1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 2. Inspect and discuss preparatory work performed by other trades.
 3. Inspect and discuss electrical roughing-in for electrified door hardware.
 4. Review sequence of operation for each type of electrified door hardware.
 5. Review required testing, inspecting, and certifying procedures.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.
- D. Deliver keys and permanent cores to Owner by registered mail overnight package service, or in person.

1.8 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware, caused by product defects.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
 - a. Exit Devices: Three years from date of Substantial Completion.
 - b. Manual Closers: 10 years from date of Substantial Completion.

1.10 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.
- B. Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door and door hardware operation. Provide parts and supplies that are the same as those used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled in Part 3 "Door Hardware Schedule" to comply with requirements in this Section.
 - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products only.
 - 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required no substitutions. Manufacturers' names are abbreviated in Part 3 "Door Hardware Schedule" Article.

2.2 HINGES

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. McKinney; an ASSA ABLOY Group Company.

2.3 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Mortise Locks: Minimum 3/4-inch latchbolt throw.
 - 2. Deadbolts: Minimum 1-inch bolt throw.
- C. Lock Backset: 2-3/4 inches, unless otherwise indicated.
- D. Lock Trim:
 - 1. Description: As indicated on Drawings.
 - 2. Levers: Wrought.
 - 3. Full Plate Escutcheons: Wrought.
 - 4. Dummy Trim: Match lock trim and escutcheons.
 - 5. Operating Device: Lever with Full Plate escutcheons.
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
- F. Mortise Locks: BHMA A156.13; Operational Grade 1; stamped steel case with steel or brass parts; Series 1000.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.
- G. Push-Pull Latches: Bored, BHMA A156.2; Series 4000 Mortise, BHMA A156.13; Grade 1; with paddle handles that retract latchbolt; capable of being mounted vertically or horizontally.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.

2.4 LOCK CYLINDERS

- A. Provide to all locking devices 6 pin interchangeable core.
- B. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
 - 1. Manufacturer: Same manufacturer as for locking devices.

2. Manufacturers: Subject to compliance with requirements, provide products by one of the:
 - a. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.
- C. Standard Lock Cylinders: BHMA A156.5; Grade 1; permanent cores that are interchangeable; face finished to match lockset.
- D. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

2.5 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
 1. Great-Grand Master Key System: Change keys, a master key, a grand master key, and a great-grand master key operate cylinders.
 2. Existing System:
 - a. Master key or grand master key locks to Owner's existing system. Verify and insure to match existing.
- B. Keys: Nickel silver.
 1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: "DO NOT DUPLICATE."
 2. Quantity: In addition to one extra key blank for each lock, provide the following:
 - a. Cylinder Change Keys: Three.
 - b. Master Keys: Five.
 - c. Grand Master Keys: Five.
 - d. Great-Grand Master Keys: Five.

2.6 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. LCN Closers; an Ingersoll-Rand company.

2.7 MECHANICAL STOPS AND HOLDERS

- A. Wall- and Floor-Mounted Stops: BHMA A156.16; Stainless Steel base metal.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. National Guard Products (NGP).

2.8 OVERHEAD STOPS AND HOLDERS

- A. Overhead Stops and Holders: BHMA A156.8.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Glynn-Johnson; an Ingersoll-Rand company.

2.9 DOOR GASKETING

- A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. National Guard Products.

2.10 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch- thick, finish as indicated; with manufacturer's standard machine or self-tapping screw fasteners.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. IVES Hardware; an Ingersoll-Rand company.

2.11 FABRICATION

- A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.
 - 1. Manufacturer's identification is permitted on rim of lock cylinders only.
- B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
- C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
 - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
 - 2. Fire-Rated Applications:

- a. Wood or Machine Screws: For the following:
 - 1) Hinges mortised to doors or frames; use threaded-to-the-head wood screws for wood doors and frames.
 - 2) Strike plates to frames.
 - 3) Closers to doors and frames.
- b. Steel Through Bolts: For the following unless door blocking is provided:
 - 1) Surface hinges to doors.
 - 2) Closers to doors and frames.
 - 3) Surface-mounted exit devices.
- 3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
- 4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
- 5. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.12 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

- B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Furnish permanent cores to Owner for installation.
- E. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- F. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- G. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

3.4 FIELD QUALITY CONTROL

- A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.
 - 1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
 - 2. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors, door hardware, and electrified door hardware.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DOOR HARDWARE SCHEDULE: The Hardware Schedule represents the hardware per leaf. Any door not scheduled shall have hardware and similar door and similar function. All doors shall be provided with Hardware as a part of the Basic Bid.

LEGEND

CR = CORBIN RUSSWIN
LCN = LCN
MK = MCKINNEY
RO = ROCKWOOD

HW – 1 (TOILET ROOM)

DOORS: #1RR1, 1RR2, 2RR1, 2RR2, 3RR1, 3RR2

1½	PAIR BUTTS	MPB68 – 4 ½ X 4 ½	MK	US26D
1	DOOR PULL	BF111 x 70C	RO	US32D
1	PUSH PLATE	70F 8 x 16	RO	US32D
1	CLOSER	4040 XP 180 REG/PA TBWMS	LCN	AL
1	WALL BUMPER	406	RO	US32D
3	DOOR SILENCERS	608-RKW	RO	GREY

HW – 2 (TOILET ROOM – PRIVATE)

DOORS: #1RR4, 1RR3

1½	PAIR BUTT	MPB68 – 4 ½ X 4 ½	MK	US26D
1	MORTISE LOCK	ML2060 x LWM x CL6	CR	626
1	CLOSER	4040 XP x P REG/PA TBWMS	LCN	AL
1	WALL BUMPER	406	RO	US32B
3	DOOR SILENCERS	608-RKW	RO	GREY

HW – 3 (STORAGE ROOM, IT CLOSETS)

DOORS: #108A, 108D, 108E, 209, 210, 303A, 311A, 1COMM1, 1COMM2, 2COMM1, 2COMM2, 3COMM1

1½	PAIR BUTTS	MPB68 - 4 ½ X 4 ½	MK	US26D
1	MORTISE LOCK	ML2057 x LWM	CR	626
1	CLOSER	4040 XP REG/PA TBWMS	LCN	AL
1	WALL BUMPER	406	RO	US32D
3	DOOR SILENCERS	608-RKW	RO	GREY

HW – 4 (EXISTING SINGLE DOOR - STORAGE ROOM, CLOSET, MECHANICAL)

DOORS #108D, 1CUST1, 1CUST2, 1ELEC1, 212, 2CUST5 (2 DOORS), 2MECH7, 3CUST1, 3CUST6

1½	PAIR BUTTS	MPB68 - 4 ½ X 4 ½	MK	US26D
1	MORTISE LOCK	ML2057 x LWM	CR	626
1	CLOSER	4040 XP REG/PA TBWMS	LCN	AL
1	WALL BUMPER	406	RO	US32D
3	DOOR SILENCERS	608-RKW	RO	GREY

HW – 5 (EXISTING PAIR DOORS - STORAGE ROOM, MECHANICAL)

DOORS #105B, 1MECH3, 1MECH4, 1ELEC1, 2MECH4, 2MECH5, 3MECH8, 3MECH9

3	PAIR BUTTS	MPB68 - 4 ½ X 4 ½ FTMS	MK	US26D
2	FLUSH BOLTS	557	RO	US26D
1	MORTISE LOCK	ML2057 x LWM	CR	626
1	CLOSER	4040 XP REG/PA TBRST	LCN	AL
2	WALL BUMPERS	406	RO	US32D
1	DUST PROOF STIKE	570	RO	US26D
2	DOOR SILENCERS	608-RKW	RO	GREY

END OF SECTION

SECTION 092900

GYPSUM DRYWALL

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the gypsum drywall as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Gypsum board work for partitions, ceilings, furring, and elsewhere where gypsum drywall work is shown on drawings.
 - 2. Metal supports for gypsum drywall construction.
 - 3. Acoustical insulation for gypsum drywall work.
 - 4. Sealant for gypsum drywall work.
 - 5. Concealed metal reinforcing for attachment of railings, toilet partitions, and other items supported on drywall partitions and walls.
 - 6. Taping and finishing of drywall joints.
 - 7. Installing rings and frames in drywall surfaces for grilles, registers and lighting fixtures.
 - 8. Bracing and connections.

1.3 RELATED SECTIONS

- A. Thermal Insulation - Section 072100.
- B. Hollow metal door frames - Section 081113.
- C. Access Doors - Section 083113.
- D. Painting and Finishing - Section 099000.
- E. Rings for grilles, registers and light fixtures - Division 23 and 26.

1.4 QUALITY ASSURANCE

- A. The following standards, as well as other standards which may be referred to in this Section, shall apply to the work of this Section:

1. The Gypsum Construction Handbook, latest edition, USG.
 2. Construction Guide, latest edition, National Gypsum.
 3. ASTM A 568 "Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements For"
 4. ASTM C 475 "Standard Specification for Joint Treatment Materials for Gypsum Wallboard Construction"
 5. ASTM C 645 "Standard Specification for Non-Structural Steel Framing Members"
 6. ASTM C 754 "Standard Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products"
 7. ASTM C 840 "Standard Specification for Application and Finishing of Gypsum Board"
 8. ASTM C 919 "Standard Specification for Use of Sealants in Acoustical Applications"
 9. ASTM C 954 "Standard Specification for Steel Drill Screws for the Application of Gypsum Board or Metal Plaster Bases to Steel Studs From 0.033 in. to 0.112 in. in Thickness"
 10. ASTM C 1002 "Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Board"
 11. ASTM C 1177 "Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing"
 12. ASTM C 1178 "Standard Specification for Glass Mat Water Resistant Gypsum Backing Board"
 13. ASTM C 1278 "Standard Specification for Fiber-Reinforced Gypsum Panel"
 14. ASTM C 1396 "Standard Specification for Gypsum Board"
 15. ASTM D 3273 "Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber"
- B. Allowable Tolerances: 1/32" offsets between planes of board faces, and 1/16" in 8'-0" for plumb, level, warp and bow.
- C. System Design Load
1. Provide standard drywall wall assemblies designed and tested by manufacturer to withstand a lateral load of 5 lbs. per sq. ft. for the maximum wall height required, and with deflection limited to L/240 of partition height.
 - a. Drywall assemblies with tile finish shall have a deflection limit of L/360.

2. Provide drywall ceiling assemblies designed, fabricated and installed to have a deflection not to exceed $L/360$.
- D. Fire-Resistance Rating: Where gypsum drywall with fire resistance ratings are indicated, provide materials and installations which are identical with those of applicable assemblies tested per ASTM E 119 by fire testing laboratories, or to design designations in UL "Fire Resistance Directory" or in listing of other testing agencies acceptable to authorities having jurisdiction, and compliant with UL Test #2079; criteria for cycle movement for all field height wall sections requiring allowance for vertical deflection within framing details.
- E. Installer: Firm with not less than 5 years of successful experience in the installation of specified materials.

1.5 SUBMITTALS

- A. Submit shop drawing for each drywall partition, furring and ceiling system showing size and gauges of framing members, hanger and anchorage devices, wallboard types, insulation, sealant, methods of assembly and fastening, control joints indicating column lines, corner details, joint finishing and relationship of drywall work to adjacent work.
- B. Samples: Each material specified herein, 12" x 12", or 12" long, or in manufacturer's container, as applicable for type of material submitted.
- C. Manufacturer's Literature: Submit technical and installation instructions for each drywall partition, furring and ceiling system specified herein, and for each fire-rated and sound-rated gypsum board assembly. Submit other data as required to show compliance with these specifications, including data for mold resistant joint compound.
- D. Test Reports: This Contractor shall submit test report, obtained by drywall manufacturer, indicating conformance of drywall assemblies to required fire ratings and sound ratings.

1.6 PRODUCT HANDLING AND PROTECTION

- A. Deliver, store and handle drywall work materials to prevent damage. Deliver materials in their original, unopened containers or bundles, and store where protected from moisture, damage and from exposure to the elements. Store wallboard in flat stacks.
- B. Protect wallboard from becoming wet.

1.7 ENVIRONMENTAL CONDITIONS

- A. Provide and maintain minimum temperature of fifty-five (55) degrees F. and adequate ventilation to eliminate excessive moisture within the building in the area of the drywall work for at least twenty-four (24) hours, prior to, during and after installation of drywall work. Installation shall not start until windows are glazed and doors are installed, unless openings are temporarily closed. Space above suspended ceilings shall be vented sufficiently to prevent temperature and pressure build up.

