Project Manual for

OREGON STATION

Greenwood Development

The Boudreaux Group, Inc.
Post Office Box 5695
Columbia, South Carolina 29250

Architect's Project No. G-1025-22-1

Construction Documents

February 21, 2024

TECHNICAL SPECIFICATIONS

DIVISION 01 - GENERAL REQUIREMENTS

DIVISION 02 - EXISTING CONDITIONS

DIVISION 03 – CONCRETE

DIVISION 04 – MASONRY

DIVISION 05 - METALS

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

DIVISION 08 - OPENINGS

DIVISION 09 – FINISHES

DIVISION 10 – SPECIALTIES - DIVISION 33 – UTILITIES

DIVISION 14 – CONVEYING EQUIPMENT

DIVISION 21 – FIRE PROTECTION

DIVISION 22- PLUMBING

DIVISION 23- HEATING, VENTILATION AND AIR CONDITIONING

DIVISION 26- ELECTRICAL

APPENDIX A- ASBESTOS REPORT
LIMITED ASBESTOS CONTAINING MATERIAL INVESTIGATION REPORT

APPENDIX B- GEOTECHNICAL REPORTS

PROJECT GEOTECHNICAL REPORT

APPENDIX C- LEAD-BASED PAINT SURVEY (FOR REFERENCE ONLY)

PROJECT LEAD-BASED PAINT ASSESSMENT- PRODUCED BY BUNNELL LAMMONS ENGINEERING

END OF TABLE OF CONTENTS

INDEX OF DRAWINGS

Cont’d

Cont’d

Cont’d

Cont’d

ELECTRICAL

END OF DOCUMENT

SECTION 010010 – INVITATION FOR CONSTRUCTION BIDS`

Greenwood Developers is seeking bids for General Contractor services for the Renovation at 150 Oregon Ave in Greenwood, SC of approximately 36,000 square feet of existing building along with a small addition to house an elevator, stair and entry. In addition, site work to west of the building is included to create an outdoor amenity area as well as the construction of a performance pavilion.

PLEASE ENSURE THAT YOU READ THIS SECTION IN ITS ENTIRETY, *as special requirements are addressed pertaining to what is considered a 'Responsive' bid.*

Sealed bids for all labor and material required for the Greenwood Development, Oregon Station Project will be received from bidders by the Architect, The BOUDREAUX Group, Inc. at 1519 Sumter St., Columbia, SC 29201 by **Wednesday, May 1st, 2024 by 2:00pm.** It is the responsibility of each bidder to ensure receipt of their bids IN ADVANCE of the deadline. For any issues with Bid Submittals please contact the Architect's office, c/o Erica Timmons at 803-799-0247. Construction is anticipated to begin in early Summer, 2024 (exact date of commencement is to be determined and negotiated with the Owner).

The Construction Documents with the Construction Drawings and Project Manual, including Instructions to Bidders, Form of Proposal, Form of Agreement, Forms of Bid Bond, Performance and Payment Bond, Technical Specifications and other contract documents will be made available to bidders as detailed below:

Bidders are to only bid from the PDF sets of the bidding documents received directly from the Architect. Requests for documents can be made by email to Erica Timmons, at etimmons@boudreauxgroup.com. It is the responsibility of each bidder to ensure complete sets of documents are downloaded and any applicable Bid Addendums are received IN ADVANCE OF the bid deadline.

Subcontractors and suppliers must have their bids turned in to the General Contractor at least two (2) hours prior to bid opening.

Bidders are responsible for the cost of printing any sets of documents as they deem necessary to print for their convenience with their efforts to bid the documents. The quality of such printing, in that it matches in clarity the of the PDF's provided in the link provided document download link, is the responsibility of the bidders. **All bids are to be based on full sets of bidding documents only.**

NOTICE TO BIDDERS:

THERE IS A NON-MANDATORY PRE-BID CONFERENCE ON Wednesday, April 10, 2024 at 10:00AM at the project site, 150 Oregon Ave, Greenwood, SC. Parking is available around the site. At the conference, all questions are to be directed to the Architect and submitted to the Architect **IN WRITING** within 48 hours of the Pre-Bid Conference. Send written questions via e-mail to Erica Timmons at etimmons@boudreauxgroup.com **AND George Schafer** at gschafer@boudreauxgroup.com. Questions and answers will be documented in the Pre-Bid Conference Meeting Minutes and will be issued via an Addendum. Bids are not to be based on oral interpretations, discussions or questions and answers, as to the meaning of the Drawings and Specifications during the Pre-Bid conference.

BIDDERS QUALIFICATION SUBMITTAL:

No bid may be withdrawn for a period of **sixty (60) days** after the time and date of the bid opening. Both Performance and Material Bonds (hereafter declared Performance and Payment Bond) are required in an amount equal to 100 percent of the contract price, within 10 days of the date of signing the "agreement."

ADDITIONAL INFORMATION:

***THE OWNER RESERVES THE RIGHT TO REJECT ANY AND ALL BIDS, WAIVE INFORMALITIES AND AWARD THE CONTRACT IN THE BEST INTEREST OF THE OWNER. All bids will be evaluated based on construction cost and proposed duration of construction, and the Owner will award to the Most Responsive Bidder based on the same criteria.**

END OF SECTION 010010

SECTION 010020 - FORM OF PROPOSAL

DATE:_____

TO: Greenwood Development

Hand Delivery, Email, UPS or FedEx,:

Erica Timmons, c/o BOUDREAUX
etimmons@boudreauxgroup.com
Re: Greenwood Development/Oregon Station
1519 Sumter Street
Columbia, SC 29201

Bidder:_____

Address:_____

_____

The undersigned, having carefully examined the specifications for the Greenwood Development, Oregon Station project, Greenwood, South Carolina and the drawings similarly entitled, all dated **March 13, 2024** and the following addenda: (If applicable)

Addendum No. _____Dated _____ Addendum No. _____Dated_____

Addendum No. _____Dated _____ Addendum No. _____Dated_____

as well as the premises and conditions affecting the work, proposes to furnish all services, labor, and materials called for by them for:

Base Bid work in accordance with said documents for the lump sum of

_____Dollars

($_____) which sum is hereinafter called the "Base Bid". Substantial Completion date of Base Bid work shall be achieved in the number of days stipulated under the Contract Time.

Proposed Construction Time:_____Calendar Days

By submitting this bid, the General Contractor acknowledges that they have thoroughly read the Project Manual and are in agreement with the terms listed in the AIA A101-2017 and the Supplementary Conditions.

ALTERNATE (S) TO THE BASE BID

The undersigned proposes the following alternate prices and that should any of the following ALTERNATE(S) be accepted and incorporated in the AGREEMENT BETWEEN OWNER AND CONTRACTOR, the BASE BID will be altered in each case as follows. The number of days stipulated under the Contract Time is to remain unchanged.

Add Alternate No. 1: Trellis Fin Blade Alternate.

Add the sum of _____ ($_____)

UNIT PRICES:

Provide UNIT PRICES for only the items listed. The UNIT PRICES shall indicate the amount to be added to the Contract sum for each item. UNIT PRICES shall include all costs including, charges for materials, labor, equipment, fees, taxes, insurance, bonding, overhead, profit, etc. The Owner reserves the right in include or not to include any of the following UNIT PRICES in the Contract:

NO.	ITEM	UNIT	ADD
1.	Removal of unsatisfactory soil material.	CY	_____
2.	Replacement with suitable on-site fill.	CY	_____
3.	Replacement with suitable off-site fill.	CY	_____
4.	Patching of existing concrete.	CY	_____

BID HOLDING TIME AND CONTRACT ACCEPTANCE:

The undersigned hereby agrees that this bid may not be revoked or withdrawn after the time set for the opening of bids, but shall remain open for acceptance for a period of ***sixty (60) days*** following such time.

In case the undersigned be notified in writing by mail, telegraph, or delivery of the acceptance of this bid, within ten (10) days from notice, the Owner shall send a contract for the work for the above-stated amount and at the same time, the Contractor shall furnish and deliver for the Owner a Performance Bond and a Payment Bond, in the form issued by the American Institute of Architects (AIA Form A312-2010), each in an amount equal to 100 percent (100%) of the contract sum.

Respectfully submitted,

Bidder's Firm Name:
_____

Address
_____
_____

SEAL IF BIDDER
IS A CORPORATION

State of South Carolina Contractor's License No._____

By:_____

Title:_____

END OF SECTION 01002

SECTION 010030 - FORM OF AGREEMENT

Reference Form of Agreement, AIA Document A101, "Standard Form of Agreement Between Owner and Contractor- Stipulated Sum," 2017 Edition, published by the American Institute of Architects.

END OF SECTION 010030

DRAFT AIA® Document A101® – 2017

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the « » day of « » in the year « »
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

«Greenwood Development, LLC »« »
«104 Maxwell Avenue »
«Greenwood, SC 29646 »
« »

and the Contractor:
(Name, legal status, address and other information)

«TBD »« »
« »
« »
« »

for the following Project:
(Name, location and detailed description)

«Oregon Station»
«Greenwood, SC 29646 »
« »

The Architect:
(Name, legal status, address and other information)

«The BOUDREAUX Group, Inc. »« »
«1519 Sumter Street »
«Columbia, SC 29201 »
«803-799-0247 »

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201®–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

TABLE OF ARTICLES

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[« »] The date of this Agreement.

[« »] A date set forth in a notice to proceed issued by the Owner.

[« »] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

« »

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

[« »] Not later than « » (« ») calendar days from the date of commencement of the Work.

[« »] By the following date: « »

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be « » ($ « »), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

« »

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

« »

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

« »

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the « » day of a month, the Owner shall make payment of the amount certified to the Contractor not later than the « » day of the « » month. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than « » (« ») days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

- **.1** That portion of the Contract Sum properly allocable to completed Work;
- **.2** That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- **.3** That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

- **.1** The aggregate of any amounts previously paid by the Owner;
- **.2** The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
- **.3** Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
- **.4** For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2017; and
- **.5** Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

« »

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

« »

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

« »

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

« »

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

« »

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

« » % « »

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)

« »
« »
« »

« »

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[« »] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[« »] Litigation in a court of competent jurisdiction

[« »] Other *(Specify)*

« »

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

« »

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

« »
« »
« »
« »
« »
« »

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

« »
« »
« »
« »
« »
« »

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with AIA Document E203–2013, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

« »

§ 8.7 Other provisions:

« »

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor

.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds

.3 AIA Document A201™–2017, General Conditions of the Contract for Construction

.4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:
(Insert the date of the E203-2013 incorporated into this Agreement.)

« »

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[« »] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

« »

[« »] The Sustainability Plan:

Title	Date	Pages

[« »] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

« »

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
« »« »	« »« »
(Printed name and title)	*(Printed name and title)*

SECTION 010040 - FORM OF BONDS

PERFORMANCE AND PAYMENT BONDS:

The form of Performance and Payment Bonds required under this contract will be AIA Document A312, "Performance Bond", 2010 Edition and AIA Document A312, "Payment Bond", 2010 Edition published by the American Institute of Architects.

END OF SECTION 010040

DRAFT

AIA® Document A312® – 2010

Payment Bond

CONTRACTOR:
(Name, legal status and address)

« »« »
« »

SURETY:
(Name, legal status and principal place of business)

« »« »
« »

OWNER:
(Name, legal status and address)

«Greenwood Development, LLC »« »
«104 Maxwell Avenue
Greenwood, SC 29646 »

CONSTRUCTION CONTRACT
Date: « »
Amount: $ «0.00»
Description:
(Name and location)

«Oregon Station»
« »

BOND
Date:
(Not earlier than Construction Contract Date)
« »
Amount: $ « »
Modifications to this Bond: [« »] None [« »] See Section 18

CONTRACTOR AS PRINCIPAL
Company: *(Corporate Seal)*

Signature: _____
Name and Title: « »« »

SURETY
Company: *(Corporate Seal)*

Signature: _____
Name and Title: « »« »

(Any additional signatures appear on the last page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

« »
« »
« »

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

« »
« »
« »
« »
« »
« »

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

§ 4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

- **.1** have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- **.2** have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

§ 6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

§ 7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

§ 8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

§ 16 Definitions

§ 16.1 Claim. A written statement by the Claimant including at a minimum:

- **.1** the name of the Claimant;
- **.2** the name of the person for whom the labor was done, or materials or equipment furnished;
- **.3** a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- **.4** a brief description of the labor, materials or equipment furnished;
- **.5** the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- **.6** the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- **.7** the total amount of previous payments received by the Claimant; and
- **.8** the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

« »

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »
Address:	« »	Address:	« »

DRAFT

AIA® Document A312® – 2010

Performance Bond

CONTRACTOR:
(Name, legal status and address)

« »« »
« »

SURETY:
(Name, legal status and principal place of business)

« »« »
« »

OWNER:
(Name, legal status and address)

« Greenwood Development, LLC »« »
«104 Maxwell Avenue
Greenwood, SC 29646
« »

CONSTRUCTION CONTRACT
Date: « »
Amount: $ «0.00»
Description:
(Name and location)

«Oregon Station»
« »

BOND
Date:
(Not earlier than Construction Contract Date)
« »
Amount: $ « »
Modifications to this Bond: [« »] None [« »] See Section 16

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »

(Any additional signatures appear on the last page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone)

AGENT or **BROKER:**

« »
« »
« »

OWNER'S REPRESENTATIVE:
(Architect, Engineer or other party:)

« »
« »
« »
« »
« »
« »

ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

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§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

§ 2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

.1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;

.2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

.3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

§ 4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

§ 5 When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

§ 5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

.1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

.2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and

.3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

§ 10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

« »

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)

CONTRACTOR AS PRINCIPAL		**SURETY**	
Company:	*(Corporate Seal)*	Company:	*(Corporate Seal)*
Signature:		Signature:	
Name and Title:	« »« »	Name and Title:	« »« »
Address:	« »	Address:	« »

SECTION 010050- GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

The General Conditions of the Contract for Construction, AIA Document A201, **2017 Edition**, a standard document of and published by the American Institute of Architects, is hereby made a part of these specifications and, except as modified and supplemented by the Section entitled "Supplementary Conditions", are the general conditions on which all contracts for this work will be based.

END OF SECTION 010050

DRAFT

AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

«Oregon Station»
«200 Oregon Avenue
Greenwood, SC 29646 »

THE OWNER:
(Name, legal status and address)

«Greenwood Development
104 Maxwell Avenue
Greenwood, SC 29646 »« »
« »

THE ARCHITECT:
(Name, legal status and address)

«The BOUDREAUX Group, Inc.
1519 Sumter Street (P.O. Box 5695) »« »
«Columbia, SC 29201 (29250) »

TABLE OF ARTICLES

ADDITIONS AND DELETIONS: The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

INDEX
(Topics and numbers in bold are Section headings.)

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

§ 1.1.2 The Contract

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

§ 1.1.3 The Work

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

§ 1.1.4 The Project

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

§ 1.1.5 The Drawings

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

§ 1.1.6 The Specifications

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

§ 1.1.7 Instruments of Service

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

§ 1.1.8 Initial Decision Maker

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.2 Correlation and Intent of the Contract Documents

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

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

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

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

§ 1.3 Capitalization

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

§ 1.4 Interpretation

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

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

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

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors, and suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document

G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

ARTICLE 2 OWNER

§ 2.1 General

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

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

§ 2.2 Evidence of the Owner's Financial Arrangements

§ 2.2.1 Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.

§ 2.2.2 Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in the Contract Documents.

§ 2.2.3 After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.4 Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.

§ 2.3 Information and Services Required of the Owner

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

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

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

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

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

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

§ 2.4 Owner's Right to Stop the Work

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

§ 2.5 Owner's Right to Carry Out the Work

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect, or failure. If current and future payments are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.

ARTICLE 3 CONTRACTOR

§ 3.1 General

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

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

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

§ 3.2 Review of Contract Documents and Field Conditions by Contractor

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.3.4, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall submit Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences, and procedures, and for coordinating all portions of the Work under the Contract. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be solely responsible for the jobsite safety of such means, methods, techniques, sequences, or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures.

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

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

§ 3.4 Labor and Materials

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

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

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

§ 3.5 Warranty

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

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

§ 3.6 Taxes

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

§ 3.7 Permits, Fees, Notices and Compliance with Laws

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

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

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

§ 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 14 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend that an equitable adjustment be made in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

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

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

§ 3.9 Superintendent

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

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.

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

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised at appropriate intervals as required by the conditions of the Work and Project.

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

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

§ 3.11 Documents and Samples at the Site

The Contractor shall make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives, and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and

delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. The Contractor shall not be required to provide professional services in violation of applicable law.

§ 3.12.10.1 If professional design services or certifications by a design professional related to systems, materials, or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will

specify all performance and design criteria that such services must satisfy. The Contractor shall be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings, and other submittals prepared by such professional. Shop Drawings, and other submittals related to the Work, designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

§ 3.12.10.2 If the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 3.13 Use of Site

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

§ 3.14 Cutting and Patching

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

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

§ 3.15 Cleaning Up

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

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

§ 3.16 Access to Work

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

§ 3.17 Royalties, Patents and Copyrights

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

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses, and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss, or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

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

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

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

§ 4.2 Administration of the Contract

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

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

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of, and will not be responsible for acts or omissions of, the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 Communications

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols.

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

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.4.2 and 13.4.3, whether or not the Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, suppliers, their agents or employees, or other persons or entities performing portions of the Work.

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

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

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

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more Project representatives to assist in carrying out the Architect's responsibilities at the site. The Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

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

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

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

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

ARTICLE 5 SUBCONTRACTORS

§ 5.1 Definitions

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

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

§ 5.2 Award of Subcontracts and Other Contracts for Portions of the Work

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

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

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

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

§ 5.3 Subcontractual Relations

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

§ 5.4 Contingent Assignment of Subcontracts

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

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

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 Owner's Right to Perform Construction and to Award Separate Contracts

§ 6.1.1 The term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of subrogation.

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

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

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

§ 6.2 Mutual Responsibility

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

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a Separate Contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work shall constitute an acknowledgment that the Owner's or Separate Contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

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

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

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

§ 6.3 Owner's Right to Clean Up

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

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 General

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

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

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

§ 7.2 Change Orders

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

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

§ 7.3 Construction Change Directives

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

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

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

- **.1** Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- **.2** Unit prices stated in the Contract Documents or subsequently agreed upon;
- **.3** Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- **.4** As provided in Section 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.4 shall be limited to the following:

.1 Costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

.2 Costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 Costs of supervision and field office personnel directly attributable to the change.

§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

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

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

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

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

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

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

ARTICLE 8 TIME

§ 8.1 Definitions

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

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

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

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

§ 8.2 Progress and Completion

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

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

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

§ 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner pending mediation and binding dispute resolution; or (5) by other causes that the Contractor asserts, and the Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect may determine.

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

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

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

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

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

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

§ 9.3 Applications for Payment

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

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

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

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site.

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

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole as provided in Section 9.5.1.

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

§ 9.5 Decisions to Withhold Certification

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

- **.1** defective Work not remedied;
- **.2** third party claims filed or reasonable evidence indicating probable filing of such claims, unless security acceptable to the Owner is provided by the Contractor;
- **.3** failure of the Contractor to make payments properly to Subcontractors or suppliers for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
.5 damage to the Owner or a Separate Contractor;
.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
.7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When either party disputes the Architect's decision regarding a Certificate for Payment under Section 9.5.1, in whole or in part, that party may submit a Claim in accordance with Article 15.

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

§ 9.5.4 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or supplier to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Contractor shall reflect such payment on its next Application for Payment.

§ 9.6 Progress Payments

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

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

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

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

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

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

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

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

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

§ 9.8 Substantial Completion

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

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

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

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

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

§ 9.9 Partial Occupancy or Use

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

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

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

§ 9.10 Final Completion and Final Payment

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

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect, (3) a written statement that the Contractor knows of no reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and releases and waivers of liens, claims, security interests, or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

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

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

- **.1** liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- **.2** failure of the Work to comply with the requirements of the Contract Documents;
- **.3** terms of special warranties required by the Contract Documents; or
- **.4** audits performed by the Owner, if permitted by the Contract Documents, after final payment.

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

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 Safety Precautions and Programs

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

§ 10.2 Safety of Persons and Property

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

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

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

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

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

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

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

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

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

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

§ 10.3.2 Upon receipt of the Contractor's notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of the material or substance or who are to perform the task of removal or safe containment of the material or substance. The Contractor and the Architect will

promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable additional costs of shutdown, delay, and start-up.

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

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

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

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

§ 10.4 Emergencies

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

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 Contractor's Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's commercial general liability policy or as otherwise described in the Contract Documents.

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

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

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act

or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

§ 11.2.1 The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.

§ 11.2.2 Failure to Purchase Required Property Insurance. If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.

§ 11.2.3 Notice of Cancellation or Expiration of Owner's Required Property Insurance. Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.

§ 11.3 Waivers of Subrogation

§ 11.3.1 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other; (2) the Architect and Architect's consultants; and (3) Separate Contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire, or other causes of loss, to the extent those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the property insurance required by the Agreement shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.5.2. The Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors in similar manner.

§ 11.5.2 Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 Uncovering of Work

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

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

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

§ 12.2.2 After Substantial Completion

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of any applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of notice from the Owner to do so, unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.5.

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

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

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

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

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 Acceptance of Nonconforming Work

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

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 Governing Law

The Contract shall be governed by the law of the place where the Project is located, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 Successors and Assigns

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

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

§ 13.3 Rights and Remedies

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

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

§ 13.4 Tests and Inspections

§ 13.4.1 Tests, inspections, and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules, and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and

approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections, and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 If the Architect, Owner, or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection, or approval not included under Section 13.4.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection, or approval, by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.4.3, shall be at the Owner's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure, including those of repeated procedures and compensation for the Architect's services and expenses, shall be at the Contractor's expense.

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

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

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

§ 13.5 Interest

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

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

- **.1** Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- **.2** An act of government, such as a declaration of national emergency, that requires all Work to be stopped;
- **.3** Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- **.4** The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.

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

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.

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

§ 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

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

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, the Owner may, without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

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

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

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

§ 14.3 Suspension by the Owner for Convenience

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

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

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

§ 14.4 Termination by the Owner for Convenience

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

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

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

§ 14.4.3 In case of such termination for the Owner's convenience, the Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, a change in the Contract Time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with this Section 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party under this Section 15.1.3.1 shall be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in Section 15.1.3 shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

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

§ 15.1.7 Waiver of Claims for Consequential Damages

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

.1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

.2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit, except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

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

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

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

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

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

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

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

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

§ 15.3 Mediation

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract, except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.