1.8 JOB MOCK-UP

- A. At a suitable location, where directed by the Architect, lay up a portion of a finished wall and ceiling demonstrating the quality of work, including finishing, to be obtained under this Section. Omit drywall boards in locations as directed by the Architect to show stud spacing and attachments; after acceptance, complete assembly.
- B. Adjust the finishing techniques as required to achieve the finish required by the Architect as described in this Section of these specifications.
- C. Upon approval of the mock-up, the mock-up may be left in place as a portion of the finished work of this Section.
- D. All drywall work shall be equal in quality to approved mock-up.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturers for Gypsum Drywall Panels and Accessories: U.S. Gypsum Co., Georgia Pacific, CertainTeed Corporation, Continental Building Products, or National Gypsum Co. meeting specification requirements are acceptable.
 - 1. All drywall products must be manufactured in North America.
- B. Acceptable Manufacturers for Metal Supports of Drywall Assemblies: Unless otherwise noted, provide products manufactured by ClarkDietrich Building Systems, Super Stud Building Products, Marino/Ware, or approved equal.

2.2 METAL SUPPORTS

- A. Metal Floor and Ceiling Runners
 - 1. Channel Type: Formed from 20 U.S. Std. gauge (unless otherwise noted) galvanized steel, width to suit channel type metal studs. Use 20 ga. top runners with 1-1/4" minimum flanges.
 - 2. Ceiling runners and head of wall connections at rated partitions shall conform to UL #2079 for cycle movement. Provide positive mechanical connection of framing to structure, allowing for vertical movement within connections. Minimum of 20 ga. galvanized steel for clips, 25 ga. galvanized steel for ceiling runners. Providing a friction free – anti-seizure movement capacity.
 - a. As manufactured by the Steel Network, VertiClip or VertiTrack or equal made by Metal-Lite Inc.
 - b. FireTrak (including stud clips) by FireTrak Corp. or equal made by Metal-Lite Inc.

B. Metal Studs, Framing and Furring

1. Channel Type Studs: Channel type with holes for passage of conduit formed from minimum 20 U.S. Std. gauge (unless heavier gauge is required to meet deflection limits) galvanized steel, width as shown on drawings.
2. Furring Channels: Hat shaped, formed from galvanized steel, 25 U.S. Std. gauge.
3. Continuous 16 gauge x 8" wide steel wall plate screwed to studs as required for support of railings, toilet partitions and other items supported on drywall partitions and walls.

C. Suspended Ceiling and Fascia Supports

1. Main Runners: 1-1/2" steel channels, cold rolled at 0.475 lbs. per ft., rust-inhibitive paint finish.
2. Furring Members: Screw-type hat-shaped furring channels of 25 ga. zinc-coated steel; comply with ASTM C 645.
3. Hangers: Galvanized, 1" x 3/16" flat steel slats capable of supporting 5x calculated load supported.
4. Hanger Anchorages: Provide inserts, clips, bolts, screws and other devices applicable to the required method of structural anchorage for ceiling hangers. Size devices for 5x calculated load supported.
5. Furring Anchorages: 16 ga. galvanized wire ties, manufacturer's standard clips, bolts or screws as recommended by furring manufacturer.

D. All galvanized steel members shall have coating conforming to ASTM A 653, G60.

2.3 GYPSUM WALLBOARD TYPES

- A. Gypsum Wallboard: 5/8" thick "Sheetrock" by USG, "Gold Bond" by National Gypsum, or "Regular Gypsum" by CertainTeed Corp., 48" wide, in maximum lengths available to minimize end-to-end butt joints.
- B. Gypsum Ceiling Board: 5/8" thick, sag-resistant, long edges tapered.
- C. Fire-Rated Gypsum Wallboard: 5/8" thick "Sheetrock Firecode C" by USG, "Firecheck Type C" by Lafarge/Continental, "Gold Bond Fireshield" by National Gypsum, or "Type C" and "Type X" by CertainTeed Corp., 48" wide, in maximum lengths available to minimize end-to-end butt joints.
- D. Water-Resistant Backing Board for Tile Finish: 5/8" thick, "DUROCK Glass Mat Tile Backerboard" by USG, "Dens-Shield Tile Backer Board" by Georgia Pacific, or "DiamondBack Tile Backer" by CertainTeed Corp. Cover joints with a pressure sensitive woven glass fiber tape equal to Imperial Type P Tape.
- E. Moisture/Mold-Resistant Gypsum Wallboard (where Shown on drawings): 5/8" thick "Mold Tough" or "Mold Tough FR" by U.S. Gypsum, "DensArmor Plus" by Georgia

Pacific, "Mold Defense" and/or "Mold Defense Type X" by Lafarge/Continental, or "Gold Bond EXP Interior Extreme Gypsum Board" by National Gypsum, 48" wide, in maximum lengths available to minimize end-to-end butt joints. Board must have a rating of 10 per ASTM D 3273 with a core that meets ASTM C 1396, Section 6 or ASTM C 1658.

F. NOTE: Where plywood is indicated in gypsum wallboard assemblies, as detailed on drawings, provide plywood conforming to the following:

1. Provide APA Structural 1 Rated Sheathing, Interior grade or better, with span rating to suit stud spacing; thickness as noted on drawings; fire-retardant treated in accordance with requirements of Section 062000.

2.4 ACCESSORIES

- A. Acoustical Insulation: Paper-less, non-combustible, semi-rigid mineral fiber mat, 2" thick, in walls (unless otherwise indicated), 3 lb./cu. ft. maximum density; Thermafiber LLC "Thermafiber," or approved equal.
- B. Fasteners for Wallboard: USG Brand Screws; Type S Bugle Head for fastening wallboard to lighter gauge interior metal framing (up to 20 ga.). Type S-12 Bugle Head for fastening wallboard to heavier gauge interior metal framing (20 ga. to 12 ga.); Type S and Type S-12 Pan Head for attaching metal studs to door frames and runners; and Type G Bugle Head for fastening wallboard to wallboard. Lengths specified below under "Part 3 - Execution" Articles and as recommended by drywall manufacturer.
- C. Laminating Adhesive: "Sheetrock Brand Joint Compound."
- D. Metal Trim - Corner Beads: For 90 degree External Corners - "Dur-A-Bead" No. 103, 27 U.S. Std. ga. galvanized steel, 1-1/4" x 1-1/4", for 90 degree external corners.
- E. Metal Trim - Edge Beads: "Sheetrock Brand Paper Faced Metal Bead and Trim."
- F. Metal Trim Treatment Materials and Joint Treatment Materials for Gypsum Drywall Boards: Paper tape for joint reinforcing; Setting Type (Durabond 90) or Lightweight Setting Type Joint Compound for taping and topping; and Ready Mix Compound for finishing.
 1. For mold-resistant drywall, water resistant drywall, and tile backer board, use glass mesh tape with setting joint compound that is rated 10 when tested in accordance with ASTM D 3273 and evaluated in accordance with ASTM D 3274. Acceptable joint compound is "Rapid Set One Pass" made by CTS Cement Manufacturing Corp. or "Rapid Joint" manufactured by Lafarge North America or approved equal meeting standards noted herein.
- G. Control Joints: No. 0.093, USG.
- H. Acoustical Sealant: USG "Acoustical Sealant" or "Tremco Acoustical Caulking" of Tremco Mfg. Co., or approved equal.
- I. Neoprene Gaskets: Conform to ASTM D 1056.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where gypsum drywall is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. General

1. Install drywall work in accordance with drywall manufacturer's printed instructions and as indicated on drawings and specified herein.
2. All metal framing for drywall partitions shall extend from floor to underside of structural deck above. Provide for vertical deflection with positive mechanical connections of framing members to structure.
3. Provide concealed reinforcement, 16 ga. thick by eight (8) inches wide or as detailed or as recommended by manufacturer, for attachment of railings, toilet partitions, and other items to be supported on the partitions which cannot be attached to the metal framing members. Concealed reinforcement shall span between metal studs and be attached thereto using two (2) self-tapping pan head screws at each stud.

- a. Back of drywall shall be scored or notched to prevent bulging out where reinforcement plate occurs.

- B. Fire-Rated Assemblies: Install fire-rated assemblies in accordance with requirements of authorities having jurisdiction, Underwriters' Laboratories and test results obtained and published by the drywall manufacturer, for the fire-rated drywall assembly types indicated on the drawings.

- C. Acoustical Assemblies: Install acoustically-rated assemblies to achieve a minimum STC as noted on drawings, in accordance with test results obtained and published by the drywall manufacturer, for the drywall assembly type indicated on the drawings.

D. Sealant

1. Install continuous acoustical sealant bead at top and bottom edges of wallboard where indicated or required for sound rating as wallboard is installed, and between metal trim edge beads and abutting construction.
2. Install acoustical sealant in 1/8" wide vertical control joints within the length of the wall or partitions, and in all other joints, specified below under "Control Joints." Install bead of acoustical sealant around electric switch and outlet boxes, piping, ducts, and around any other penetration in the wallboard; place sealant bead between penetrations and edge of wallboard.

3. Where sealant is exposed to view, protect adjacent surfaces from damage and from sealant material, and tool sealant flush with and in same plane as wallboard surface. Sealant beads shall be 1/4" to 3/8" diameter.

E. Wallboard Application

1. Do not install wallboard panels until steel door frames are in place; coordinate work with Section 081113, "Steel Doors and Frames."
2. See drawings for all board types. Use fire-rated wallboard for fire-rated assemblies. Use water-resistant wallboard where indicated on drawings and where wallboard would be subject to moisture. Install water-resistant wallboard in full, large sheets (no scraps) to limit number of butt joints.
3. Apply wallboard with long dimension parallel to stud framing members, and with abutting edges occurring over stud flanges.
4. Install wallboard for partitions from floor to underside of structure above and secure rigidly in place by screw attachment, unless otherwise indicated.
5. Provide "Thermafiber" safing insulation meeting standards of Section 078413 at flutes of metal deck where partitions carry up to bottom of metal deck.
6. Neatly cut wallboard to fit around outlets, switch boxes, framed openings, piping, ducts, and other items which penetrate wallboard; fill gaps with acoustic sealant.
7. Where wallboard is to be applied to curved surfaces, dampen wallboard on back side as required to obtain required curve. Finish surface shall present smooth, even curve without fluting or other imperfections.
8. Screw fasten wallboard with power-driven electric screw driver, screw heads to slightly depress surface of wallboard without cutting paper, screws not closer than 3/8" from ends and edges of wallboard.
9. Where studs are doubled-up, screw fasten wallboard to both studs in a staggered pattern.

F. Metal Trim: Install and mechanically secure in accordance with manufacturer's instructions; and finish with three (3) coats of joint compound, feathered and finish sanded smooth with adjacent wallboard surface, in accordance with manufacturer's instructions.

1. Corner Beads: Install specified corner beads in single lengths at all external corners, unless corner lengths exceed standard stock lengths.
2. Edge Beads: Install specified edge beads in single lengths at all terminating edges of wallboard exposed to view, where edges abut dissimilar materials, where edges would be exposed to view, and elsewhere where shown on drawings. Where indicated on drawings, seal joint between metal edge bead and adjoining surface with specified gasket, 1/8" wide minimum and set back 1/8" from face of wallboard, unless other size and profile indicated on drawings.

3. Casing beads shall be set in long lengths, neatly butted at joints. Provide casing beads at juncture of board and vertical surfaces and at exposed perimeters.
- G. Control Joint Locations: Gypsum board surfaces shall be isolated with control joints where:
1. Ceiling abuts a structural element, dissimilar wall or other vertical penetration.
 2. Construction changes within the plane of the partition or ceiling.
 3. Shown on approved shop drawings.
 4. Ceiling dimensions exceed thirty (30) feet in either direction.
 5. Wings of "L," "U," and "T" shaped ceiling areas are joined.
 6. Expansion or control joints occur in the structural elements of the building.
 7. Partition or furring abuts a structural element or dissimilar wall or ceiling.
 8. Partition or furring runs exceed 30' without interruption.
 9. Where control joints are required, ceiling height door frames may be used as control joints. Less than ceiling height frames shall have control joints extending to the ceiling from both corners.
- H. Joint Treatment and Spackling
1. Joints between face wallboards in the same plane, joints at internal corners of intersecting partitions and joints at internal corners of intersections between ceilings and walls or partitions shall be filled with joint compound.
 2. Screw heads and other depressions shall be filled with joint compound. Joint compound shall be applied in three (3) coats, feathered and finish surface sanded smooth with adjacent wallboard surface, in accordance with manufacturer's instructions. Treatment of joints and screw heads with joint compound is also required where wallboard will be covered by finish materials which require a smooth surface, such as vinyl wall coverings.

3.3 FURRED WALLS AND PARTITIONS

- A. Use specified metal furring channels. Run metal furring channel framing members vertically, space sixteen (16) inches o.c. maximum. Fasten furring channels to concrete or masonry surfaces with power-driven fasteners or concrete stub nails spaced sixteen (16) inches o.c. maximum through alternate wing flanges (staggered) of furring channel. Furring channels shall be shimmed as necessary to provide a plumb and level backing for wallboard. At inside of exterior walls, an asphalt felt protection strip shall be installed between each furring channel and the wall. Furring channel and splices shall be provided by nesting channels at least eight (8) inches and securely anchoring to concrete or masonry with two (2) fasteners in each wing.
- B. Wallboard Installation: Same as specified under Article 3.4 - "Metal Stud Partitions."

3.4 METAL STUD PARTITIONS

- A. Unless otherwise noted, steel framing members shall be installed in accordance with ASTM C 754.
- B. Runner Installation: Use channel type. Align accurately at floor according to partition layout. Anchor runners securely sixteen (16) inches o.c. maximum with power-driven anchors to floor slab, with power-driven anchors to structural slab above. See "Stud Installation" below for runners over heads of metal door frames. Where required, carefully remove sprayed-on fireproofing to allow partition to be properly installed.
- C. Stud Installation
 - 1. Use channel type, positioned vertically in runners, spaced as noted on drawings, but not more than sixteen (16) inches o.c.
 - 2. Anchor studs to floor runners with screw fasteners. Provide snap-in or slotted hole slip joint bolt connections of studs to ceiling runners leaving space for movement. Anchor studs at partition intersections, partition corners and where partition abuts other construction to floor and ceiling runners with sheet metal screws through each stud flange and runner flange.
 - 3. Connection at ceiling runner for non-rated partitions shall be snap-in or slotted hole slip joint bolt connection that shall allow for movement. Seal studs abutting other construction with 1/8" thick neoprene gasket continuously between stud and abutting construction.
 - 4. Connections for fire rated partitions at ceiling runners shall conform to UL Design #2079.
 - 5. Install metal stud horizontal bracing wherever vertical studs are cut or wallboard is cut for passage of pipes, ducts or other penetrations, and anchor horizontal bracing to vertical studs with sheet metal screws.
 - 6. At jambs of door frames and borrowed light frames, install doubled-up studs (not back to back) from floor to underside of structural deck, and securely anchor studs to jamb anchors of frames and to runners with screws. Provide cross braces from hollow metal frames to underside of slab.
 - 7. Over heads of door frames, install cut-to-length section of runner with flanges slit and web bent to allow flanges to overlap adjacent vertical studs, and securely anchor runner to adjacent vertical studs with sheet metal screws. Install cut-to-length vertical studs from runner (over heads of door frame) to ceiling runner sixteen (16) inches maximum o.c. and at vertical joints of wallboard, and securely anchor studs to runners with sheet metal screws.
 - 8. At control joints, in field of partition, install double-up studs (back to back) from floor to ceiling runner, with 1/4" thick continuous compressible gasket between studs. When necessary, splice studs with eight (8) inches minimum nested laps and attach flanges together with two (2) sheet metal screws in each flange. All screws shall be self-tapping sheet metal screws.

- D. Runners and Studs at Chase Wall: As specified above for "Runners" and "Studs" and as specified herein. Chase walls shall have either a single or double row of floor and ceiling runners with metal studs sixteen (16) inches o.c. maximum and positioned vertically in the runners so that the studs are opposite each other in pairs with the flanges pointing in the same direction. Anchor all studs to runner flanges with sheet metal screws through each stud flange and runner flange following requirements of paragraph 3.4, B. Provide cross bracing between the rows of studs by attaching runner channels or studs set full width of chase attached to vertical studs with one self-tapping screw at each end. Space cross bracing not over thirty-six (36) inches o.c. vertically.
- E. Wallboard Installation - Single Layer Application (Screw Attached)
1. Install wallboard with long dimension parallel to framing member and with abutting edge joints over web of framing member. Install wallboard with long dimension perpendicular to framing members above and below openings in drywall extending to second stud at each side of opening. Joints on opposite sides of wall shall be arranged so as to occur on different studs.
 2. Boards shall be fastened securely to metal studs with screws as specified. Where a free end occurs between studs, back blocking shall be required. Center abutting ends over studs. Correct work as necessary so that faces of boards are flush, smooth, true.
 3. Wallboard screws shall be applied with an electric screw gun. Screws shall be driven not less than 3/8" from ends or edges of board to provide uniform dimple not over 1/32" deep. Screws shall be spaced twelve (12) inches o.c. in the field of the board and 8" o.c. staggered along the abutting edges.
 4. All ends and edges of wallboard shall occur over screwing members (studs or furring channels). Boards shall be brought into contact but shall not be forced into place. Where ends or edges abut, they shall be staggered. Joints on opposite sides of a partition shall be so arranged as to occur on different studs.
 5. At locations where piping receptacles, conduit, switches, etc., penetrate drywall partitions, provide non-drying sealant and an approved sealant stop at cut board locations inside partition.
- F. Wallboard Installation - Double-Layer Application
1. General: See drawings for wallboard partition types required.
 2. First Layer (Screw Attached): Install as described above for single layer application.
 3. Second Layer (Screw Attached): Screw attach second layer, unless laminating method of attachment indicated on drawings or necessary to obtain required sound rating or fire rating. Install wallboard vertically with vertical joints offset thirty-two (32) inches from first layer joints and staggered on opposite sides of wall. Attach wallboard with 1-5/8" screws sixteen (16) inches o.c. along vertical joints and sixteen (16) inches o.c. in the field of the wallboard. Screw through first layer into metal framing members.

4. Second Layer (Laminated): Install wallboard vertically. Stagger joints of second layer from first layer joints. Laminate second layer with specified laminating adhesive in beads or strips running continuously from floor to ceiling in accordance with manufacturer's instructions. After laminating, screw wallboard to framing members with 1-5/8" screws, spaced twelve (12) inches o.c. around perimeter of wallboard.
- G. Wallboard Installation - Laminated Application: Where laminated wallboard is indicated, use specified laminating adhesive, install wallboard vertically and maintain tolerances as specified for screw attached wallboard.
- H. Insulation Installation: Install where indicated on drawings. Place blanket tightly between studs.
- I. Deflection of Structure Above: To allow for possible deflection of structure above partitions, provide top runners for non-rated partitions with 1-1/4" minimum flanges and do not screw studs or drywall to top runner. Where positive anchorage of studs to top runner is required, anchorage device shall be by means of slotted hole (in clip connection with screw attachment to web of steel through bushings located in slots of clips), or other anchorage device approved by Architect.
- J. Control Joints
 1. Leave a 1/2" continuous opening between gypsum boards for insertion of surface mounted joint.
 2. Back by double framing members.
 3. Attach control joint to face layer with 9/16" galvanized staples six (6) inches o.c. at both flanges along entire length of joint.
 4. Provide two (2) inch wide gypsum panel strip or other adequate seal behind control joint in fire rated partitions and partitions with safing insulation.

3.5 DRYWALL FASCIAS AND CEILINGS

- A. Furnish and install inserts, hanger clips and similar devices in coordination with other work.
- B. Secure hangers to inserts and clips. Clamp or bolt hangers to main runners.
- C. Space main runners 4'-0" o.c. and space hangers 4'-0" o.c. along runners, except as otherwise shown.
- D. Level main runners to a tolerance of 1/4" in 12'-0", measured both lengthwise on each runner and transversely between parallel runners.
- E. Metal Furring Channels: Space sixteen (16) inches o.c. maximum. Attach to 1-1/2" main runner channels with furring channel clips (on alternate sides of main runner channels). Furring channels shall not be let into or come in contact with abutting masonry walls. End splices shall be provided by nesting furring channels no less than

eight (8) inches and securely wire tying. At any openings that interrupt the furring channels, install additional cross reinforcing to restore lateral stability.

- F. Mechanical accessories, hangers, splices, runner channels and other members used in suspension system shall be of metal, zinc coated, or coated with rust inhibitive paint, of suitable design and of adequate strength to support units securely without sagging, and such as to bring unit faces to finished indicated lines and levels.
 - 1. Provide special furring where ducts are over two (2) feet wide.
- G. Apply board with its long dimension at right angles to channels. Locate board butt joints over center of furring channels. Attach board with one (1) inch self-drilling drywall screws twelve (12) inches o.c. in field of board at each furring channel; eight (8) inches o.c. at butt joints located not less than 3/8" from edges.

3.6 FINISHING

- A. Taping: A thin, uniform layer of compound shall be applied to all joints and angles to be reinforced. Reinforcing tape shall be applied immediately, centered over the joint, seated into the compound. A skim coat shall follow immediately, but shall not function as a fill or second coat. Tape shall be properly folded and embedded in all angles to provide a true angle.
- B. Filling: After initial coat of compound has hardened, additional compound shall be applied, filling the board taper flush with the surface. The fill coat shall cover the tape and feather out slightly beyond the tape. On joints with no taper, the fill coat shall cover the tape and feather out at least four (4) inches on either side of the tape. No fill coat is necessary on interior angles.
- C. After compound has hardened, a finishing coat of compound shall be spread evenly over and extending slightly beyond the fill coat on all joints and feathered to a smooth, uniform finish. Over tapered edges, the finished joint shall not protrude beyond the plane of the surface. All taped angles shall receive a finish coat to cover the tape and taping compound, and provide a true angle. Where necessary, sanding shall be done between coats and following the final application of compound to provide a smooth surface, ready for painting.
- D. Fastener Depressions: Compound shall be applied to all fastener depressions followed, when hardened by at least two (2) coats of compound, leaving all depressions level with the plane of the surface.
- E. Finishing Beads and Trim: Compound shall be applied to all bead and trim and shall be feathered out from the ground to the plane of the surface. When hardened, this shall be followed by two (2) coats of compound each extending slightly beyond the previous coat. The finish coat shall be feathered from the ground to the plane of the surface and sanded as necessary to provide a flat, smooth surface ready for decoration.
- F. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840.
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.

2. Level 2: Panels that are a substrate for tile, and where indicated.
 3. Level 5: Level of finish for surfaces exposed to view shall conform to Level 5 of ASTM C 840 and GA-214 of the Gypsum Association.
 - a. Skim Coat: For final coat of Level 5 finish, use setting type, sandable topping compound.
 - G. Drywall construction with defects of such character which will mar appearance of finished work, or which is otherwise defective, will be rejected and shall be removed and replaced at no expense to the Owner.
- 3.7 CLEANING AND ADJUSTMENT
- A. At the completion of installation of the work, all rubbish shall be removed from the building leaving floors broom clean. Excess material, scaffolding, tools and other equipment shall be removed from the building.
 - B. Work shall be left in clean condition ready for painting or wall covering. All work shall be as approved by Architect.
 - C. Cutting and Repairing: Include all cutting, fitting and repairing of the work included herein in connection with all mechanical trades and all other trades which come in conjunction with any part of the work, and leave all work complete and perfect after all trades have completed their work.
- 3.8 PROTECTION OF WORK
- A. Installer shall advise Contractor of required procedures for protecting drywall work from damage and deterioration during remainder of construction period.

END OF SECTION

SECTION 093013

TILING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the tiling work as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Porcelain floor tile.
 - 2. Ceramic wall tile and base.
 - 3. Quartz saddles.
 - 4. Setting beds, grout, sealant and waterproofing membrane.

1.3 RELATED SECTIONS

- A. Cast-in-Place Concrete - Section 033000.
- B. Gypsum Drywall - Section 092900.

1.4 REFERENCES

- A. ANSI A108 Series/A118 Series - American National Standards for Installation of Ceramic Tile.
- B. ANSI A136.1 - American National Standards for Organic Adhesives for Installation of Ceramic Tile.
- C. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.
- D. ASTM C 150 - Standard Specification for Portland Cement.
- E. TCNA - Handbook for Ceramic, Glass and Stone Tile Installation; Tile Council of North America.
- F. ISO 13007 - International Standards Organization; Classification for Grout and Adhesives.
- G. Large Format Tile (LFT): Tile 15" or larger in any direction and/or 144 sq. in. in size.

1.5 QUALITY ASSURANCE

- A. Qualifications of Installers: For cutting, installing and grouting of ceramic tile, use only thoroughly trained and experienced journeyman tile setters who are completely familiar with the requirements of this work, and the recommendations contained in the referenced standards, and the installers are Certified Ceramic Tile Installer (CTI) through the Ceramic Tile Education Foundation (CTEF) or Tile Installer Thin Set Standards (ITS) verification through the University of Ceramic Tile and Stone.
- B. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with the following:
 - 1. Manufacture all ceramic tile in accordance with Standard Grade Requirements of ANSI A-137.1.
 - 2. Install all ceramic tile in accordance with the recommendations contained in "Tile Council of North America Handbook for Ceramic, Glass, and Stone Tile Installation (TCNA)," latest edition.
- C. All surfaces shall have a minimum wet DCOF AcuTest value of 0.42.

1.6 SUBMITTALS

- A. Samples
 - 1. Before any tile is delivered to the job site, submit to the Architect a full-size tile sample of each product mounted on hardboard back-up with selected grout color for each color and pattern of ceramic tile and grout specified.
 - 2. Submit 6" length of quartz saddles.
 - 3. Submit 12" x 12" samples of waterproofing membrane.
- B. Master Grade Certificates: Prior to opening ceramic tile containers, submit to the Architect a Master Grade Certificate, signed by an officer of the firm manufacturing the ceramic tile used, and issued when the shipment is made, stating the grade, kind of tile, identification marks for tile containers, and the name and location of the project.
- C. Mock-Ups
 - 1. At an area on the site where approved by the Architect, provide a mock-up ceramic tile installation.
 - a. Make the mock-up approximately 36" x 36" in dimension.
 - b. Provide one mock-up for each type, class, and color of installation required under this Section.
 - c. The mock-ups may be used as part of the Work, and may be included in the finished Work when so approved by the Architect.
 - d. Revise as necessary to secure the Architect's approval.