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

§ 15.3.3 Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.

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

§ 15.4 Arbitration

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

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

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

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

§ 15.4.4 Consolidation or Joinder

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

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

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

SECTION 010060 - SUPPLEMENTARY CONDITIONS

GENERAL CONDITIONS:

AIA Document A201, **2017 Edition** - General Conditions of the Contract for Construction and Supplementary Conditions are Part of this contract.

Whenever the work "Architect" appears herein, the intent is "Architect and/or Engineer".

SUPPLEMENTS:

The following supplements modify, delete and/or add to the General Conditions and/or Supplementary Conditions. Where any article, paragraph or subparagraph in the General Conditions and/or Supplementary Conditions is supplemented by one of the following paragraphs, the provisions of such article, paragraph or subparagraph shall remain in effect and the supplemental provisions shall be considered as added thereto. When any article, paragraph or subparagraph in the General Conditions and/or Supplementary Conditions is amended, voided, or superseded by any of the following paragraphs, the provisions of such article, paragraph or subparagraph not so amended, voided, or superseded shall remain in effect.

ARTICLE 1 - GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

Add the following:

"1.1.1.1 The Contractor's Bid shall be part of the Contract Documents."

"1.1.2.1 Form of Agreement shall be AIA Document A101, 'Standard Form of Agreement Between Owner and Contractor,' 2017 Edition.

"1.1.2.2 In the event of conflict between the specifications and drawings, the provisions of whichever document is more specific shall govern. The specifications are to supplement the drawings with more specific information indicated in the specifications that may not be identified on less detailed drawings. Detailed drawings are to supplement the specifications to further illustrate the specific conditions of the project that is not as specifically described in the specifications."

"1.1.4.1 The scope of Work includes the following:

The scope of Work includes all the work described in the Construction Documents including the Drawings and Project Manual titled Oregon Station, and dated 02.21.2024.

The scope of Work includes:

Project includes but is not limited to the following: Renovation of approximately 36,000 square feet of existing building along with a small addition to house an elevator, stair and entry. In addition, site work to west of the building is included to create an outdoor amenity area as well as the construction of a performance pavilion.

"1.1.5.1 Addenda: Written or graphic instruments issued prior to the execution of the Agreement which modify or interpret the Contract Documents, Drawings and Specifications by additions, deletions, clarifications or corrections. Such addendum or addenda will take precedent over the position of the general drawings and specifications concerned and will be considered as part of the Contract Documents."

"1.1.9 Agreement: The Agreement represents the entire and integrated agreement between the parties hereto and supersedes all prior negotiations, representations or agreements, either written or oral, including the bidding documents. The Agreement may be amended or modified by a Change Order."

"1.1.10 Bid: The written offer of the bidder, submitted on the prescribed form, properly signed and guaranteed, to perform the work at the prices quoted by the Bidder."

"1.1.11 Bid Bond: The security furnished by the Bidder with his bid for the Project is guaranty he will enter into a contract for the work at the prices quoted by the Bidder."

"1.1.12 Bid Form: The approved form on which the Owner requires formal bids to be prepared and submitted for the work."

"1.1.13 Bidder: Any individual, firm or corporation of combination of same submitting a bid for the work contemplated, acting directly or through a duly authorized representative."

"1.1.14 Bonds: Bid, Performance and Payment Bonds and other instruments of security furnished by the Contractor and his Surety in accordance with the Contract Documents."

"1.1.15 Calendar Day: Every day shown on the calendar, Sundays, and holidays included."

"1.1.16 Architect/Engineer: The person, firm or corporation named as such in the Contract Drawings and duly appointed by the Owner to undertake the duties and powers herein assigned to the Engineer, acting either directly or through duly authorized representatives."

"1.1.17 Equipment: All machinery, together with the necessary supplies for upkeep and maintenance, and all tools, and apparatus necessary for the proper construction and acceptable completion of the work."

"1.1.18 Furnish: Furnish and install complete, in place, and ready for use."

"1.1.19 Materials: Any substance specified for use in construction of the Project and its appurtenances."

"1.1.20 Notice to Proceed: Written communication issued by the Owner to the Contractor authorizing him to proceed with the Work and establishing the date of commencement of the Work."

"1.1.21 Payment Bond: The approved form of security furnished by the Contractor to guarantee the payment to all persons supplying labor and materials in the prosecution of the work in accordance with the terms of the Contract."

"1.1.22 Performance Bond: The approved form of security furnished by the Contractor to guarantee the completion of the work in accordance with the terms of the Contract."

1.1.23 Pre-Construction Conference: A conference following award and prior to start of the construction to be attended by a duly authorized representative of the Architect and by the responsible officials of the Contractor and other affected parties."

"1.1.24 Provide: Furnish and install complete, in place, and ready for use."

"1.1.25 Supplemental Conditions: Conditions of the Contract other than the General Conditions."

"1.1.26 Superintendent: The Contractor's authorized representative in responsible charge of the work."

"1.1.27 Supplier: Any person or organization who supplies materials or equipment for the Work, including that fabricated to a special design, but who does not perform labor at the site."

"1.1.28 Surety: The corporation, partnership or individual bond with and for the Contractor for the full and complete performance of the contract, and for the payment of all debts pertaining to the work."

"1.1.29 Titles (or Headings): The titles or headings of the sections and subsections herein are intended for convenience of reference and shall not be considered as having any bearing on their interpretation."

"1.1.30 Work: All labor necessary to produce the construction required by the Contract Documents, and all materials and equipment incorporated or to be incorporated in the Project."

"1.1.31 Written Notice: Any notice to any party of the Agreement relative to any part of this Agreement in writing and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party and his last given address, or delivered in person to said party or his authorized representative on the Work."

ARTICLE 2 – OWNER

2.1 GENERAL

Modify as follows:

2.1.1 Last line delete "authorized" and substitute therefore "designated."

Add the following:

"2.1.1.1 Greenwood Communities and Resorts

2.2 Information and Services Required of the Owner

Modify as follows:

2.2.1 Delete subparagraph 2.2.1 in its entirety.

2.2.5 Delete in its entirety and substitute with the following:

"2.2.5 Addenda: The Contractor will not be provided with hard copies of the Drawings and Project Manuals as the bid documents will be issued in digital PDF format. If the Contractor so desires, the Contractor will be responsible for the purchase of additional copies of the Drawings and Project Manual for the Contractor's use, directly from the printer selected by the architect where quality control of printing is being managed by the architect. The Contractor should also include in his bid the cost of printing three (3) Construction Sets of the Drawings and Project Manuals which will include the incorporation of all Addendum items issued during the

bidding period. These Construction Sets are to be used by the General Contractor as the official field and office sets and for the completion of as-built drawings."

ARTICLE 3 – CONTRACTOR

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

Add the following:

"3.2.5 The following principles shall govern the settlement of disputes which may arise over discrepancies in the contract documents: (a) as between figures given on drawings and the scaled measurements, the figures shall govern - no measurements should be taken by scale as working dimensions except on large-scale drawings not dimensioned in detail; (b) as between large-scale drawings and small-scale drawings, the larger scale shall govern; (c) as between drawings and specifications, refer to paragraph 1.1.2.2 as added by these Supplementary Conditions (d) as between the Form of Agreement including Supplementary and Special Conditions and the Technical Specifications, requirements of the Form of Agreement shall govern. The principles set forth herein shall not altar provisions of Article I, paragraph 1.2. Architect should be notified of any discrepancies prior to execution of the work."

"3.2.6 Specific reference in the specifications to any article, device, product, materials, fixtures, form or type of construction, etc. by name, make, or catalog number, with or without the words "or equal" shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition and the Contractor in such cases may, at his option, use any article, device, product, material, fixture, form or type of construction which, in the judgment of the Architect/Engineer expressed in writing, is equal to that named. Where quality and other characteristics are very nearly the same, the question of determining equal materials and readily available service sometimes resolves itself to a matter of personal opinion and judgment and in these and all other cases involving the approval of materials, the opinion, judgment and decision of the Architect/Engineer and the Owner shall be final and bind all parties concerned."

"3.2.6.1 Requests for written approval to substitute materials or equipment considered, by the Contractor as equal to those specified must have been submitted for approval ten (10) calendar days prior to bid opening date to the Architect/Engineer. Requests must have been accompanied by samples, descriptive literature, and engineering information as necessary to fully identify and allow appraisal of the product. Requests must have been made in writing."

"3.2.6.2 Approval of the Architects/Engineer to use materials and/or equipment, if granted, will have been in the form of a written addendum and will have been issued to all bidders. Approved substitutions may be used at Contractor's option. No substitutions will be allowed, nor will an increase in Contract be allowed (for using materials specified) if substitutions have been requested later than ten (10) days prior to bid opening date except where the Contractor can demonstrate to the Architect that such substitutions results in an additional benefit to the owner over and beyond the products and systems indicated as being acceptable to be included in the Work as approved by both the Architect and Owner and should not result in any additional cost to the Owner."

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

“3.3.1.1 PERFORMANCE OF WORK BY PRIME CONTRACTOR:

General Contractor shall perform on the site, and with his own organization, work equivalent to not less than

20 percent of the total amount of work to be performed under the Contract. If, during the progress of work hereunder, the Contractor requests a reduction in such percentage, and the Architect determines that it would be to Owner's advantage, the percentage of work required to be done by Contractor may be reduced; provided written approval of such reduction is obtained by Contractor from the Architect."

Add the follow:

"3.3.4 Testing Services: The Owner will hire a Testing Agency to perform the testing of all materials indicated to be tested in technical specification sections. The Testing Agency will be selected by the Architect and Owner. The contractor is to include in this Bid the costs of accommodating and coordinating such testing and any additional testing the Contractor may so desire to perform, as a part of the Contractor's quality control measures or otherwise."

"3.3.5 Asbestos: Contractor shall not allow the use of asbestos containing products, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work, even if the products are nonfriable and/or certain minimal amounts of asbestos, and even though such products may still be legally installed."

3.4 LABOR AND MATERIALS

Add the following:

"3.4.1.2 The Contractor shall not allow the use of lead materials in public water applications. "Lead free" solder, flux and pipe must be used in all public drinking water applications as outlined in the 1986 Amendments to the Safe Drinking Water Act. "Lead free" solder and flux are defined as containing less than 0.2% lead, while valves, pipes and appurtenances must contain less than 8.0% lead."

3.5 WARRANTY

Add the following:

"3.5.1 Warranties and guarantees are required on all of the following items and items as indicated by the specifications:

Contractor's One Year Guarantee (See Attachment)

3.6 TAXES

Add the following:

"3.6.1 Contractor shall hold Owner and his agents harmless against any claim or liability from pertinent clauses of State Law."

3.7 PERMITS, FEES, NOTICES & COMPLIANCES WITH LAWS

Add the following:

"3.7.1.1 In order that the inspection services of county building departments might be made available site utilities and electrical work, the contractor shall require that each subcontractor for these specialty contracts apply for, obtain and pay the cost of a permit and inspection fees for that specialty for which he is a subcontractor." The General Contractor shall apply for and pay for a building permit from Richland County

Government as well as any other permits/fees required by local ordinances. Tap and Impact fees will be paid for by the General Contractor as part of this contract."