2. The mock-ups, when approved by the Architect, will be used as datum for comparison with the remainder of the work of this Section for the purposes of acceptance or rejection.
3. If the mock-up panels are not permitted to be part of the finished Work, completely demolish and remove them from the job site upon completion and acceptance of the work of this Section.

1.7 PRODUCT HANDLING

A. Delivery and Storage

1. Deliver all materials of this Section to the job site in their original unopened containers with all labels intact and legible at time of use.
2. Store all materials under cover in a manner to prevent damage and contamination; store only the specified materials at the job site.

B. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation, and to protect the installed work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.8 PROJECT CONDITIONS

A. Maintain environmental conditions and protect work during and after installation to comply with referenced standards and manufacturer's printed recommendations.

B. Vent temporary heaters to exterior to prevent damage to tile work from carbon dioxide buildup.

C. Maintain temperatures at not less than 50 deg. F. in tiled areas during installation and for 7 days after completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS OF TILE

A. Provide tile as scheduled on the drawings, or approved equal meeting these specifications. The Architect reserves the right to pick tile from any price group.

2.2 TILE AND BASE

A. T1: Provide Dal Tile Veranda Solids Colorbody Porcelain, or approved equal.

1. Color: P551 Sapphire.
2. Size: 13" x 20".
3. Suitable for wet and level interior applications.

4. Water Absorption: Meets or exceeds <0.5% when tested in accordance with ASTM C 373.
 5. Breaking Strength: Meets or exceeds >500 lbs. when tested in accordance with ASTM C 648.
 6. Scratch Hardness: Meets or exceeds 8.0 in accordance with ASTM MOHS.
 7. Installation: Monolithic.
- B. T2: Provide Dal Tile Natural Hues Eco-Body Ceramic Wall Tile, or approved equal.
1. Color: QH48 Carnation.
 2. Finish: Glossy.
 3. Size: 3" x 9".
 4. Installation: 1/2" offset vertical brick pattern; see drawings for details.
 5. Scratch Hardness: Meets or exceeds 5.0-7.0 in accordance with ASTM MOHS.
 6. Grout: 1/4" to match Polyblend #370 Dove Gray.
- C. Base (TB1): Provide Dal Tile Natural Hues Eco-Body ceramic wall tile flat tile cove base Q-36126, or approved equal, to match T2.
1. Color: To match T2.
 2. Size: 6" x 12".

2.3 TRIM AND SPECIAL SHAPES

- A. Provide external and internal corners, trim shapes at openings, and all other trim and special shapes to match the tile specified herein, as required by field conditions and drawing details.

2.4 QUARTZ SADDLES

- A. Provide Cosentino Silestone Quartz Surfacing. Cut saddle to fit jamb profile, honed finish.

2.5 SETTING BEDS AND GROUT

- A. Portland Cement: ASTM C 150, Type 1.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Sand: ASTM C 144, clean and graded natural sand.
- D. Reinforcing for Mud Set Systems: 2" x 2" x 16/16 ga. welded wire mesh.
- E. Latex Admixture for Mortar Bed

1. MAPEI, Planicrete AC, blended with a 3:1 site mix.
 2. Laticrete 333.
 3. Pro Spec; Acrylic Additive.
 4. Custom Building Products; Custom Crete Thin Set Additive.
- F. Latex-Portland Cement Bond Coat, complying with ANSI A118.4 and ISO 13007, C2ES2P2 with minimum compressive strength of 400 psi.
1. MAPEI, Keralastic System thin set mortar, consisting of Kerabond dry-set mortar and Keralastic latex admixture.
 2. Laticrete; 211 dry-set mortar and 4237 latex admixture.
 3. Pro Spec; Permalastic System consisting of Permalastic Dryset Mortar and Permalastic Admixture
 4. Custom Building Products; Pro-Lite.
- G. Wall and Base Tile
1. Over drywall, use ANSI A136.1-1967 Organic Adhesive for installation of Ceramic Tile, Type I and ISO 13007 D2TE. Shear strength shall be 50 psi minimum. Adhesive primer as recommended by adhesive manufacturer. Manufacturer shall certify, in writing, that adhesive and primer used are proper types for the intended tile types and application. Conform to TCA Detail W-242.
 - a. MAPEI Type 1 Mastic.
 - b. Laticrete Type 1 Adhesive.
 - c. ProSpec B-1000 Tile Adhesive.
 - d. Custom Building Products' Reliabond Adhesive Type 1.
 2. Over glass mat water resistant gypsum backer board, use a Latex Portland cement mortar bond coat, MAPEI, Kerabond/Keralastic System, conforming to ANSI A118.4, ISO 13007-C2ES2P2, and TCA Detail W-245.
- H. Floor Tile and Saddle – Thin Set over Waterproof Setting Bed: Set floor tile and saddle using thin set latex Portland cement bond coat, Basis of Design: Mapei, Kerabond/Keralastic System, conforming to ANSI A118.4, ISO 13007-C2ES2P2, and waterproofing membrane conforming to TCA Detail F-122/122A.
- I. Waterproofing Membrane: Complying with ANSI A118.10 and ANSI A118.12; and having IAPMO certification as a shower pan liner; provide "Mapelastic 400" by Mapei with factory blended "Bio-Block" antimicrobial protection, "Laticrete 9235 with Mircoban" made by Laticrete International, ProSpec "B6000," Custom Building Products' "9240," or approved equal.
1. Reinforce membrane with polyester fabric.
- J. Water: Clean, fresh and suitable for drinking.

- K. Grout: Complying with A118.7; and ISO 13007, CG2WAF; for grouting ceramic tile, provide a commercial Portland cement grout "Ultracolor Plus" (additive not required) made by Mapei, Laticrete "Permacolor," or approved equal. Add latex additive to grout made by same manufacturer as grout.
1. 1/8" to match polyblend #370 dove gray
- L. Physical Properties: The setting beds and grouts must meet the following physical requirements:
1. Compressive Strength: 3000 psi min.
 2. Shear Bond Strength: 500 psi min.
 3. Water Absorption: 4.0% max.
 4. Service Rating (ASTM C 627): Extra Heavy Duty.
- M. Sealer: Seal all grout joints and all unglazed tile using "Sealer's Choice 15 Gold" as manufactured by Aqua Mix Inc., or approved equal.
- N. Temporary Protective Coating: Either product indicated below that is applied in the tile manufacturer's factory and formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products; and easily removable after grouting is completed without damaging grout or tile.
1. Petroleum paraffin wax, applied hot, fully refined and odorless, containing at least 0.5 percent oil with a melting point of 120 to 140 deg. F. per ASTM D 87.
 2. Grout release in form of manufacturer's standard proprietary liquid coating that is specially formulated and recommended for use as temporary protective coating for tile.
- O. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.6 SEALANT

- A. Joint Backing: Preformed, compressible, resilient, non-extruding, non-staining strips of foam neoprene, foam polyethylene, or other material recommended by sealant manufacturer.
- B. Bond Breaker: Polyethylene tape, 3 mils thick, or other material recommended by sealant manufacturer.
- C. Sealant Primer: Colorless, non-staining, or type to suit substrate surface, as recommended by sealant manufacturer.
- D. Sealant: One-part silicone based sanitary sealant, conforming to ASTM C 920, Type S, Grade NS, Class 25. Sealant hardness upon full cure shall be between 20-30 Shore "A" Durometer. Color of sealant to blend with or match adjacent materials, and as selected

by the Architect. Sealant shall be equivalent to 1700 Sanitary Sealant made by General Electric or approved equal.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where ceramic tile is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 CONDITION OF SURFACES

- A. Allowable Variations in Substrate Levels in Floors: + 1/8" in 10'-0" distance and 1/4" total max. variation from levels shown.
- B. Grind or fill concrete and masonry substrates as required to comply with allowable variations.
- C. Concrete substrates must meet ANSI A108.01 tolerances and surface textures in preparation for tile work. Coordinate with concrete trades.

3.3 PREPARATION

- A. Coordinate the following with Section 033000:
 - 1. Steel trowel and fine broom finish concrete slabs that are to receive ceramic tile. Cure concrete slabs that are to receive tile before tile application. Do not use liquid curing compounds or other coatings that may prevent bonding of tile setting materials to slabs. Slab shall be dry at time of tile installation.
 - 2. Tile floors with floor drains must have a slope to direction of 1/4" per foot; coordinate this with concrete trades.
- B. Etch concrete substrate as may be required to remove curing compounds or other substances that would interfere with proper bond of setting bed. Rinse with water to remove all traces of treatment.
- C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved samples. If not factory blended, either return to manufacturer or blend tiles at project site before installing.
- D. Field Applied Temporary Protective Coating: Pre-coat tile with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.4 JOINTS IN TILE WORK

- A. Joint Widths: 1/16" wide in ceramic tile.

- B. Alignment: Wall, base and floor joints shall align through the field and trim. Direction and location of all joints as directed by Architect.
- C. Movement Joints: Conform to TCA Detail EJ171. Locate where movement joints are in back-up material. Provide movement joint at joints between mop receptors and ceramic tile. Provide movement joint at all vertical internal joints of wall tile. Movement joints 1/8" wide in ceramic tile. Fill all movement joints with specified backing and sealant. Use bond breaker where sufficient space for joint backing does not exist.
 - 1. Provide sealant between ceramic tile and plumbing fixtures, mirrors, pipes, countertops and other dissimilar materials penetrating or adjacent to ceramic tile.

3.5 INSTALLATION

- A. Comply with the following installation standards:
 - 1. Wall tile over drywall using organic adhesive - ANSI A136.1 and ISO 13007, D2TE.
 - 2. Wall tile over cement board or glass mat backer board using dry set mortar with latex additive - ANSI A118.4 and ISO 13007, C2ES2P2.
 - 3. Floor tile using full mud set mortar - ANSI A118.4, A228.15, and ISO 13007, C2ES2P2.
 - 4. Floor tile over waterproofing membrane - ANSI A118.4, 118.5, and ISO 13007, C2ES2P2.
- B. Backs of tile must be cleaned before installation.
- C. All setting beds and/or adhesives shall provide for an average contact area of not less than 95% coverage.
- D. Allowable Variations in Finished Work: Do not exceed the following deviations from level and plumb, and from elevations, locations, slopes and alignment shown.
 - 1. Floors: 1/8" in 10'-0" run, any direction; +/- 1/8" at any location; 1/32" offset at any location.
 - 2. Walls: 1/8" in 8'-0" run, any direction; 1/8" at any location; offset at any location, 1/32".
 - 3. Joints: +/- 1/32" joint width variation of any location; 1/16" in 3'-0" run deviation from plumb and true.
- E. Waterproofing Membrane
 - 1. Install the membrane in strict accordance with manufacturer's written recommendations.
 - 2. Upon completion of work, test horizontal membrane for leaks by flood testing per ASTM D 5957. Inspect for leakage. Make necessary adjustments to stop all

leakage and retest until watertight. If membrane is not immediately covered by another surface, provide protection until membrane is covered.

- F. Handle, store, mix and apply setting and grouting materials in compliance with the manufacturer's instructions.
- G. Extend tile work into recesses and under equipment and fixtures, to form a complete covering without interruptions. Terminate work neatly at obstructions, edges and corners without disruption of pattern or joint alignment.
- H. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight, aligned joints. Fit tile closely to electrical outlets, piping and fixtures so that plates, collars, or covers overlap tile.
- I. Lay tile in grid pattern. Align joints when adjoining tiles on floor, base, walls and trim are the same size. Lay out tile work and center tile fields both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths.

3.6 INSTALLATION OF SADDLES

- A. Install quartz saddles cut to profiles and sizes shown, accurately fitted to jambs, coped at stops, set in full bed of mortar herein specified, and with grouted edge joints as specified for floor tile.

3.7 CLEANING AND PROTECTION OF CERAMIC TILE

- A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use cleaners only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning to insure removal of all cleaning material.
 - 3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.
- B. Protect installed tile work with Kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. Apply coat of sealer to all grout joints and all unglazed tile.
- C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- D. Before final inspection, remove protective coverings from tile surfaces.

- E. Leave finished installation clean and free of cracked, chipped, broken, unbonded or otherwise defective tile work.

END OF SECTION

SECTION 095113

ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the acoustical panel ceilings as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Acoustical panel units.
 - 2. Exposed "T" suspension system, including hangers and inserts.
 - 3. Provisions for the installation of lighting fixtures, diffusers, grilles and similar items provided under other Sections.
 - 4. Cutting, drilling, scribing and fitting as required for electro-mechanical penetrations.
 - 5. Perimeter and column moldings, trim and accessories for acoustical ceilings.

1.3 RELATED SECTIONS

- A. Steel Deck - Section 053100.
- B. Drywall ceilings - Section 092900.
- C. Diffusers, grilles and related frames - Division 23.
- D. Lighting fixtures - Division 26.

1.4 QUALITY ASSURANCE

- A. Codes and Standards: In addition to complying with all pertinent codes and regulations, comply with all pertinent recommendations published by the Ceilings and Interior Systems Contractor's Association.
- B. Qualifications of Installers
 - 1. The suspended ceiling subcontractor shall have a record of successful installation of similar ceilings acceptable to Architect and shall be currently approved by the manufacturer of the ceiling suspension system.

2. For the actual fabrication and installation of all components of the system, use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.
- C. The work is subject to the following standards:
1. ASTM C 635 "Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings," American Society for Testing and Materials.
 2. ASTM C 636 "Standard Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels," American Society for Testing and Materials.
- D. In addition to suspension system specified, provide seismic struts and seismic clips to meet seismic standards as required by prevailing Codes and Ordinances.

1.5 SUBMITTALS

- A. Shop Drawings: Submit completely dimensioned ceiling layouts for all areas where acoustical ceilings are required, showing:
1. Any deviations from Architect's reflected ceiling plan layouts, especially lighting fixture and dimensions. Also indicate if any light fixtures will not fit into Architect's ceiling layout due to dimensional restrictions or field conditions.
 2. Direction and spacing of suspension members and location of hangers for carrying suspension members.
 3. Direction, sizes and types of acoustical units, showing suspension grid members, and starting point for each individual ceiling area.
 4. Moldings at perimeter of ceiling, at columns and elsewhere as required due to penetrations or exposure at edge of ceiling tiles.
 5. Location and direction of lights, air diffusers, air slots, and similar items in the ceiling plane.
 6. Details of construction and installation at all conditions.
 7. Materials, gauges, thickness and finishes.
- B. Samples and Product Literature: Submit the following samples and related manufacturer's descriptive literature.
1. Twelve (12) inch long components of suspension systems, including moldings.
 2. Acoustical units — full size.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination or other causes.
- B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical ceiling units carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

- A. Do not install acoustical ceilings until wet-work in space is completed and nominally dry, work above ceilings has been completed, and ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

1.8 COORDINATION

- A. Coordinate layout and installation of acoustical ceiling units and suspension system components with other work supported by or penetrating through ceilings, including light fixtures, HVAC equipment, fire suppression system components, and partition system.

1.9 EXTRA STOCK

- A. Extra Stock: Deliver stock of maintenance material to Owner. Furnish maintenance material matching products installed, packaged with protective covering for storage and identified with appropriate labels.
 - 1. Acoustical Ceiling Units: Furnish quantity of full size units equal to 2.0% of amount installed.

PART 2 PRODUCTS

2.1 ACOUSTICAL UNITS

- A. Provide 5/8" thick, 24" x 24" mineral fiber panels equal to "Cortega," No. 770 with square edge, as manufactured by Armstrong World Industries, or equal made by USG Interiors, Inc. or Roxul Rockfon. Panels shall have factory applied white finish with light reflectance value of 0.82. Panels shall meet ASTM E 1264, Type III, Form 2, Pattern C D, Class A, with minimum flame spread of 25 and smoke developed of 50 per ASTM E 84.

2.2 SUSPENSION SYSTEM

- A. Provide exposed "T" steel suspension system with low sheen white baked enamel finish equal to "Prelude XL 7300," 15/16" exposed tee 2-way grid system made by

Armstrong World Industries, or equal made by USG Interiors, Inc. or Chicago Metallic Corp.

- B. The suspension system shall support the ceiling assembly shown on the drawings and specified herein, with a maximum deflection of 1/360 of the span, in accordance with ASTM C 635.
- C. Provide min. 12 ga. galvanized wire hangers, soft annealed steel conforming to ASTM A 641, prestretched, Class 1 zinc coating, soft temper, size so that stress at 3 times hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than yield stress of wire.
- D. Provide ceiling clips and inserts to receive hangers, type as recommended by suspension system manufacturer, sizes for pull-out resistance of not less than five (5) times the hanger design load, as indicated in ASTM C 635.
- E. Suspension systems shall conform to ASTM C 635, intermediate duty.
- F. Provide manufacturer's standard wall moldings with off-white baked enamel finish to match suspension systems. For circular penetrations of ceilings, provide edge moldings fabricated to diameter required to fit penetration exactly.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas where acoustical panel ceilings are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected to permit proper installation of the layout.

3.2 PREPARATION

- A. Coordination: Furnish layouts for inserts, clips, or other supports required to be installed by other trades for support of acoustical ceilings.
- B. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less-than-half width units at borders, and comply with reflected ceiling plans.

3.3 INSTALLATION

- A. Codes and Standards: Install materials in accordance with manufacturer's printed instructions, and to comply with governing regulations and industry standards.
- B. Install suspension systems to comply with ASTM C 636, with wire hangers supported only from building structural members. Locate hangers not more than 6" from each end and spaced 4'-0" along direct-hung runner, leveling to tolerance of 1/8" in 12'-0".

- C. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye-screws, or other devices which are secure and appropriate for substrate, and which will not deteriorate or fail with age or elevated temperatures.
- D. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum which are not part of supporting structural or ceiling suspension system. Splay hangers only where required to miss obstructions and offset resulting horizontal force by bracing, reinforcing, countersplaying or other equally effective means.
- E. Install edge moldings at edges of each acoustical ceiling area, and at locations where edge of acoustical units would otherwise be exposed after completion of the work.
 - 1. Secure moldings to building construction by fastening through vertical leg. Space holes not more than 3" from each end and not more than sixteen (16) inches o.c. between end holes. Fasten tight against vertical surfaces.
 - 2. Level moldings with ceiling suspension system, to a level tolerance of 1/8" in 12'-0".
- F. Install acoustical units in coordination with suspension system, with edges concealed by support of suspension members. Scribe and cut panels to fit accurately at borders and at penetrations.
- G. Install hold-down clips in toilet areas, and in areas where required by governing regulations; space 2'-0" o.c. on all cross tees.
- H. Light fixtures or other ceiling apparatus shall not be supported from main beams or cross tees if their weight causes the total load to exceed the deflection capability of the ceiling suspension system. In such cases the load shall be supported by supplemental hangers furnished and installed by this Section of work.
- I. Where fixture or ceiling apparatus installation causes eccentric loading on runners, provide stabilizer bars to prevent rotation.

3.4 ADJUST AND CLEAN

- A. Clean exposed surfaces of acoustical ceilings, including trim, edge molding, and suspension members; comply with manufacturer's instructions for cleaning and touch-up of minor finish damage. Remove and replace work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

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SECTION 096513

RESILIENT BASE AND ACCESSORIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the resilient accessories, as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Rubber base.
 - 2. Accessories.

1.3 RELATED SECTIONS

- A. Gypsum Drywall - Section 092900.

1.4 QUALITY ASSURANCE

- A. Qualifications of Installers: Use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.

1.5 SUBMITTALS

- A. Manufacturer's Data: For information only, submit manufacturer's technical information and installation instructions for type of resilient base.
- B. Samples: Submit six (6) inch long samples of base.

1.6 DELIVERY AND STORAGE

- A. Deliver materials to the project site in the manufacturer's original unopened containers, clearly marked to indicate pattern, gauge, lot number and sequence of materials.
- B. Carefully handle all materials and store in original containers at not less than seventy (70) degrees F. for at least forty-eight (48) hours before start of installation.

1.7 JOB CONDITIONS

- A. Continuously heat spaces to receive base to a temperature of seventy (70) degrees F. for at least forty-eight (48) hours prior to installation, whenever project conditions are such that heating is required. Maintain seventy (70) degrees F. temperature continuously

during and after installation as recommended by the manufacturer, but for not less than forty-eight (48) hours. Maintain a temperature of not less than fifty-five (55) degrees F. in areas where work is completed.

PART 2 PRODUCTS

2.1 BASE (RB1)

- A. Provide 700 Series Base as manufactured by Roppe, or approved equal. Provide 4" high by 1/8" thick extruded rubber/vinyl mix base, Type TP thermoplastic rubber, Group 1 (solid), top set cove base with pre-formed internal and external corner pieces, color as specified herein. Base shall conform to performance requirements of S.S. F-1861.
- B. Color: Match Roppe 700 Series 154 Salem.

2.2 ACCESSORIES

- A. Adhesives: Waterproof, stabilized type, as recommended by the manufacturer for the type of service indicated.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where resilient base is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. In all spaces where base is indicated, install bases tight to walls, partitions, columns, built-in cabinets, etc., without gaps at top or bulges at bottom, with tight joints and flush edges, with molded corner pieces at internal and external corners. Provide end stops adjacent to flush type door frames and where base does not terminate against an adjacent surface. Keep base in full contact with walls until adhesive sets.

3.3 CLEANING AND PROTECTION

- A. Remove any excess adhesive or other surface blemishes from base using neutral type cleaners as recommended by the manufacturer.

END OF SECTION

SECTION 096519

RESILIENT TILE FLOORING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the resilient tile flooring, as shown on the drawings and/or specified herein, including, but not limited to, the following:

1. Linoleum tile for elevator.
2. Bio-based tile.

1.3 RELATED SECTIONS

- A. Elevator - Division 14.

1.4 QUALITY ASSURANCE

- A. Qualifications of Installers: Use only personnel who are thoroughly trained and experienced in the skills required and completely familiar with the requirements established for this work.

1.5 SUBMITTALS

- A. Manufacturer's Data: For information only, submit manufacturer's technical information and installation instructions for type of resilient tile.
- B. Samples
 1. Submit full-size sample tiles for each type and color required, representative of the expected range of color and pattern variation. Sample submittals will be reviewed for color, texture and pattern only. Compliance with all other requirements is the exclusive responsibility of the Contractor.
 2. Submit six (6) inch long samples of transition strips.
- C. Submit manufacturer's warranty as noted herein.

1.6 DELIVERY AND STORAGE

- A. Deliver materials to the project site in the manufacturer's original unopened containers, clearly marked to indicate pattern, gauge, lot number and sequence of materials.

- B. Carefully handle all materials and store in original containers at not less than seventy (70) degrees F. for at least forty-eight (48) hours before start of installation.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F. or more than 95 deg F., in spaces to receive floor tile during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F. or more than 95 deg F.
- C. Close spaces to traffic during floor tile installation.
- D. Close spaces to traffic for 48 hours after floor tile installation.
- E. Protect all materials from the direct flow of heat from hot air registers, radiators, or other heating fixtures and appliances.
- F. Install floor tile after other finishing operations, including painting, have been completed.

1.8 WARRANTY

- A. Provide manufacturers 5-year limited warranty.

PART 2 PRODUCTS

2.1 LINOLUEM TILE (LIN1)

- A. Provide Marmoleum Modular Tiles as manufactured by Forbo, or approved equal.
 - 1. Color: T3030 Blue.
 - 2. Size: 19.7" x 19.7".
 - 3. Polyester backing.
 - 4. Meets or exceeds all technical requirements as set forth in ASTM F 2195 "Standard Specification for Linoleum Floor Tile," Type 1.
 - 5. Environmental: 100% USDA certified biobased product, compliant with CHPS 01350 requirements for VOC emissions and indoor air quality, 60% pre-consumer recycled content.

6. Static Load Limit: 1,500 pounds per square inch when tested in accordance with ASTM F 970-00 "Standard Test Method for Static Load Limit
7. Slip Resistance: Meets or exceeds industry recommendation of >0.5 for flat surfaces when tested in accordance with ASTM D 2047, Standard Test Method for Static Coefficient of Friction.
8. Fire Testing: Class 1 when tested in accordance with ASTM E 648/NFPA 253, "Standard Test Method for Critical Radiant Flux. Meets 450 or less when tested in accordance with ASTM E 662/NFPA 258, "Standard Test Method for Smoke Density."

2.2 BIO-BASED TILE (BBT1)

- A. Provide 12" x 12" x 1/8" thick bio-based tile equal to "Migrations" made by Armstrong, or approved equal, color T3507 Metal Gray. Tile shall be composed of polyester resin binder, fillers and pigments with colors and pattern to be dispersed uniformly throughout its thickness. Tile shall conform to the requirements of ASTM F 2982 "Standard Specification for Polyester Composition Floor Tile." Tile shall not contain polyvinyl chloride resins or plasticizers.

2.3 ACCESSORIES

- A. Adhesives: Waterproof, stabilized type, as recommended by the tile manufacturer for the type of service indicated.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where resilient tile flooring is to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 CONDITION OF SURFACES

- A. Allowable Variations in Substrate Levels (Floors): $\pm 1/8"$ in 10'-0" distance and 1/4" total maximum variation from levels shown.

3.3 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
 1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

- C. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.4 INSTALLATION OF BIO-BASED TILE

- A. Install flooring in strict accordance with the latest edition of Armstrong Flooring Guaranteed Installation Systems manual, F-5061. Failure to comply may result in voiding the manufacturer's warranty.
- B. Install flooring wall to wall before the installation of floor-set cabinets, casework, furniture, equipment, movable partitions, etc. Extend flooring into toe spaces, door recesses, closets, and similar openings as shown on the drawings.
- C. Scribe, cut, and fit to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.
- D. Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.