"3.7.1.2 Tap and Impact Fees: The Contractor shall secure and pay the cost of all tap fees and impact fees related to the construction and Final Occupancy of the building."

3.11 DOCUMENTS AND SAMPLES AT THE SITE

Add the following:

"3.11.1 Record Drawings: In addition to prints specified elsewhere herein to be furnished by Architects, Architects will furnish Contractor one complete set of white prints of general drawings. Contractor and/or subcontractors under his direction shall record on set of white prints each and every change that is made from general drawings at time it is made. This includes any changes that are made on site in arrangement or construction of building as well as a complete record of exact manner in which electrical and utilities are installed. Dimensions shall be included where necessary to accurately locate piping and other items that will be concealed in finished building and that it may later be necessary to service. Upon completion of construction, Contractor shall submit this set of marked-up white prints to the Architect. These marked-up white prints shall show construction and all services thereto exactly as built and installed. The Contractor shall make any necessary additions as requested by the Architect.

"3.11.2 Maintenance File - The Owner shall be provided by the General Contractor through the Architects/Engineers, three (3) copies each of complete indexed Maintenance Files. The File will be bound in hardback bindings, clearly showing name of building and construction date. Each and every device, fixture, machine, control and component part used in and on the job will be included, with all information needed to operate, adjust, repair, and secure replacement parts in the future.

For each item show:
a. Name and where used on job;
b. Manufacturer and address;
c. Supplies or distributor and address;
d. Make, model or catalog number, size, color, serial number;
e. Parts list;
f. Operation instructions and adjustments;
g. Lubrication, maintenance procedures and tests;
h. Wiring or piping diagrams;
i. Guarantee-Warranty and service information.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

Add the following:

"3.12.5.1 Contractor Review: Review submittals prior to transmittal; determine and verify field measurements, field construction criteria, manufacturer's catalog numbers, and conformance of submittal with requirements of contract documents.

Coordinate submittals with requirements of work and of contract documents.

Sign or initial and stamp Approved (not reviewed) each sheet of shop drawings and product data, and each sample label to certify compliance with requirements of contract documents. Notify architect in writing at time of submittal, or any deviations from requirements of contract documents.

Should the Contractor submit for approval equipment that requires modifications to the structures, piping, layout, etc., detailed on the Drawings, he shall also submit for approval details of the proposed modifications. If such equipment and modifications are approved, the Contractor, at no additional cost to the Owner, shall do all work necessary to make such modifications. Required structural changes shall be designed and detailed by an Engineer registered in the state in which the project will be constructed. Drawings shall be signed and show registration number or may have seal affixed."

3.13 USE OF SITE

Add the following:

"3.13.1 Contractor's Temporary Facilities:

Temporary Field Office: It is assumed that the General Contractor will set up a temporary office within the existing building therefore a job trailer is not required.

Temporary Sheds: Contractor may provide and maintain additional storage sheds and other temporary buildings or trailers as he requires. Location of sheds and trailers shall be approved by the Owner.

Removal: At the completion of the Contract, or as directed by the Owner, remove all temporary buildings, sheds, and trailers from the site, and leave the grounds in condition as hereinafter specified in other sections."

"3.13.2 Contractor's Temporary Equipment:

Contractor shall furnish, maintain, and remove at completion, all equipment such as temporary stairs, ladders, ramps, chutes, and like facilities, as required for proper execution of work of all trades.

Contractor and each subcontractor for his own use shall provide all scaffolding required for execution of his work. Such scaffolding shall conform to requirements of authorities having jurisdiction over such work, and be maintained in safe condition at all times. Remove when no longer required."

"3.13.3 Lifting Devices and Hoisting Equipment:

Contractor shall provide, operate, and maintain machines for hoisting materials, as well as other type hoists and derricks, as may be required for execution of all trades' work. Such apparatus, equipment and construction shall meet requirements of labor laws and other state or local laws applicable thereto."

"3.13.4 Temporary Water During Construction:

The General Contractor will be able to use water available at the existing site and is not expected to pay for usage.

"3.13.5 Temporary Electricity During Construction:

The General Contractor will be able to use power available at the existing site and is not expected to pay for usage.

"3.13.6 Temporary Toilet Facilities:

The contractor shall provide temporary toilet facilities on site. The contractor is responsible for maintaining

the cleanliness of the facilities. The contractor shall make provision for temporary toilet facilities at his own expense." Coordinate with the Owner on preferred location.

"3.13.7 Weather Protection, Temporary Heat and Ventilation:

Extent: The contractor shall provide, at his expense, all weather protection, temporary heat and fuel as necessary to carry on the work expeditiously during inclement weather, to protect all work and materials against injury from dampness and cold, and to provide suitable working conditions for the installation and curing of materials until final acceptance by the Owner."

"3.13.8 Underground Utilities Damage Prevention Act:

Contractor and all subcontractors shall comply with all requirements of the so called "underground utilities damage prevention act, Statute 58-35-10".
Contractor needs to determine the location of existing underground utilities using whatever means he deems necessary to prevent damage or interruption of service."

"3.13.9 Layout Of The Work:

Complete scope of the work shall be established and maintained by the Contractor.

Before commencing any work, the Contractor shall verify all dimensions and notes as indicated on the drawings. He shall report any errors or inconsistencies in them to the Architect before commencing work."

"3.13.10 Materials and Workmanship:

All items shall be installed in a workmanlike manner in accordance with best-recognized practice in field concerned. Manufactured items shall be installed in strict accordance with manufacturer's printed directions, specifications and/or recommendations for an installation of highest quality. All working parts shall be properly adjusted after installation and be left in perfect working order.

All items exposed to weather, or otherwise subjected to flooding or wetting, shall be installed in such a manner as to ensure a permanent watertight and weather tight installation. Unless otherwise indicated, items exposed to weather, or subject to flooding or wetting, shall be installed so as to shed and not hold water. Items shall in all cases be installed plumb and true and/or in proper relationship to surrounding materials.

When standard specifications such as American Society for Testing and Materials, Federal Specifications, Department of Commerce (Commercial Standards), American Institute of Steel Construction, or other well-known public or trade associations are cited as standards to govern materials and/or workmanship, such specifications, or portion thereof as referred to, shall be equally as binding and have full force and effect as though it were copied into these specifications. Such standard specifications as are mentioned are generally recognized by and available to trades concerned. Architects will, however, upon request of a bidder or contractor, furnish for inspection a copy of any standard specification mentioned, or direct bidder or contractor to any easily available copy. Unless otherwise expressly stated, standard specifications referred to shall be considered as latest edition and/or revisions of such specifications that is in effect on date of invitation for bids. In case of any conflicts between standard specifications and written portion of contract specifications, the contract specifications shall govern."

ARTICLE 4 - ARCHITECT

4.1 GENERAL

Add the following:

"4.1.1.1 The Architect/Engineer is The Boudreaux Group, Inc., 1519 Sumter Street (Post Office Box 5695), Columbia, South Carolina 29201 (29250), telephone (803)799-0247, FAX No. (803) 771-6844".

"4.1.4. In the Specifications or on the Drawings, where the words `as directed' `as required', `as approved', `as permitted' or words of like effect are used, Contractor shall understand that direction, requirement, approval or permission of Architect/Engineer is intended. Similar words `approved;, `acceptable', `satisfactory', or words of like import mean approved by, acceptable to or satisfactory to Architects/Engineer."

4.2 ARCHITECT

Add the following:

"4.2.7.1 Shop Drawings and Samples: The Architect/Engineer approval of Shop Drawings or Samples shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents, including form, function, and performance, unless the Contractor has informed the Architect, in a separate written notice, of such deviation at the time of submission and the Architect has given separate written approval to specific deviation, nor shall the Architect's approval relieve the Contractor from responsibility for errors or omissions in the Shop Drawings or samples. The Architect/Engineer and Owner do not guarantee field dimensions.

Shop Drawings shall be dated and contain: Name of project; description or names of equipment, materials and items; and complete identification of locations at which materials or equipment are to be installed, reference to the Section of Specifications where it is specified and drawing number where shown. Apply Contractor's stamp indicating Approved (not reviewed), signed or initialed, certifying to review, verification of products, field dimensions and field construction criteria, and coordination of information with requirements of work and contract documents.

Submission of Shop Drawings shall be accompanied by a standard transmittal form, copies of which will be furnished by the Contractor. Form shall be filled out in its entirety. Coordinate submittals into logical groupings to facilitate interrelation of the several items:

1. Finishes which involve Architect/Engineer selection of colors, textures, or patterns.
2. Associated items, which require correlation for efficient function or for installation.

Contractor shall comply with submittal procedures outlined in specification section 01330 Submittal Procedures.

"4.2.7.2 Architect/Engineer Review Procedures:

The Architect will return to the contractor without examination shop drawings, product data and other required submittals, which have not been prepared according to contract requirements. Submittals received without the Contractor's stamp and signature of approval will not be reviewed and will be returned to the Contractor for checking and resubmittal.

The Architect will review submittals only for conformance with the design concept of the project and with information given in the contract documents. Errors and discrepancies observed during review of submittals will be noted, but checking will not assure verification of dimensions or include verifications of quantities.

The Architect's review of a separate item submittal shall not indicate approval of an assembly in which such item functions.

The Architect's review and submittal action shall not relieve the Contractor from responsibility for errors or omissions in shop drawings or product data submittals or for lack of coordination in assembly of materials and equipment with other work, nor from the responsibility of furnishing materials and labor not indicated on submitted shop drawings or product data, but required by the contract documents for completion of the work.

If no changes to the shop drawings, product data or other required submittals are required the submittal will be returned to the Contractor bearing the stamp of the architect: "No exceptions taken". No further resubmittals are required.

If changes to the shop drawings, product data, or other required submittals are required but are of such minor nature that fabrication can proceed in accordance with the corrections noted by the Architect, submittals will be returned to the contractor bearing the stamp of the Architect: "Make corrections noted." The contractor shall proceed with fabrication in accordance with the Architect's corrections. No further resubmittals are required.

1. If changes to shop drawings are required, which are not of a minor nature although the drawing is acceptable and fabrication can proceed in accordance with the corrections noted by the Architect, or
2. In the event portions of a drawing are unacceptable, although fabrication on the remaining portions can proceed in accordance with the corrections noted by the architect, shop drawings and other submittals will be returned to the Contractor bearing the stamp of the Architect: "Amend and resubmit". The Contractor may proceed with fabrication on all acceptable portions of the drawings in accordance with corrections noted by the Architect. The Contractor shall correct the original drawings and resubmit in accordance with the shop drawings submittal procedure.

If changes are required to the shop drawings but are of such nature that fabrication cannot proceed copies of each shop drawing will be returned to the Contractor bearing the stamp of the Architect: "Rejected, see remark." The Contractor shall not proceed with fabrication and he shall correct the original tracing and resubmit it in accordance with the shop drawings submittal procedure.

The Architect's review action of submittals shall not be construed as authorizing any change in the contract sum or contract time unless so stated in a separate written order, nor shall it be construed as relieving the Contractor of his responsibility for coordination of work with other trades, or interpreted as approving quantities and dimensions.