3.5 INSTALLATION OF LINOLEUM TILE

- A. Install following manufacturer's guidelines.

3.6 CLEANING

- A. Bio-Based Tile: Perform initial and on-going maintenance according to the latest edition of Armstrong Guaranteed Flooring Installation Systems Manual, F-5061.
- B. Linoleum Tile: After installation is completed, allow a minimum of 5 days for the adhesive to properly bond and cure before conducting wet cleaning procedures. See Forbo Flooring's Floor Care Guide for additional information.

3.7 PROTECTION

- A. Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings. (See "Finishing the Job" in the latest edition of Armstrong Flooring Guaranteed Installation Systems Manual, F-5061.)

END OF SECTION

SECTION 099000

PAINTING AND FINISHING

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the painting and finishing as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Prime painting unprimed surfaces to be painted under this Section.
 - 2. Painting all items furnished with a prime coat of paint, including touching up of or repairing of abraded, damaged or rusted prime coats applied by others.
 - 3. Painting all ferrous metal (except stainless steel) exposed to view.
 - 4. Painting all galvanized ferrous metals exposed to view.
 - 5. Painting interior concrete block exposed to view.
 - 6. Painting gypsum drywall exposed to view.
 - 7. Painting of wood exposed to view, except items which are specified to be painted or finished under other Sections of these specifications. Back painting of all wood in contact with concrete, masonry or other moisture areas.
 - 8. Painting pipes, pipe coverings, conduit, ducts, insulation, hangers, supports and other mechanical and electrical items and equipment exposed to view.
 - 9. Painting surfaces above, behind or below grilles, gratings, diffusers, louvers, lighting fixtures, and the like, which are exposed to view through these items.
 - 10. Incidental painting and touching up as required to produce proper finish for painted surfaces, including touching up of factory finished items.
 - 11. Painting of any surface not specifically mentioned to be painted herein or on drawings, but for which painting is obviously necessary to complete the job, or work which comes within the intent of these specifications, shall be included as though specified.

1.3 RELATED SECTIONS

- A. Shop priming is required on some, but not all of the items scheduled to be field painted. Refer to other Sections of work for complete description.
- B. Shop Coat on Machinery and Equipment: Refer to the Sections under which various items of manufactured equipment with factory applied shop prime coats are furnished, including, but not necessarily limited to, the following Sections. All items of equipment furnished with prime coat finish shall be finish painted under this Section.
 - 1. Plumbing - Division 22.
 - 2. Heating, Ventilation and Air Conditioning - Division 23.

1.4 MATERIALS AND EQUIPMENT NOT TO BE PAINTED

- A. Items of equipment furnished with complete factory finish, except for items specified to be given a finish coat under this Section.
- B. Factory-finished toilet partitions.
- C. Non-ferrous metals, except for items specified and/or indicated to be painted.
- D. Finished hardware, excepting hardware that is factory primed.
- E. Surfaces not to be painted shall be left completely free of droppings and accidentally applied materials resulting from the work of this Section.

1.5 QUALITY ASSURANCE

- A. Job Mock-Up
 - 1. In addition to the samples specified herein to be submitted for approval, apply in the field, at their final location, each type and color of approved paint materials, applied 10 feet wide, floor to ceiling of wall surfaces, before proceeding with the remainder of the work, for approval by the Architect. Paint mock-ups to include door and frame assembly.
 - 2. These applications when approved will establish the quality and workmanship for the work of this Section.
 - 3. Repaint individual areas which are not approved, as determined by the Architect, until approval is received. Assume at least two paint mock-ups of each color and gloss for approval.
- B. Qualification of Painters: Use only qualified journeyman painters for the mixing and application of paint on exposed surfaces.
- C. Paint Coordination: Provide finish coats which are compatible with the prime paints used. Review other Sections of these specifications in which prime paints are to be provided to ensure compatibility of the total coatings system for the various substrates. Upon request from other subcontractors, furnish information on the characteristics of the finish materials proposed to be used, to ensure that compatible prime coats are used.

Provide barrier coats over incompatible primers or remove and re-prime as required. Notify the Architect in writing of any anticipated problems using the coating systems as specified with substrates primed by others.

- D. All paints must conform to the Volatile Organic Compounds (VOC) standards of prevailing codes and ordinances.

1.6 SUBMITTALS

- A. Materials List: Before any paint materials are delivered to the job site, submit to the Architect a complete list of all materials proposed to be furnished and installed under this portion of the work. This shall in no way be construed as permitting substitution of materials for those specified or accepted for this work by the Architect.
- B. Samples
 - 1. Accompanying the materials list, submit to the Architect copies of the full range of colors available in each of the proposed products.
 - 2. Upon direction of the Architect, prepare and deliver to the Architect two (2) identical sets of Samples of each of the selected colors and glosses painted onto 8-1/2" x 11" x 1/4" thick material; whenever possible, the material for Samples shall be the same material as that on which the coating will be applied in the work.
- C. Manufacturer's Recommendations: In each case where material proposed is not the material specified or specifically described as an acceptable alternate in this Section of these specifications, submit for the Architect's review the current recommended method of application published by the manufacturer of the proposed material.
- D. Closeout Submittal
 - 1. Coating Maintenance Manual: Upon conclusion of the project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual such as Sherwin Williams "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, MSDS, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.7 PRODUCT HANDLING

- A. Deliver all paint materials to the job site in their original unopened containers with all labels intact and legible at time of use.
- B. Protection
 - 1. Store only the approved materials at the job site, and store only in a suitable and designated area restricted to the storage of paint materials and related equipment.
 - 2. Use all means necessary to ensure the safe storage and use of paint materials and the prompt and safe disposal of waste.

3. Use all means necessary to protect paint materials before, during and after application and to protect the installed work and materials of all other trades.
- C. Replacements: In the event of damage, immediately make all repairs and replacements necessary.

1.8 EXTRA STOCK

- A. Upon completion of this portion of the Work, deliver to the Owner an extra stock of paint equaling approximately ten (10) percent of each color and gloss used and each coating material used, with all such extra stock tightly sealed in clearly labeled containers.

1.9 JOB CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 50 degrees F. and 90 degrees F., unless otherwise permitted by the paint manufacturer's printed instructions.
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and the surrounding air temperatures are between 45 degrees F. and 95 degrees F. unless otherwise permitted by the paint manufacturer's printed instructions.
- C. Do not apply paint in snow, rain, fog or mist; or when the relative humidity exceeds eighty-five (85) percent; or to damp or wet surfaces; unless otherwise permitted by the paint manufacturer's printed instructions.
- D. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application and drying periods.

PART 2 PRODUCTS

2.1 PAINT MANUFACTURERS

- A. Except as otherwise noted, provide the painting products as manufactured by Sherwin Williams (S-W). Comply with number of coats and required minimum mil thicknesses as specified herein.

2.2 MATERIALS

- A. Provide undercoat paint produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer, and use only to recommended limits.
- B. Colors and Glosses: All colors and glosses shall be as selected by the Architect. Certain colors will require paint manufacturer to prepare special factory mixes to match colors selected by the Architect. Color schedule (with gloss) shall be furnished by the Architect.
- C. Coloring Pigment: Products of or furnished by the manufacturer of the paint or enamel approved for the work.

- D. Linseed Oil: Raw or boiled, as required, of approved manufacture, per ASTM D 234 and D 260, respectively.
- E. Turpentine: Pure distilled gum spirits of turpentine, per ASTM D 13.
- F. Shellac: Pure gum shellac (white or orange) cut in pure denatured alcohol using not less than four (4) lbs. of gum per gallon of alcohol.
- G. Driers, Putty, Spackling Compound, Patching Plaster, etc.: Best quality, of approved manufacture.
- H. Heat Resistant Paint: Where required, use heat resistant paint when applying paint to heating lines and equipment.

2.3 GENERAL STANDARDS

- A. The various surfaces shall be painted or finished as specified below in Article 2.4. However, the Architect reserves the right to change the finishes within the range of flat, semi-gloss or gloss, without additional cost to the Owner.
- B. All paints, varnishes, enamels, lacquers, stains and similar materials must be delivered in the original containers with the seals unbroken and label intact and with the manufacturer's instructions printed thereon.
- C. All painting materials shall bear identifying labels on the containers with the manufacturer's instructions printed thereon.
- D. Paint shall not be badly settled, caked or thickened in the container, shall be readily dispersed with a paddle to a smooth consistency and shall have excellent application properties.
- E. Paint shall arrive on the job color-mixed except for tinting of under-coats and possible thinning.
- F. All thinning and tinting materials shall be as recommended by the manufacturer for the particular material thinned or tinted.
- G. It shall be the responsibility of the Contractor to see that all mixed colors match the color selection made by the Architect prior to application of the coating.

2.4 SCHEDULE OF FINISHES

- A. High-Performance Coating on Exterior Galvanized Ferrous Metals
 - First Coat: "Recoatable Epoxy Primer 867-45" by Sherwin Williams.
 - Second Coat: "Hi-Solids Urethane B65-300/350" by Sherwin Williams.
- B. High-Performance Coating on Exterior Non-Galvanized Ferrous Metals
 - Prime Coat: "Zinc Clad II Plus Inorganic Zinc Rich Coating B69V212" by Sherwin Williams.
 - Second Coat: "Macropoxy 646 I.C. Epoxy B58-600" by Sherwin Williams.

Third Coat: "Hi-Solids Polyurethane B65-300/350" by Sherwin Williams.

C. Interior Ferrous Metal

Satin Finish/Latex

Primer: Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer B66-310

First Coat: S-W Pro-Classic Waterborne Acrylic Satin, B20

Second Coat: S-W Pro-Classic Waterborne Acrylic Satin, B20
a. Total DFT not less than: 3.9 mils

Semi-Gloss Finish/Latex

Primer: Sherwin-Williams, Pro Industrial Pro-Cryl Universal Primer B66-310

First Coat: S-W Pro-Classic Waterborne Acrylic Semi-Gloss, B31

Second Coat: S-W Pro-Classic Waterborne Acrylic Semi-Gloss, B31
a. Total DFT not less than: 4.0 mils

D. Interior Concrete Block

Flat Finish/Vinyl Acrylic Latex over Filler

Block Filler: S-W Preprite Block Filler, B25W25

First Coat: S-W Promar 200 Zero VOC Interior Latex Flat, B30-2600

Second Coat: S-W Promar 200 Zero VOC Interior Latex Flat, B30-2600
a. Total DFT not less than: 10.7 mils

Eggshell Finish/Vinyl Acrylic Latex Over Filler

Block Filler: S-W Preprite Block Filler, B25W25

First Coat: S-W Promar 200 Zero VOC Interior Latex Eggshell, B20-2600

Second Coat: S-W Promar 200 Zero VOC Interior Latex Eggshell, B20-2600
a. Total DFT not less than: 10.9 mils

Semi-Gloss Finish/Vinyl Acrylic Latex over Filler

Block Filler: S-W Preprite Block Filler, B25W25

First Coat: S-W Promar 200 Zero VOC Interior Latex S. Gloss, B31-2600

Second Coat: S-W Promar 200 Zero VOC Interior Latex S. Gloss, B31-2600
a. Total DFT not less than: 10.7 mils

E. Interior Drywall

Flat Finish/Vinyl Acrylic Latex

Primer: S-W Promar 200 Interior Latex Primer

First Coat: S-W Promar 200 Zero VOC Interior Latex Flat, B30-2600

Second Coat: S-W Promar 200 Zero VOC Interior Latex Flat, B30-2600
a. Total DFT not less than: 3.6 mils

Eggshell Finish/Vinyl Acrylic Latex

Primer: S-W Promar 200 Interior Latex Primer

First Coat: S-W Promar 200 Zero VOC Interior Latex Egg-Shell, B20-2600

Second Coat: S-W Promar 200 Zero VOC Interior Latex Egg-Shell, B20-2600
a. Total DFT not less than: 3.8 mils

F. Interior Painted Wood

Satin Finish/Latex

- Primer: S-W Premium Wall and Wood Primer B28W111
First Coat: S-W Pro Classic Interior WB, Acrylic/Alkyd Classic B20
Second Coat: S-W Pro Classic Interior WB, Acrylic/Alkyd Classic B20
a. Total DFT not less than: 4.0 mils

Semi-Gloss Finish/Latex

- Primer: S-W Premium Wall and Wood Primer B28W111
First Coat: S-W Pro Classic Interior WB, Acrylic/Alkyd Classic Semi-Gloss B31
Second Coat: S-W Pro Classic Interior WB, Acrylic/Alkyd Classic Semi-Gloss B31
a. Total DFT not less than: 3.8 mils

2.5 EXISTING SURFACES TO BE PAINTED

- A. Existing surfaces shall be painted in accordance with schedule given in Article 2.4 herein except that first or prime coat may be eliminated where existing paint is sound. Where existing paint must be removed down to base material, provide first or prime coat as specified.