No claim for delay caused by the disapproval of submittals will be allowed if such disapproval is based on noncompliance or any other deviation from the Contract.

The right is reserved by the Architect to require at the Contractor's expense the submission of detail, shop, erection or setting drawings, schedules or data for any part of work, whether or not specifically mentioned in technical sections, where substitutions or modifications are proposed by the Contractor or where such information is essential to the proper assembly, coordination or execution of work under the contract.

If major corrections are necessary, the Architect will return the submittal to the Contractor with general notes only."

"4.2.7.3 Distribution:

Contractor shall duplicate and distribute reproductions of shop drawings, copies of product data, samples and other required submittals, which bear Architect's stamp of approval, to job site file, record drawings file, subcontractors, suppliers, other affected contractors, and other entities requiring information."

"4.2.9.1 Warranties and guarantees are required on all of the following items and other items as indicated by the specifications:

Contractor's One Year Guarantee (see attached form)

ARTICLE 5 - SUBCONTRACTORS:

5.3 SUBCONTRACTUAL RELATIONS

Add the following:

"5.3.1 The Contractor shall assure the Owner, by affidavit or in such other manner as the Owner may approve, that all agreements between the Contractor and his subcontractors incorporate the provisions of paragraph 5.3 as necessary to preserve and protect the rights of the Owner and the Architect/Engineer under the Contract Documents with respect to the work to be performed by subcontractors so that the subcontracting thereof will not prejudice such rights."

ARTICLE 7 - CHANGES IN THE WORK

7.2 CHANGE ORDERS

Add the following:

"7.2.2 Requests for additional cost or time must be submitted in a timely manner no later than 10 days after contractor or subcontractor becomes aware of a potential change order item. A change order, when issued, shall be full compensation, or credit, for the extra work included, omitted, or substituted. It shall show on its face, the adjustment in time for completion of the project as a result of the change in the work. Each change order shall include all costs related thereto, including all overhead, miscellaneous expenses, and incidentals. The contractor shall submit a written and itemized proposal for each Change Order under consideration (Change Proposal Requests) within 21 days of receipt of a pricing request.

“7.2.3 In cases where completion time is extended for the execution of change orders, the contractor shall not be entitled to extended overhead and profit compensation for any one change order where the period of time extension is less than 7 days and shall only be entitled to extended overhead and profit compensation for any one change order for the number of days beyond 7 days. And the basis of evaluation of time extension shall be on individual change orders and not on the accumulation of change orders.”

"7.2.4 In determining the cost or credit to the Owner resulting from a change in the Work, by either Change Order or Directive, the allowances for overhead and profit combined, included in the total cost to the Owner, shall not exceed the percentages herein scheduled, as follows:

1. For the Prime Contractor, for any work performed by his own forces, 15% of the cost;

2. For each Subcontractor involved, for work performed by his own forces 15% of the cost;

3. For the Prime Contractor, for work performed by his Subcontractors, 7% of the amount due the

Subcontractor."

ARTICLE 8 - TIME:

8.1 DEFINITIONS

Add the following:

"8.1.1.1 Contract Time:

The Contractor shall commence actual physical work on this project within ten (10) days from date set forth in the NOTICE TO PROCEED. Subject to authorized adjustments, all work shall be substantially complete (as evidenced by the date on the CERTIFICATE OF SUBSTANTIAL COMPLETION) within **250** ***days*** from the date set forth in the NOTICE TO PROCEED and finally completed in an additional **7 days**."

"8.1.1.2 Liquidated Damages: The Contractor agrees that from the compensation to be paid, the Owner may retain as liquidated damages the sum of ***Two Hundred and Fifty Dollars ($250.00)*** for each calendar day the actual contract time exceeds the specified contract time and the work is not Substantially Complete (as determined by Architect). The Contractor agrees that from the compensation to be paid, the Owner may retain as liquidated damages the sum of ***Two Hundred and Fifty Dollars ($250.00)*** for each calendar day beyond Substantial Completion the actual contract time exceeds the specified contract time and the work is not Finally Complete (as determined by Architect). These sums are agreed upon as the proper measure of liquidated damages which the owner will sustain per diem by failure of the Contractor to complete the work by the time stipulated and this sum is not to be construed as in any sense a penalty."

8.3 DELAYS AND EXTENSIONS OF TIME

Modify as follows:

Delete “8.3 Delays and Extensions of Time” in its entirety and substitute with the following:

"8.3 DELAYS AND EXTENSIONS OF TIME

8.3.1 Completion time stipulated under other sections of the Contract Documents may be extended by Change Order to provide one additional work day for each full work day that the Contractor is prevented from working by reason of one or more of the following causes:

1. Unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not limited to, catastrophes and/or acts of God, acts of another contractor in the performance of a separate contract with the Owner, epidemics, quarantine restrictions, strikes or freight embargoes;

2. An unusual amount of severe weather to such an extent as to be definitely abnormal and beyond conditions that may be reasonable anticipated. For the purpose of this contract, a total of five (5) working days per calendar month shall be anticipated as 'normally bad or severe weather', and such time will not be considered justification for an extension of time.
   Normally bad or severe weather is defined as days having more than a trace of precipitation during the hours of 8 AM to 5 PM, excluding Saturdays, Sundays and Holidays.

   Normally bad or severe weather is defined as days having more than a trace of precipitation during the hours of 8 AM to 5 PM on Saturdays, Sundays and Holidays ONLY when the contractor issues in

writing, that the Contractor will be working with a full crew (as is appropriate for the portion of work in progress) on specified days, 7 days in advance of working on these Saturdays, Sundays and/or Holidays and ONLY when the contractor can justify in writing the need to work on these days to meet the construction schedule. These days will not be granted if the Architect deems that the Contractor has not made a reasonable good faith effort to remain on schedule or that it is not necessary for the Contractor to work on these days to remain on schedule.

Extension of time may be requested for days fitting this description in excess of the five days referred to above. Additionally, one day following any day having more than one inch of precipitation in its 24 hours may be justified as an extension if the contractor can show that no work was performed on the job due to muddy conditions on the site.

3. Stoppage of work ordered by Owner or Architect/Engineer for reasons over which Contractor has no control.

The Contractor shall, within ten (10) days after the beginning of such delay notify the Owner and Architect/Engineer in writing of the cause of the delay. The Architect/Engineer will then ascertain the facts and extent of delay, and notify the Contractor within ten (10) days of the owner's decision in the matter. Notice of delay and requests for extension of time shall set forth the cause, and number of additional working days contractor desires contract extended.

8.3.2 The contractor shall not be entitled to extended overhead and profit compensation for the period of the time extension for an unusual amount of sever weather.

8.3.3 No claims for extension of time will be considered when based on delays caused by conditions existing at the time bids were received, and of which the Contractor might be reasonably expected to have full knowledge at the time of bidding, or upon delays caused by failure on the part of the Contractor to anticipate properly the requirements of the work contracted for as to materials, labor and equipment. All claims for extension of time shall be made in writing to the Architect/Engineer with the next application for payment; otherwise they shall be waived.

8.3.4 The completion date stipulated under other sections of the Contract Documents may be extended by Change Order to compensate for additional work that may be ordered by Owner, provided such work is over and beyond scope of work covered by original contract, and is of such nature as to materially affect date of completion."

ARTICLE 9 - PAYMENT AND COMPLETION

9.3 APPLICATIONS FOR PAYMENT

Modify as follows:

9.3.1 Second sentence following "notarized" delete "if required".

Add the following:

"9.3.1.3 Progress Payments: Based upon Application for Payment submitted to the Architect by the Contractor, and the Church’s financial institution, and Certificates for Payment issued by the Architect, the owner shall make progress payments on account of the Contract Sum to the contractor as provided in the Contract Documents for the period ending the last business day of the month as follows; not later than ninety percent (90%) of the portion of the Contract Sum properly allocable to labor, materials and equipment

incorporated in the work and ninety percent (90%) of the portion of the Contract Sum properly allocable to materials located at some other location agreed upon in writing (and properly insured and bonded if off site), for the period covered by the Application for Payment, less the aggregate of previous payments made by the owner. The remaining 10% retainage shall not be released at Substantial Completion. Retainage will be released as part of Final Payment at Final Completion.

"9.3.2.1 Rental equipment such as, but not limited to, mobile equipment, pans, forms, scaffolding, compressors, and the like, shall not be considered material stored."

9.8 SUBSTANTIAL COMPLETION

Modify as follows:

9.8.1 First sentence following "Work" delete "or designated portion thereof".

9.8.2 First sentence following "Work" delete "or a portion thereof".

9.8.3 First and second sentence following "Work" delete "or designated portion thereof".

9.8.4 First and second sentence following "Work" delete " or designated portion thereof".

9.8.5 Second sentence following "Work" delete " or designated portion thereof".

9.10 Final Completion and Final Payment

Add the following:

"9.10.1.1 When the Contractor is ready for final inspection, he shall give notice to the Architect/Engineer with a copy to the Owner in the following words:

> The work on the contract for (show name of improvement or project as it appears in the Form of Agreement), having been fully completed, except as stipulated herein below, it is requested that a final inspection be made promptly by the Architect/Engineer. The following work is incomplete through no fault or negligence of the Contractor: (list any work the Contractor regards as exceptionable and after each item substantiate why its incompleteness is not due to his fault or negligence).

No final inspection shall be made until such time as the Architect/Engineer and the owner have received a letter in exact form indicated above. If the architect is requested to perform Final Inspection and the status of the work has not reached Final Completion, **the contractor will have to reimburse the architect for time and expenses related to the inspection trip**.

"9.10.2.1 Contractor shall submit to Architect/Engineer Contractor's Affidavit of Payment of Debts and Claims on AIA Document G706, latest edition, together with all supporting documents as called for thereon, including (as applicable):

1. Consent of Surety to Final Payment on AIA Document G707, latest edition.

2. Contractor's Release of Waiver of Liens, conditional upon receipt of final payment. Submit in letter form under Contractor's letterhead.

3. Separate Releases or Waivers of Liens from all Subcontractors and Materials and Equipment Suppliers on reproduction of form supplied by Architect/Engineer in Contract Documents. Accompany with a list thereof.

4. Contractor's Affidavit of Release of Liens on AIA Document G706A, latest edition."

"9.10.3.1 The balance payable under conditions stated shall reflect retainage for thrice the value of uncompleted work, as determined by the Architect/Engineer, but not more than 10% of the contract amount."

ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

Add the following:

“10.5 PROTECTION OF INSTALLED MATERIAL

10.5.1 Protect installed products and control traffic in immediate area to prevent damage from subsequent operations.

10.5.2 Provide protective coverings at walls.

10.5.5 Storage and protection:

Provide protection of weather, traffic and usage of installed material requiring additional craftsmen and materials to finish the project.

Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.

For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.

Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.

Arrange storage to provide access for inspection. Periodically inspect to assure products are undamaged, and are maintained under required conditions.

Store and protect existing materials to be reinstalled same as above.

Packaging, Transportation: Require supplier to package products in boxes or crates for protection during shipment, handling and storage. Protect sensitive products against exposure to elements and moisture. Protect sensitive equipment and finishes against impact, abrasion and other damage. “

10.6 OSHA STANDARDS:

Contractor and all subcontractors shall comply with all applicable requirements of the South Carolina OSHA Construction Standards in all construction operations."