2.6 PIPING AND MECHANICAL EQUIPMENT EXPOSED TO VIEW

- A. Paint all exposed piping, conduits, ductwork and mechanical and electrical equipment. Use heat resisting paint when applied to heating lines and equipment. The Contractor is cautioned not to paint or otherwise disturb moving parts in the mechanical systems. Mask or otherwise protect all parts as required to prevent damage.
- B. Exposed Uncovered Ductwork, Piping, Hangers and Equipment: Latex Enamel Undercoater and one (1) coat Acrylic Latex Flat.
- C. Exposed Covered Piping, Duct Work and Equipment: Primer/Sealer and one (1) coat Acrylic Latex Flat.
- D. Panel Boards, Grilles and Exposed Surfaces of Electrical Equipment: Latex Enamel Undercoater and two (2) coats Latex Semi-Gloss.
- E. Equipment or Apparatus with Factory-Applied Paint: Refinish any damaged surfaces to match original finish. Do not paint over name plates and labels.
- F. All surfaces of insulation and all other work to be painted shall be wiped or washed clean before any painting is started.
- G. All conduit, boxes, distribution boxes, light and power panels, hangers, clamps, etc., are included where painting is required.
- H. All items of Mechanical and Electrical trades which are furnished painted under their respective Contracts shall be carefully coordinated with the work of this Section so as to leave no doubt as to what items are scheduled to be painted under this Section.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where painting and finishing are to be applied and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 GENERAL WORKMANSHIP REQUIREMENTS

- A. Only skilled mechanics shall be employed. Application may be by brush or roller. Spray application only upon acceptance from the Architect in writing.
- B. The Contractor shall furnish the Architect a schedule showing when he expects to have completed the respective coats of paint for the various areas and surfaces. This schedule shall be kept current as the job progresses.
- C. The Contractor shall protect his work at all times, and shall protect all adjacent work and materials by suitable covering or other method during progress of his work. Upon completion of the work, he shall remove all paint and varnish spots from floors, glass and other surfaces. He shall remove from the premises all rubbish and accumulated materials of whatever nature not caused by others and shall leave his part of the work in clean, orderly and acceptable condition.
- D. Remove and protect hardware, accessories, device plates, lighting fixtures, and factory finished work, and similar items, or provide ample in place protection. Upon completion of each space, carefully replace all removed items by workmen skilled in the trades involved.
- E. Remove electrical panel box covers and doors before painting walls. Paint separately and re-install after all paint is dry.
- F. All materials shall be applied under adequate illumination, evenly spread and flowed on smoothly to avoid runs, sags, holidays, brush marks, air bubbles and excessive roller stipple.
- G. Coverage and hide shall be complete. When color, stain, dirt or undercoats show through final coat of paint, the surface shall be covered by additional coats until the paint film is of uniform finish, color, appearance and coverage, at no additional cost to the Owner.
- H. All coats shall be dry to manufacturer's recommendations before applying succeeding coats.

3.3 PREPARATION OF SURFACES

- A. Existing Surfaces: Clean existing surfaces requiring paint or finishing, remove all loose and flaking paint or finish and sand surface smooth as required to receive new paint or finish. No "telegraphing" of lines, ridges, flakes, etc., through new surfacing is permitted. Where this occurs, Contractor shall be required to sand smooth and re-finish until surface meets with Architect's approval.

B. General

1. The Contractor shall be held wholly responsible for the finished appearance and satisfactory completion of painting work. Properly prepare all surfaces to receive paint, which includes cleaning, sanding, and touching-up of all prime coats applied under other Sections of the work. Broom clean all spaces before painting is started. All surfaces to be painted or finished shall be perfectly dry, clean and smooth.
2. Perform all preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified, for each particular substrate condition.
3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease with clean cloths and cleaning solvents prior to mechanical cleaning. Program the cleaning and painting so that dust and other contaminants from the cleaning process will not fall in wet, newly painted surfaces.

C. Metal Surfaces

1. Weld Fluxes: Remove weld fluxes, splatters, and alkali contaminants from metal surfaces in an approved manner and leave surface ready to receive painting.
2. Bare Metal: Thoroughly clean off all foreign matter such as grease, rust, scale and dirt before priming coat is applied. Clean surfaces, where solder flux has been used, with benzene. Clean surfaces by flushing with mineral spirits. For aluminum surfaces, wipe down with an oil free solvent prior to application of any pre-treatment.
 - a. Bare metal to receive high performance coating specified herein must be blast cleaned SSPC SP-6 prior to application if field applied primer; coordinate with steel trades furnishing ferrous metals to receive this coating to insure that this cleaning method is followed.
3. Shop Primed Metal: Clean off foreign matter as specified for "Bare Metal." Prime bare, rusted, abraded and marred surfaces with approved primer after proper cleaning of surfaces. Sandpaper all rough surfaces smooth.
4. Galvanized Metal: Prepare surface as per the requirements of ASTM D 6386.
5. Metal Filler: Fill dents, cracks, hollow places, open joints and other irregularities in metal work to be painted with an approved metal filler suitable for the purpose and meeting the requirements of the related Section of work; after setting, sand to a smooth, hard finish, flush with adjoining surface.
6. Allow at least 28 days, from installation of final plaster coat, before starting work.

- D. Gypsum Drywall Surfaces: Scrape off all projections and splatters, spackles all holes or depressions, including taped and spackled joints, sand smooth. Conform to standards established in Section 092900, "Gypsum Drywall."

- E. Wood Surfaces: Sand to remove all roughness, loose edges, splinters, or splinters and then brush to remove dust. Wash off grease or dirt with an approved cleaner. Fill all cracks, splits, nail holes, screw holes, and surface defects with putty after the priming coat has been applied. Putty shall be brought up flush with the surface and sanded smooth and touched-up with primer when dry.
- F. Block Masonry Surfaces: Thoroughly clean off all grit, grease, dirt mortar drippings or splatters, and other foreign matter. Remove nibs or projections from masonry surfaces. Fill cracks, holes or voids, not filled under the "Masonry" Section, with Portland cement grout, and bag surface so that it has approximately the same texture as the adjacent masonry surface.
- G. Testing for Moisture Content: Contractor shall test all masonry and drywall surfaces for moisture content using a reliable electronic moisture meter. Contractor shall also test latex type fillers for moisture content before application of top coats of paint. Do not apply any paint or sealer to any surface or to latex type filler where the moisture content exceeds seven (7) percent as measured by the electronic moisture meter.
- H. Touch-Up: Prime paint all patched portions in addition to all other specified coats.

3.4 MATERIALS PREPARATION

- A. Mix and prepare painting materials in strict accordance with the manufacturer's directions.
- B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing, and application of paint in a clean condition, free of foreign materials and residue.
- C. Stir all materials before application to produce a mixture of uniform density, and as required during the application of the materials. Do not stir any film which may form on the surface into the material. Remove the film and, if necessary, strain the material before using.
- D. Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are to be applied. Tint undercoats to match the color of the finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

3.5 APPLICATION

- A. General
 - 1. Apply paint by brush or roller in accordance with the manufacturer's directions. Use brushes best suited for the type of material being applied. Use rollers of carpet, velvet back, or high pile sheep's wool as recommended by the paint manufacturer for material and texture required.
 - 2. The number of coats and paint film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has completely dried. Sand between each enamel or varnish coat application with fine

sandpaper, or rub surfaces with pumice stone where required to produce an even, smooth surface in accordance with the coating manufacturer's directions.

3. Apply additional coats when undercoats, stains, or other conditions show through the final coat of paint, until the paint film is of uniform finish, color and appearance. Give special attention to insure that all surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a film thickness equivalent to that of flat surfaces.
4. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - a. "Exposed surfaces" is defined as those areas visible when permanent or built-in fixtures, convactor covers, covers for finned tube radiation, grilles, etc., are in place in areas scheduled to be painted.
5. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint, before final installation of equipment.
6. Paint the back sides of access panels, removable or hinged covers to match the exposed surfaces.
7. Finish doors on tops, bottoms, and side edges the same as the faces, unless otherwise indicated.
8. Enamel finish applied to wood or metal shall be sanded with fine sandpaper and then cleaned between coats to produce an even surface.
9. Paste wood filler applied on open grained wood after beginning to flatten, shall be wiped across the grain of the wood, then with a circular motion, to secure a smooth, filled, clean surface with filler remaining in open grain only. After overnight dry, sand surface with the grain until smooth before applying specified coat.

B. Scheduling Painting

1. Apply the first coat material to surfaces that have been cleaned, pre-treated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
2. Allow sufficient time between successive coatings to permit proper drying. Do not re-coat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and the application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

C. Prime Coats: Re-coat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

D. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage.

- E. Touching-Up of Factory Finishes: Unless otherwise specified or shown, materials with a factory finish shall not be painted at the project site. To touch up, the Contractor shall use the factory finished material manufacturer's recommended paint materials to repair abraded, chipped, or otherwise defective surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether to be painted or not, against damage by the painting and finishing work. Leave all such work undamaged. Correct any damages by cleaning, repairing or replacing, and repainting, as acceptable to the Architect.
- B. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

3.7 CLEAN UP

- A. During the progress of the work, remove from the site all discarded paint materials, rubbish, cans and rags at the end of each work day.
- B. Upon completion of painting work, clean window glass and other paint spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.
- C. At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

END OF SECTION

SECTION 102113

TOILET PARTITIONS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the toilet partitions as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:
 - 1. Floor-mounted, overhead-braced, solid plastic toilet partitions.
 - 2. Wall-hung urinal screens.
 - 3. Hardware and accessories.

1.3 RELATED SECTIONS

- A. Gypsum Drywall - Section 092900.
- B. Ceramic Tiling - Section 093013.
- C. Toilet Accessories - Section 102813.

1.4 QUALITY ASSURANCE

- A. Field Measurements: Take field measurements prior to fabrication to ensure proper fitting of the work.
- B. Inserts and Anchorages: Furnish inserts and anchoring devices which must be built into other work for the installation of toilet partitions and related work. Coordinate delivery with other work to avoid delay.

1.5 SUBMITTALS

- A. Shop Drawings: Before any of the materials of this Section are delivered to the job site, submit the following:
 - 1. Room layouts and elevations for all areas, with dimensions based on actual dimensions taken at job site.
 - 2. Materials, finishes, details of construction, gauges of metal, hardware, fastening and anchoring conditions and relation to adjoining constructions.

- B. Samples - Submit:
 - 1. Solid plastic panel, each color - 12" x 12".
 - 2. All hardware and fitting items and fastenings for same. Include all items listed under 2.2 C. below.
- C. Templates: Submit templates to other trades as required for support of toilet partitions.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Type and Manufacturer: Toilet compartment shall be floor-mounted, overhead-braced, 100% post consumer recycled HDPE solid plastic assemblies with non-corrosive doors, panels, and pilasters equal to "Hiny Hiders" as manufactured by Scranton Products, or equivalent product of Bradley Corporation, Santana Products, Inc., or approved equal.
- B. Type: Provide wall hung urinal screens of same material as toilet partitions.

2.2 MATERIALS AND COMPONENTS

- A. Panels, doors, and pilasters shall be fabricated from solid plastic material containing a minimum of 100% post-consumer recycled material manufactured under high pressure forming a single component section which is waterproof, nonabsorbent, and has a self-lubricating surface that resists marking with pens, pencils, or other writing implements. All panels, doors, and pilasters to arrive at the job site with special protective plastic covering. Components shall have shiplap joints to eliminate sightlines into stalls.
- B. Solid plastic material shall meet National Fire Protection Association Class A, Uniform Building Code Class I, ASTM E 84 Fire Resistance Standards; flame spread 20, smoke density 95. Color: Hammered Metallic Finish.
- C. Finish Thickness
 - 1. Stiles and Doors: 3/4 inch.
 - 2. Panels: 1/2 inch.
- D. Wall Posts: Pre-drilled for door hardware, 18-8, Type 304, 16 gauge stainless steel with satin finish; 1 inch x 1-1/2 inches x 58 inches high.
- E. Stiles: Floor-Anchored stiles furnished with expansion shields and threaded rods.
 - 1. Leveling Devices: 7 gauge, 3/16 inches thick, corrosion-resistant, chromate-treated, double zinc-plated steel angle leveling bar bolted to stile; furnished with 3/8 inch diameter threaded rods, hex nuts, lock washers, flat washers, spacer sleeves, expansion anchors, and shoe retainers.
 - 2. Stile Shoes: One-piece, 22 gauge, 18-8, Type 304 stainless steel, 4 inch height; tops with 90 degree return to stile. One-piece shoe capable of adapting to 3/4 inch

or 1 inch stile thickness and capable of being fastened (by clip) to stiles starting at wall line.

F. Anchors: Expansion shields and threaded rods at floor connections as applicable. Threaded rods secured to supports above ceiling as applicable. Supports above ceiling furnished and installed as Work of Section 055000.