ARTICLE 11 - INSURANCE:

11.1 CONTRACTOR'S LIABILITY INSURANCE

Add the following:

"11.1.2.1 The insurance required by Subparagraph 11.1.1 shall be written for not less than the following, or greater if required by law.

1. Worker's Compensation:

   (a) State — Statutory

   (b) Employer's Liability — $1,000,000

2. Comprehensive General Liability (including Premises-Operations; Independent Contractor's Protective; Products and Completed Operations; Bodily Injury; Broad Form Property Damage). The Contractor shall include the Architect as an additional insured party on the Comprehensive General Liability Policy.

   (a) Combined single interest (bodily injury and property damage): $1,000,000 minimum

   (b) Property Damage Liability Insurance shall provide X, C and U coverage.

3. Contractual Liability:

   Combined Single Interest: $500,000 minimum.

4. Personal Injury, with Employment Exclusion deleted:

   $1,000,000 Annual Aggregate

5. Comprehensive Automobile Liability (including hired and non-owned coverage):

   Combined single interest: $1,000,000

6. Business Umbrella Policy: $2,000,000"

"11.1.2.2 In addition to Contractual Liability including indemnification provision Bodily Injury and Property Damage coverage under both comprehensive General and Comprehensive Automobile forms shall include "occurrence" basis wording, which means an event, or continuous or repeated exposure to conditions which unexpectedly causes injury or damage during policy period."

"11.1.2.3 Contractor shall either (a) require each of his Subcontractors to procure and maintain during the life of his subcontract Subcontractors Comprehensive General Liability, Automobile Liability, and Property Damage Liability Insurance of the type and in the same amounts as specified in this Subparagraph, or (b) insure the activities of his Subcontractors in his own policy."

"11.1.3 The insurance required in Subparagraph 11.1.1 shall include contractual liability insurance applicable to the Contractor's obligations under Paragraph 4.18."

"11.1.3.1 The Contractor shall furnish one copy each of Certificates of Insurance herein required for each

copy of the Agreement which shall specifically set forth evidence of all coverage required by Subparagraph 11.1.1, 11.1.2, 11.1.3. The form of the Certificates shall be AIA Document G705. The Contractor shall furnish to the Owner copies of any endorsements that are subsequently issued amending coverage or limits.

"11.1.3.2 Certificate of Insurance must be filed through Architect/Engineer on AIA Document G705, latest edition, by an insurer authorized to do business in South Carolina by South Carolina State Insurance Commission. All blanks and questions on Certificate must be filled out completely. Incomplete or inadequate Certificate will be returned to Contractor as unsatisfactory and commencement of his work will be delayed until satisfactory Certificate is submitted. Such delay will not warrant extension of contract time."

"11.1.4 Certificate of Insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. These certificates shall contain a provision that coverages afforded under the policies will not be canceled until at least thirty days prior written notice has been given to the Owner."

Modify as follows:

Delete 11.3 Project Management Protective Liability Insurance in its entirety.

11.3 PROPERTY INSURANCE

Add the following:

"11.3.11 Property Insurance required under this Paragraph 11.4 shall be furnished, purchased and maintained by the Contractor until Substantial Completion of the entire project. During the period between Substantial Completion and Final Completion, or during the period of time in which any building is occupied by the Owner (for the value of that building) but before Substantial Completion of the entire project, the Property Insurance required under this Paragraph 11.4 shall be furnished, purchased and maintained by the Owner."

11.4 PERFORMANCE BOND AND PAYMENT BOND

Add the following :

11.4.3 Contractor shall provide and pay the cost of Performance and Payment Bonds, in the form of AIA Document A312 "PERFORMANCE BOND AND LABOR AND MATERIAL BOND". Each shall be in the full amount of the Contract Sum, issued by a Surety Company licensed in South Carolina, with an "A" minimum rating of performance as stated in the most current publication of "Best's Key Rating Guide, Property Liability" which shall show a financial strength rating of at last five (5) times the Contract price. Each Bond shall be accompanied by a "Power of Attorney" authorizing the attorney-in-fact to bind the surety and certified to include the date of the Bond.

ARTICLE 13 - MISCELLANEOUS PROVISIONS:

13.1 GOVERNING LAW

Add the following:

"13.1.1.1 By executing a contract for the Project the Contractor agrees to submit itself to the jurisdiction of the courts of the State of South Carolina for all matters arising or to arise hereunder, including but not limited to performance of said contract and payment of all licenses and taxes of whatever or nature applicable

thereto."

13.5 TESTS AND INSPECTIONS

Modify as follows:

13.5.1 Delete the second sentence “Unless otherwise provided ….” and replace with the following:

“Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with and independent testing agency as hired and selected by the Owner, or with the appropriate public authority, and shall bear all related costs of accommodating and coordinating with the testing agency for the testing of all materials indicated to be tested in technical specification sections, and shall bear all related costs of inspections and approvals.”

Add the following:

"13.5.1.2 Testing for soil conditions, concrete, grout, and materials here in specified shall be completed by a qualified testing and materials laboratory selected and approved by the Owner, Architect and Engineer and hired by the Owner. The General Contractor shall be responsible for making arrangements for such tests and inspections and for obtaining test results and approvals from the Owner’s independent testing laboratory or entity in a manner that is acceptable to the Owner and Architect/Engineer. See also Supplementary Conditions 3.3.4. Testing Services"

13.6 INTEREST

Delete this Subparagraph in its entirety.

Add the following:

“13.8 CONFLICT OF INTEREST

13.8.1 No official of the Owner who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept or approve, or to take part in negotiation, making, accepting, or approving any architectural, engineering, inspecting, construction or material supply contract or any subcontract in connection with the construction of the project, shall become directly or indirectly interested personally in this Contract or in any part thereof. No officer, employee, architect, attorney, engineer or inspector of or for the Owner who is authorized in such capacity and on behalf of the Owner who is in any legislative, executive, supervisory, or other similar functions in connection with the construction of the project, shall become directly or indirectly interested personally in this Contract or in any part thereof, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the project.”

“13.9 SPECIFICATION HEADINGS

13.9.1 For convenience of reference, these Specifications are divided into various Divisions, Sections, Subsections and Paragraphs. The titles of these headings shall not be taken as a correct or complete segregation of the various types of material and labor nor as an attempt to outline jurisdictional procedures. The headings shall not be deemed to limit or restrict the content, meaning or effect of such section, subsection, paragraph, provision or part. The organization of the specifications into the various headings, and the arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade. Each subcontract shall be dependent upon its own definite confines, regardless of Divisions of these Specifications. No responsibility, direct or implied, is

assumed by the owner for omissions or duplications by the Contractor or by any of his subcontractors due to real or alleged errors in arrangement of matter in Contract Documents."

A13.10 PUBLICITY

13.10.1 All prime contractors and their subcontractors shall submit to the Owner for approval all publicity items, including photographs, relating to the work of this project. The Owner shall approve any and all material prior to release for publication.

END OF SECTION 010060

(Attachments)

CONTRACTOR'S ONE YEAR GUARANTEE

STATE OF

COUNTY OF

NAME OF PROJECT Oregon Station

_____ as General Contractor on the above named project does hereby guarantee that all work executed under the requirements of the Contract Documents shall be free from defects due to faulty materials and/or workmanship for a period of one (1) year from date of execution of the Certificate of Substantial Completion, and hereby agrees to remedy defects due to faulty materials and/or workmanship, and pay for any damage resulting there from, at no cost to the Owner, provided however, that the following are excluded from this guarantee:

a. Defects or failures resulting from abuse by Owner.

b. Damage caused by fire, tornado, hail, hurricane, acts of God, wars, riots, or civil commotion.

It is specifically understood that the terms of this guarantee, the compliance therewith, and the fulfillment of all obligations thereunder are fully protected by the Performance Bond furnished by the Contractor.

_____
(Name of Contracting firm)

*By_____

Title_____

*Must be executed by an officer of the contracting firm.

SWORN TO before me this _____
day of_____, 20_____.
_____(SEAL)
Notary Public for_____(state).

CONTRACTOR'S GUARANTEE
ON
ROOFS, WALLS, AND FLOORS ON GRADE

STATE OF

COUNTY OF

1. We, _____as
(General Contractor)

General Contractor for the construction of the _____ do hereby guarantee that for a period of two (2) years from the date of the execution of the Certificate of Substantial Completion; that all base flashing at building component abutments and intersections with the roof, flashing and counter flashing at roof edges, gutters and down leaders, decks and nailers, and other work on the surface of the roof (that may not be included under the specified roof warranty); that all flashing; base flashing; counterflashing; metal work; fascias; roof expansion joints; wall expansion joints, caulked joints in or between windows, door frames and other frames, facing materials; exterior walls above or below grade; floors on grade; or through or around sleeves and other built-in items in floors on grade, shall be absolutely watertight and free from all leaks, provided, however, that the following are excluded from this warranty:

a. Defects or failures resulting from abuse of Owner.

b. Damage caused by fire, tornado, hail, hurricane, acts of God, wars, riots or civil commotion.

2. The said _____
(General Contractor)

agrees that should any leaks occur in the roofs or walls of the said

_____
(Name of Project)

the said_____
(General Contractor)

will promptly remedy the said leaks and pay for any damage to other work of said project resulting therefrom.

CONTRACTOR□S GUARANTEE ON ROOFS, WALLS, AND FLOORS ON GRADE (cont□d)

3. It is further understood and agreed by the General Contractor that positive action to correct any leakage and/or damage from leakage to the building, will be undertaken by the Contractor within not to exceed ten (10) days from date of notification by the Owner in writing, and that failure to take such action shall serve as authorization on the part of the Contractor for the Owner to effect such corrections, and repair such damage as the Owner deems necessary, with the Contractor being held responsible for reimbursing the Owner for all reasonable costs incurred therefrom.

4. It is specifically understood that the terms of this guarantee, the compliance therewith, and the fulfillment of all obligations thereunder are fully protected by the Performance Bond furnished by the Contractor.

_____
(Name of Contracting Firm)

*By_____

Title_____

ATTEST (Notary Public)

By_____

this _____day of _____, 20____.

*Must be executed by an officer of the contracting firm.

SECTION 010070 - SPECIAL CONDITIONS

PART 1 – GENERAL

1.1 JOB SIGN

A. The Contractor shall provide one (1) sign with 1 full color rendering image printed on outdoor adhesive vinyl, mounted to 4’ x 8’ Alumilite substrate. Image to be printed in outdoor ink and matte laminated to prevent abrasion & fading. Signs to be installed using 2 12’ long wood 4x4’s post (painted)

Architect to provide digital files to contractor to provide to printer. Digital files shall be provided in optional formats (.tiff, .jpeg, or .eps) for sign printing.

Job Sign files to be provided to Contractor within 14 days of Notice to proceed.

1.2 PERSONS AUTHORIZED TO SIGN DOCUMENTS

A. Contractor shall, within five (5) days after a notification of award or prior to execution of a contract, whichever is earliest, file with Architect a list of all persons in his firm who are authorized to sign documents such as contracts, certificates, and affidavits on behalf of the firm and except that in the case of a corporation he shall file with Architect a certified copy of a resolution of the Board of Directors of the corporation in which is listed the personnel of such corporation, with their title, who are authorized to sign documents on behalf of the corporation to all the conditions and provisions of such documents.

1.3 APPROVAL, BY ARCHITECT, OF SUBSTITUTE MATERIALS AND EQUIPMENT

A. Approval, by the Architect, of substitute materials and equipment shall not relieve the Contractor from his responsibility to supply and install any additional materials, equipment, or labor required to make the substitution properly function within the intent of the contract documents, as issued for Bid, whether or not such additional materials, equipment or labor are shown on the data submitted with the request for approval and whether or not recognized by the Architect or Contractor. The Contractor shall supply and install such required additional material, equipment or labor solely at his own expense and at no additional cost to the Owner.

1.4 NAMING OF SUBCONTRACTORS

A. Subcontractors for the work shall be named as directed in the bid form.

1.5 PRE-CONSTRUCTION CONFERENCE

A. Owner and Architect will administer pre-construction conference for execution of scheduling, items relating to Owner-Contractor agreement and exchange of submittals. The pre-construction conference will be held at the project prior to commencement of work.

B. Owner and Architect will administer mobilization conference as part of the pre-construction conference for clarification of Owner and Contractor responsibilities in use of site and review of

administrative procedures.

1.6 PROGRESS MEETINGS

A. The Contractor shall schedule and administer project meetings throughout progress of the work.

B. The Contractor shall make physical arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies within two days to Architect, participants, and those affected by decisions made at meetings.

C. Attendance: Job Superintendent; major Subcontractors and Suppliers; Owner and Architect as appropriate to agenda topics for each meeting.

D. Suggested Agenda: Review of work progress, status of progress schedule and adjustments thereto, delivery schedules, submittals, maintenance of quality standards, pending changes and substitutions, and other items affecting progress of work.

1.7 PREINSTALLATION CONFERENCES

A. When required in individual specification Section, convene a preinstallation conference prior to commencing work of the Section.

B. Require attendance of entities directly affecting, or affected by, work of the Section.

C. Review conditions of installation, preparation and installation procedures, and coordination with related work.

1.8 PRODUCT DATA

A. Submit only pages that are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to specification section and article number. Show reference standards, performance characteristics, and capacities; wiring and piping diagrams and controls; component parts; finishes; dimensions; and required clearances.

B. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable to the work. Delete information not applicable.

C. Submit electronic copies in PDF format.

1.9 SAMPLES

A. Submit full range of manufacturer's standard finishes except when more restrictive requirements are specified for custom finishes, indicating colors, textures, and patterns, for Architect selection. The Architect will coordinate colors of finish materials. When requested by the Architect, submit finish samples for related work necessary to the coordination of colors. Review of approval of any finish will commence only upon receipt of requested related finishes.

B. Submit samples to illustrate functional characteristics of products including parts and attachments. Submit number of samples required by individual specification section.

C. Label each sample with identification required for transmittal letter. Submit under AIA G810 or Architect/Engineer accepted form with transmittal letter. Identify project by title and number; identify contract by number. Identify work and product by specifications section and article number.

D. Do not fabricate products or begin work that requires submittals until return of submittal with Architect acceptance.

1.10 MANUFACTURER'S INSTRUCTIONS

A. Comply with instructions in full detail, including each step in sequence. Should instructions conflict with Contract Documents, request clarification from Architect before proceeding.

1.11 MANUFACTURER'S CERTIFICATES

A. When required by individual specifications section, submit manufacturer's certificate in duplicate, that products meet or exceed specified requirements. General Contractor is solely responsible for securing manufacturer's certificates. Inability to provide certification shall be grounds for rejection of the product. General Contractor shall provide a certifiable substitute at no additional cost to the Owner.

1.12 RECEIVING MATERIALS FURNISHED BY OTHERS

A. Whenever Contractor or any Subcontractor shall receive items from another Contractor or from Owner for storage, erection or installation, Contractor or Subcontractor receiving such items shall give receipts for items delivered, and thereafter will be held responsible for care, storage, and any necessary replacing item or items received. No adjustment will be made to contract price for increased insurance premiums, except for materials and/or equipment furnished by Owner and not listed as such in other Contract Documents.

1.13 MANUFACTURERS' FIELD SERVICES

A. When specified in respective specification sections, require manufacturer to provide qualified personnel to observe field conditions, conditions of surfaces and installation, quality of workmanship, and to make appropriate recommendations. Representative shall submit written report to Architect listing observations and recommendations.

1.14 STORAGE AND PROTECTION

A. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.

B. For exterior storage of fabricated products, place on sloped supports above ground. Cover products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.

C. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.

D. Arrange storage to provide access for inspection. Periodically inspect to assure products are undamaged, and are maintained under required conditions.

1.15 CONSTRUCTION SET OF DRAWINGS AND PROJECT MANUAL

A. The Architect/Engineer will incorporate all Addendum items into the Drawings and Project Manual to produce a Construction Set of Drawings and Project Manual with all revisions clearly identified, including the Addendum under which the revisions were made. Copies of this document will be distributed electronically to the Owner and Contractor.

1.16 PACKAGING, TRANSPORTATION

A. Require supplier to package products in boxes or crates for protection during shipment, handling and storage. Protect sensitive products against exposure to elements and moisture. Protect sensitive equipment and finishes against impact, abrasion and other damage.

1.17 DELIVERY AND RECEIVING

A. Arrange deliveries of products in accordance with construction progress schedules. Allow time for inspection prior to installation.

B. Coordinate deliveries to avoid conflict with work and conditions at site; work of other Contractors, or Owner; limitations on storage space; availability of personnel and handling equipment; and Owner's use of premises.

C. Deliver products in undamaged, dry condition, in original unopened containers or packaging with identifying labels intact and legible.

D. Clearly mark partial deliveries of component parts of equipment to identify equipment and contents to permit easy accumulation of parts and to facilitate assembly.

E. Immediately on delivery, inspect shipment to assure:

1. Product complies with requirements of Contract Documents and requirements of Contract.
2. Quantities are correct.
3. Accessories and installation hardware are correct.
4. Containers and packages are intact and labels legible.
5. Products are protected and undamaged.

1.18 PRODUCT HANDLING

A. Provide equipment and personnel to handle products, including those provided by Owner, by methods to prevent soiling and damage.

B. Provide additional protection during handling to prevent marring and otherwise damaging products, packaging and surrounding surfaces.

C. Handle product by methods to avoid bending or overstressing. Lift large and heavy components only at designated lift points.

1.19 SOIL INFORMATION

A. The information concerning field soil test borings is attached to this section for review and for information for the General Contractor. The purpose of the exploration was to obtain specific data at the site for foundation and earthwork recommendations. The General Contractor shall notify Owner/Architect if conditions appear to be different at various locations within the building limits. The Owner will hire a soil testing company during construction to assure that foundation, pavement and earthwork requirements are being met. Site preparation requirements to achieve necessary soil conditions is stipulated on Civil and Structural documents.

1.20 REQUEST FOR ELECTRONIC FILES

A. Successful bidding Contractor may request electronic files directly from the Architect of Record, other than the PDF Format that is distributed with the bidding of the documents, for specific sheets pertinent to a particular trade and as is useful in the production of shop drawing documents for this project.. **Files will be distributed in AutoCAD format.** Requesting AutCAD format files of the entire project is not acceptable.

B. Contractor is responsible for identifying the exact sheet(s) requested for reproduction by sheet number (s) using the attached form “Request for Electronic Dwg. Files” completed and signed.

1.20 PERMITS AND FEES

A. General Contractor is responsible for obtaining all construction permits and paying all associate fees. Enquire with local authorities determine what will be required and the associated costs.

END OF SECTION 010070

(Attachments)

BOUDREAUX
inspired design

1519 Sumter Street (29201)
Post Office Box 5695
Columbia, South Carolina 29250
Phone: 799-0247
Fax: 771-6844

REQUEST FOR ELECTRONIC DWG FILES

DATE:

FROM: Name: _____

Address: _____

E-mail address: _____

PROJECT: **OREGON STATION** _____

THE BOUDREAUX GROUP AS AUTHOR OF THE ORIGINAL ELECTRONIC FILE HAS PREPARED THE FILE FOR SOLE USE AS A BID DOCUMENT. ANY USE OF THIS FILE, EITHER ALL OR IN-PART, FOR OTHER THAN ITS INITIAL USE AS A BID DOCUMENT SHALL BE FULL AND SUFFICIENT CAUSE TO HOLD THE BOUDREAUX GROUP, AND IT'S CONSULTANTS, AS AUTHOR OF THE ORIGINAL ELECTRONIC FILE HARMLESS AGAINST ANY CLAIM OR LIABILITY RESULTING FROM ANY DISCREPANCY, ERROR OR OMISSION IN THE FILE'S ORIGINAL OR MODIFIED FORM.

AKNOWLEDGED
AND SIGNED BY: _____

SHEET(S) REQUESTED: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Work by Owner.
5. Work under separate contracts.
6. Owner-furnished products.
7. Owner-furnished, Contractor-installed products.
8. Access to site.
9. Coordination with occupants.
10. Work restrictions.
11. Specification and drawing conventions.
12. Miscellaneous provisions.

B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

A. Project Identification: Oregon Station, Core and Shell Renovation and Site Work

1. Project Location: 150 Oregon Ave, Greenwood, SC 29646.

B. Owner: Greenwood Communities and Resorts

1. Owner's Representative: Ms. Lesley Lane, LLane@GreenwoodCR.com

C. Architect: The Boudreaux Group, 1519 Sumter Street Columbia, SC 29201, Ph. (803) 799-0247

D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Electrical Engineering:
   Mr. Jason Arehart
   Ph. (803) 731-0650
   jareheart@bea-consulting.com

2. Mechanical Engineering:
   Swygart & Associates
   Mr. Todd Swygart
   Ph. (803) 791-9300
   todd@swygart-associates.com

3. Structural Engineering:
   Stewart
   Mr. Cory High
   Ph. (704) 334-7925
   chigh@stewartinc.com

4. Civil Engineering:
   Stewart
   Mr. James Baysinger
   Ph. (704) 334-7925
   jbaysinger@stewartinc.com

5. Landscape Architecture:
   Urban Design Partners
   Mr. Michael Abate
   Ph. (704) 334-3303
   mabate@urbandesignpartners.com

E. Other Owner Consultants: The Owner has retained the following design professionals who have prepared designated portions of the Contract Documents:

F. Contractor: TBD

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Project includes but is not limited to the following: Renovation of approximately 36,000 square feet of existing building along with a small addition to house an elevator, stair and entry. In addition, site work to west of the building is included to create an outdoor

amenity area as well as the construction of a performance pavilion. Insert additional paragraphs for other major items of work.

B. Type of Contract:

1. Project will be constructed under a single prime contract. The type of contract is to be agreed upon between the Owner and the Contractor.

1.5 PHASED CONSTRUCTION

A. The Work shall be conducted in one phase.

B. Before commencing Work of each phase, submit an updated copy of Contractor's construction schedule showing the sequence, commencement and completion dates.

1.6 WORK BY OWNER (Owner Provided and Owner Installed - OPOI)

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

B. Concurrent Work: Owner will purchase the following items and perform the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
1. Purchase and installation of computer and audio visual equipment and wiring.

1.7 ACCESS TO SITE

A. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1.8 COORDINATION WITH OCCUPANTS

A. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited 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 prior to Owner acceptance of the completed Work.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.

3. Before limited 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 Work.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.9 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.