G. Hardware:

1. Compliance: Operable with one hand, without tight grasping, pinching, or twisting of the wrist, and force to operate does not exceed five pounds.
2. Emergency Access: Hinges, latch allow door to be lifted over keeper from outside compartment.
3. Materials: 18-8, Type 304, heavy-gauge stainless steel with satin finish. Chrome-plated "Zamak," aluminum, or extruded plastic hardware not acceptable.
4. Fastening: Hardware secured to door and stile by through-bolted, theft-resistant, pin-in-head Torx stainless steel machine screws into factory-installed, threaded brass inserts. Fasteners secured directly into core not acceptable.
 - a. Threaded Brass Inserts: Factory-installed; withstand direct pull force exceeding 1500 lb. per insert.
5. Clothes Hooks: Projecting no more than 1-1/8 inch from face of door.
6. Mounting: Hinges, keepers, latches, clothes hooks and their fasteners concealed inside compartment. Exposed hinges, keepers, latches, clothes hooks and their fasteners on exterior of compartment not acceptable with the exception of accessible compartments.
7. Hardware Type: Institutional hardware (G.67).
 - a. Provide gap free stile and door interlocking panels
 - b. Latch and Housing: Heavy Duty extruded aluminum. Latching housing bright dip anodized finish. Slide bolt and button bacd anodized finish.
 - c. Hinges: Stealth intergal hinge from door and pilaster material with exposed metal parts on inside of stall.
 - d. Mounting Brackets: 18 gauge stainless steel and extend full height of panel.
 - 1). U-Channels: Secure panels to stiles.
 - 2). Angle Brackets: Secure stiles-to-walls and panels-to-walls.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where floor-mounted toilet partitions are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. Install work of this Section in a rigid and permanent manner, straight and plumb, with all horizontal lines level.
- B. Install panels and doors twelve (12) inches above finished floor, unless otherwise indicated. Toilet compartment doors shall be centered on water closets, unless otherwise indicated.
- C. Maintain uniform clearance of approximately 1/2" between pilasters and panels, and 1/2" between pilasters or panels and finished wall.
- D. Maintain uniform clearance of 1/4" or less between vertical edges of doors and pilasters.
- E. Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4" into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

END OF SECTION

SECTION 102600

CORNER GUARDS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the corner guards as shown on the drawings and/or specified herein.

1.3 RELATED SECTIONS

- A. Gypsum Drywall - Section 092900

1.4 QUALITY ASSURANCE

- A. Cover materials shall be classified in accordance with ASTM E 84 as to flame spread and smoke development and shall be classified as self-extinguishing in accordance with ASTM D 635.

1.5 SUBMITTALS

- A. Samples: Two (2) samples of wall guards and corner guards each 12" long shall be delivered to the Architect.
- B. Shop Drawings: Submit shop drawings for corner guards showing all anchorage devices.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Corner Guards: Provide "Model A675" aluminum corner guards as manufactured by InPro Corporation, or approved equal.
 - 1. Size: 3" x 3" x 1/8" radius x 0.080" thick.
 - 2. Full Wall: Refer to Finish Schedule for ceiling heights.

3. Attachment and Fasteners: Pre-drilled beveled holes and Phillips head screws.
4. Finish: As selected by the Architect from manufacturer's full range.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where corner guards are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. Corner guards shall be set in alignment with the corner bead of the gypsum wallboard substrate.
- B. Surface must be dry, clean and properly sealed.
- C. Screw-On Installation: Position the corner guard on the wall and attach it using the supplied screws.

3.3 ADJUST AND CLEAN

- A. Clean surfaces promptly after installation, exercise care to avoid damage to surfaces.
- B. Protect corner guards from damage until acceptance of work.

END OF SECTION

SECTION 102813

TOILET ACCESSORIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment, and services necessary to complete the toilet accessories as shown on the drawings and/or specified herein, including, but not limited to, the following:
 - 1. Mirrors.
 - 2. Grab bars.
 - 3. Soap dispensers.
 - 4. Toilet paper dispensers.
 - 5. Paper towel dispensers.
 - 6. Waste receptacles.
 - 7. Sanitary napkin vendor/ dispenser.
 - 8. Sanitary napkin disposal unit.
 - 9. Coat hook.
 - 10. Mop and broom holder with shelf.
 - 11. Diaper-changing stations.

1.3 RELATED SECTIONS

- A. Gypsum Drywall - Section 092900.
- B. Ceramic Tiling - Section 093013.
- C. Toilet Partitions - Section 102113.

1.4 QUALITY ASSURANCE

- A. Inserts and Anchorages: Furnish inserts and anchoring devices which must be set in concrete or built into masonry; coordinate delivery with other work to avoid delay.

- B. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to assure proper operation and servicing of accessory units. Accessories shall be installed at heights in compliance with prevailing Handicapped Code.
- C. Products: Unless otherwise noted, provide products of same manufacturer for each type of unit and for units exposed in same areas.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data, catalog cuts and installation instructions for each toilet accessory.
- B. Setting Drawings: Provide setting drawings, templates, instructions, and directions for installation of anchorage devices in other work
- C. Submit schedule of accessories indicating quantity and location of each item.

1.6 PRODUCT HANDLING

- A. Deliver accessories to the site ready for use in the manufacturer's original and unopened containers and packaging, bearing labels as to type or material, manufacturer's name and brand name. Delivered materials shall be identical to approved samples.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22 gauge minimum, unless otherwise indicated.
- B. Brass: ASTM B 19 flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Galvanized Steel Sheet: ASTM A 653, G60.
- D. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.
- E. Mirrors: ASTM C 1503, mirror glazing quality, clear glass mirrors, nominal 1/4" thick.

2.2 FASTENING DEVICES

- A. Exposed Fasteners: Theft-proof type, chrome plated, or stainless steel; match finishes on which they are being used.
- B. Concealed Fasteners: Galvanized (ASTM A 123) or cadmium plated.
- C. No exposed fastening devices permitted on exposed frames.

- D. For metal stud drywall partitions, provide ten (10) gauge galvanized sheet concealed anchor plates for securing surface mounted accessories.

2.3 FABRICATION

- A. General: Stamped names or labels on exposed faces of toilet accessory units are not permitted. Unobtrusive labels on surfaces not exposed to view are acceptable. Where locks are required for a particular type of toilet accessory, provide same keying throughout project. Furnish two keys for each lock.
- B. Surface-Mounted Toilet Accessories, General: Fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage.
- C. Recessed Toilet Accessories, General: Fabricate units of all welded construction, without mitered corners. Hang doors of access panels with full-length stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.
- D. Diaper-Changing Table: As manufactured by Koala Kare products, Division of Bobrick; recessed-mounted horizontal unit that opens by folding down from stored position and with child-protection strap. Diaper-changing table shall be engineered to support a minimum of 250 lb. static load when opened.

2.4 MANUFACTURERS

- A. Provide products manufactured by Bobrick Washroom Equipment Co., American Specialties, Inc., Bradley Corp., A & J Washroom Accessories, or approved equal.

2.5 ACCESSORY SCHEDULE

- A. As selected by the Architect.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where toilet accessories are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 PREPARATION

- A. Accessories that are to be partition mounted shall be closely coordinated with other trades, so that the necessary reinforcing is provided to receive the accessories.
- B. Furnish templates and setting drawings and anchor plates required for the proper installation of the accessories at gypsum drywall and masonry partitions. Coordinate the work to assure that base plates and anchoring frames are in the proper position to secure the accessories.

- C. Verify by measurements taken at the job site those dimensions affecting the work. Bring field dimensions that are at variance with those on the approved shop drawings to the attention of the Architect. Obtain decision regarding corrective measures before the start of fabrication of items affected.
- D. Cooperate in the coordination and scheduling of the work of this Section with the work of other Sections so as not to delay job progress.

3.3 INSTALLATION

- A. Install accessories at locations indicated on the drawings, using skilled mechanics, in a plumb, level and secure manner.
- B. Concealed anchor assemblies for gypsum drywall partitions shall be securely anchored to metal studs to accommodate accessories. Assemblies shall consist of plates and/or angles tack welded to studs.
- C. Secure accessories in place, at their designated locations by means of theft-proof concealed set screws, so as to render removing of the accessory with a screwdriver impossible.
- D. Unless otherwise indicated, accessories shall conform to heights from the finished floor as shown on the drawings. Where locations are not indicated, such locations shall be as directed by the Architect.
- E. Installed accessories shall operate quietly and smoothly for use intended. Doors and operating hardware shall function without binding or unnecessary friction. Dispenser type accessories shall be keyed alike. Prior to final acceptance, master key and one duplicate key shall be given to Owner's authorized agent.
- F. The Architect shall be the sole judge of workmanship. Workmanship shall be of the highest quality. Open joints, weld marks, poor connections, etc., will not be permitted. The Architect has the right to reject any accessory if he feels the workmanship is below the standards of this project.
- G. Grab bars shall be installed so that they can support a three hundred (300) lb. load for five minutes per ASTM F 446.

3.4 CLEANING AND PROTECTION

- A. Upon completion of the installation, clean accessories of dirt, paint and foreign matter.
- B. During the installation of accessories and until finally installed and accepted, protect accessories with gummed canvas or other means in order to maintain the accessories in acceptable condition.
- C. Replace and/or repair, to the Owner's satisfaction, and at no additional cost to the Owner, installed work that is damaged or defective.

END OF SECTION

SECTION 104413

FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the fire protection specialties as shown on the drawings and/or specified herein.
 - 1. Portable fire extinguishers.
 - 2. Fire-protection cabinets.

1.3 RELATED SECTIONS

- A. Gypsum Drywall - Section 092900.
- B. Fire suppression systems - Division 21.
- C. Fire hose cabinets and valve cabinets - Division 21.

1.4 QUALITY ASSURANCE

- A. Provide portable fire extinguishers, cabinets and accessories by one manufacturer.
- B. UL-Listed Products: Provide new portable fire extinguishers which are UL-listed and bear UL "Listing Mark" for type, rating, and classification of extinguisher indicated.

1.5 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and installation instructions for all portable fire extinguishers required. For fire extinguisher cabinets include roughing-in dimensions, and details showing mounting methods, relationships to surrounding construction, door hardware, cabinet type and materials, trim style and door construction, style and materials. Where color selections by Architect are required, include color charts showing full range of manufacturer's standard colors and designs available.
- B. Samples: Submit samples, 6" square, of each required finish. Prepare samples on metal of same gauge as metal to be used in the work. Where normal color variations are to be expected, include 2 or more units in each sample showing the limits of such variations.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. JL Industries.
 - 2. Larsen's Mfg. Co.

2.2 PORTABLE FIRE EXTINGUISHERS

- A. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in colors and finishes selected by Architect from manufacturer's standard which comply with requirements of governing authorities.
- B. Abbreviations indicated below to identify extinguisher type related to UL classification and rating system and not necessarily to type and amount of extinguishing material contained in extinguisher.
- C. Multi-Purpose Dry Chemical Type: UL rated 4-A:60-B:C, 10 lb. nominal capacity, in enameled steel container, for Class A, Class B and Class C fires.
 - 1. Product: J.L. Industries' "COSMIC 10E," or approved equal, multipurpose dry chemical type consisting of heavy-duty steel cylinder, rugged metal valve and siphon tube, replaceable molded valve stem seal, pull pin and upright squeeze-grip operation.

2.3 CABINETS

- A. Type and Style: Fire extinguisher cabinets shall be metal, recessed, with clear, tempered glass panel, sized to fit within the partition or wall depth. Provide fire-rated cabinets within fire-rated partitions.
- B. Color: Fire extinguisher cabinets shall be factory pre-finished with baked enamel in the colors selected by the Architect from the standard range of colors of the selected manufacturer.
- C. Type: JL Industries' "Ambassador 3036G11FX" or approved equal, # 6 satin stainless return trim, fire extinguisher cabinet with flanged tub constructed of cold-rolled steel, die cut letters in white.

2.4 MOUNTING BRACKETS

- A. Provide manufacturer's standard bracket designed to prevent accidental dislodgment of extinguisher, of proper size for type and capacity of extinguisher specified, in manufacturer's standard enamel finish; color to match extinguisher.

2.5 IDENTIFICATION

- A. Identify fire extinguisher in cabinet with lettering spelling "FIRE EXTINGUISHER" painted on door by silk-screen process. Provide lettering on door as selected by Architect from manufacturer's standard letter sizes, styles, colors and layouts.
- B. Identify bracket-mounted extinguishers with red letter decals spelling 'FIRE EXTINGUISHER' applied to wall surface. Letter size, style and location as selected by the Architect.

PART 3 EXECUTION

3.1 INSPECTION

- A. Examine the areas and conditions where fire extinguishers and cabinets are to be installed and correct any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

3.2 INSTALLATION

- A. Install items included in this Section in locations indicated and at heights to comply with applicable regulations of governing authorities.
 - 1. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
 - 2. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.
- B. Where exact location of cabinets and bracket-mounted fire extinguishers is not indicated, locate as directed by the Architect.

3.3 SERVICE

- A. Determine the approximate completion date of the work and then inspect, charge, and tag the fire extinguishers at a date not more than 10 days before or not less than one day before actual completion date of the work.

END OF SECTION

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