1.10 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 are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are 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 scheduled on Drawings.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

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. Lump-sum allowances.

C. Related Requirements:

1. Division 01 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders for allowances..

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 LUMP-SUM ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials under allowance shall be included as part of the Contract Sum and not part of the allowance.

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: Hardware Allowance: Amount to be included: $70,000 for the purchase and INSTALLATION of all finish door hardware for interior and exterior doors. Allowance includes sales tax for purchase of material and material waste and shipping.

This allowance includes supplying the hardware not covered by the interior and exterior Storefront and Curtainwall door suppliers, but does NOT include installing such hardware. This allowance does NOT include supplying and installing the hardware that is to be supplied by the Storefront and Curtainwall door suppliers. This allowance does NOT include the cost and effort associated with the coordination of hardware components and related trades, which is the Contractor's responsibility.

B. Allowance No. 2: Wood Floor Repair: Amount to be included: $25,000. The allowance includes the repair of existing wood flooring which is damaged or cupping. The allowance does not include areas of major wood finish flooring and wood subflooring damage that are identified by key notes to be repaired under the base bid. The allowance is to include repair or replacement of the finished wood surface only with the assumption that the wood subflooring is in good condition.

END OF SECTION 012100

SECTION 012300 - ALTERNATES

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 alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Trellis Fin Blade Alternate.

1. Base Bid: Includes salvaging and reusing reclaimed wood from the demolition of existing building elements as louvers in trellis elements as identified on the Drawings.
2. Alternate: As indicated in the Drawings, in lieu of providing reclaimed wood louvers, provide aluminum louver trellis as indicated on the Drawings. Basis of Design for the louvers is ZP Aluminum or an equal manufacturer and product that is acceptable to the Architect.

END OF SECTION 012300

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.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Section 016000 "Product Requirements" 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 three 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. Substitution Request Form: Use CSI Form 13.1A.
2. 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 comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant 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.
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, including a proposal of change, if any, in the Contract Sum.
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, and is appropriate for applications indicated.
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.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven 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.

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 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 including aesthetic appearance which is to be solely determined by the Architect.
b. Substitution request is fully documented and properly submitted.
c. Requested substitution will not adversely affect Contractor's construction schedule.
d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. 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 60 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.

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. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. 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 012500

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.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

B. Related Sections include the following:

1. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

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. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request 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.

B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes 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 Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

C. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a 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 Work Change Directive on AIA Document G714. Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Work 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 Work 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 012600

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.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections include the following:

1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals 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: Correlate line items in the Schedule of Values with Application for Payment forms with Continuation Sheets.

1. Submit the Schedule of Values to Architect with initial Applications for Payment.

B. Format and Content: Use the 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 Technical 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 the Schedule of Values as indicated under 00811-0SE article 3.83.

3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. 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. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.

6. 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.
7. 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.

8. 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. Comply with requirements under 00811-OSE article 3.84 and 3.85.

B. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

C. 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.

D. Payment Application Forms: Submit on forms indicated in the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

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.

F. Transmittal: Submit 3 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.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
   1. When an application shows completion of an item, submit final or full waivers.
   2. Owner reserves the right to designate which entities involved in the Work must submit waivers.
   3. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
   4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.

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. Products list.
   5. List of Contractor's staff assignments.
   6. List of Contractor's principal consultants.
   7. Copies of building permits.
   8. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
   9. Initial progress report.
   10. Report of preconstruction conference.
   11. Certificates of insurance and insurance policies.

I. Application for Payment at Substantial Completion: After issuing 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.

J. Final Payment Application: 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

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.

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination
2. Administrative and supervisory personnel.
3. Project meetings.
4. Requests for Interpretation (RFIs).

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

C. Related Sections include the following:
1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

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.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors 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.
9. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1.5 SUBMITTALS

A. Key Personnel Names: Within 15 days of starting construction operations, 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 and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.6 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1. Include special personnel required for coordination of operations with other contractors.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
1. If applicable existing on-site facilities may be used when meeting with the Owner and Architect.

2. 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.

3. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
4. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three business days of the meeting.

B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

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. All 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. Critical work sequencing and long-lead items.
    c. Designation of key personnel and their duties.
    d. Procedures for processing field decisions and Change Orders.
    e. Procedures for RFIs.
    f. Procedures for testing and inspecting.
    g. Procedures for processing Applications for Payment.
    h. Distribution of the Contract Documents.
    i. Submittal procedures.
    j. Preparation of Record Documents.
    k. Use of the premises and existing building.
    l. Work restrictions.
    m. Owner's occupancy requirements.
    n. Responsibility for temporary facilities and controls.
    o. Construction waste management and recycling.
    p. Parking availability.
    q. Office, work, and storage areas.
    r. Equipment deliveries and priorities.
    s. First aid.
    t. Security.
    u. Progress cleaning.
    v. Working hours.

3. Minutes: Record and distribute meeting minutes.

C. Progress Meetings: Conduct progress meetings at biweekly appropriate intervals. Coordinate dates of meetings with preparation of payment requests.

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 conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to 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.

        1) Review schedule for next period.

    b. Review present and future needs of each entity 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) Status of correction of deficient items.
        14) Field observations.
        15) RFIs.
        16) Status of proposal requests.
        17) Pending changes.
        18) Status of Change Orders.
        19) Pending claims and disputes.
        20) Documentation of information for payment requests.

3. Minutes: Record the meeting minutes.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

    a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

1.8 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned 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 interpretation and the following:

1. Project name.
2. Date.
3. Name of Contractor.
4. Name of Architect.
5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

    a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. Hard-Copy RFIs:

1. Identify each page of attachments with the RFI number and sequential page number.

D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.

1. Attachments shall be electronic files Adobe Acrobat PDF format and in Word format with area on the form for Architect/Engineer’s response

E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow seven working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

1. The following RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for coordination information already indicated in the Contract Documents.
    d. Requests for adjustments in the Contract Time or the Contract Sum.
    e. Requests for interpretation of Architect's actions on submittals.
    f. Incomplete RFIs or RFIs with numerous errors.

2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
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 Division 01 Section "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 7 days of receipt of the RFI response.

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 days if Contractor disagrees with response.

G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log at meetings.

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's Construction Schedule.
2. Daily construction reports.
3. Field condition reports.
4. Special Reports

B. Related Sections include the following:
1. Division 01 Section "Payment Procedures" for submitting the Schedule of Values.
2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
3. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
4. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 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 activities are activities on the critical path. They 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. 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.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. 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.

F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Major Area: A story of construction, a separate building, or a similar significant construction element.

H. Milestone: A key or critical point in time for reference or measurement.

I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.4 SUBMITTALS

A. Contractor's Construction Schedule: Submit three opaque copies of initial schedule, large enough to show entire schedule for entire construction period.

B. Field Condition Reports: Submit two copies immediately upon discovery of field condition differences.

C. Special Reports: Immediately upon the occasion of an unusual event.

1.5 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from parties 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. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."

B. Time Frame: Extend schedule from date established from the Notice to Proceed to date of Substantial 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.

C. 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 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 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 Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
4. Startup and Testing Time: Include appropriate times for start up and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.

D. 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.

2. 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. Fabrication.
e. Sample testing.
f. Deliveries.
g. Installation.
h. Tests and inspections.
i. Adjusting.
j. Curing.
k. Startup and placement into final use and operation.

3. Area Separations: 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. Permanent space enclosure.
    c. Completion of mechanical installation.
    d. Completion of electrical installation.
    e. Substantial Completion.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Completion of each Major Activity and Substantial Completion.

F. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

2.2 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. Approximate count of personnel at Project site.
3. Equipment at Project site.
4. Material deliveries.
5. High and low temperatures and general weather conditions.
6. Accidents.
7. Meetings and significant decisions.
8. Unusual events (refer to special reports).
9. Stoppages, delays, shortages, and losses.
10. Meter readings and similar recordings.
11. Emergency procedures.
12. Orders and requests of authorities having jurisdiction.
13. Change Orders received and implemented.
14. Work Change Directives received and implemented.
15. Services connected and disconnected.
16. Equipment or system tests and startups.
17. Partial Completions and occupancies.
18. Substantial Completions authorized.

B. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.3 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day 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. Contractor's Construction Schedule Updating: At intervals that are appropriate and when requested by Architect when there is evidence of the construction being behind schedule, no more often than monthly, update schedule to reflect actual construction progress and activities. Issue schedule when it is updated at regularly scheduled progress meetings.

B. 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 013200

SECTION 013300 - SUBMITTAL 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.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections include the following:

1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
3. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
4. Division 01 Section "Quality Requirements" for submitting test and inspection reports.
5. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
6. Divisions 02 through 49 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. General: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals under the conditions and procedures indicated 010070 Special Conditions.

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. 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 enough 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 10 working 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 5 working days for review of each resubmittal.
4. Concurrent Review: The following groups of submittals and samples are to be reviewed concurrently. The review period begins after all concurrent submittals have been received. Submittals are to include all submittals in these groups.
   a. Exterior Finishes
   b. Interior Finishes
   c. Electrical
   d. Plumbing
   e. Mechanical
   f. Fire Protection

D. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 4 by 6 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:

   a. Project name.
   b. Date.
   c. Name and address of Architect
   d. Name and address of Contractor.
   e. Name and address of subcontractor.
   f. Name and address of supplier.
   g. Name of manufacturer.
   h. Submittal number or other unique identifier, including revision identifier.
   i. Number and title of appropriate Specification Section.
   j. Drawing number and detail references, as appropriate.
   k. Location(s) where product is to be installed, as appropriate.
   l. Other necessary identification.

E. Deviations: Cloud and note or otherwise specifically identify deviations from the Contract Documents on submittals.

F. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

1. Additional copies submitted for maintenance manuals will not be marked with action taken and will not be returned.

G. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals without review received from sources other than Contractor.

1. Transmittal Form: Provide locations on form for the following information:

a. Project name.
b. Date.
c. Destination (To:).
d. Source (From:).
e. Names of subcontractor, manufacturer, and supplier.
f. Category and type of submittal.
g. Submittal purpose and description.
h. Specification Section number and title.
i. Drawing number and detail references, as appropriate.
j. Transmittal number
k. Submittal and transmittal distribution record.
l. Remarks.
m. Signature of transmitter.

2. Record and identify 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 label information as related submittal.

H. 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 "No Exceptions Taken or Make Corrections Noted”

I. 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.

J. Use for Construction: Use only final submittals clearly marked with Architect's submittal action stamp indicating the action indicated to be taken by Contractor and the Architect's signature and date on the submittal stamp.

1.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

A. General: At Contractor's written request, copies of Architect's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:

1. See Section 010070 Special Conditions.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

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 printed 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 written recommendations.
b. Manufacturer's product specifications.
c. Manufacturer's installation instructions.
d. Standard color charts.
e. Manufacturer's catalog cuts.
f. Wiring diagrams showing factory-installed wiring.
g. Printed performance curves.
h. Operational range diagrams.
i. Mill reports.
j. Standard product operation and maintenance manuals.
k. Compliance with specified referenced standards.
l. Testing by recognized testing agency.
m. Application of testing agency labels and seals.
n. Notation of coordination requirements.

4. Submit Product Data before or concurrent with Samples.
5. Number of Copies: Submit five copies of Product Data, unless otherwise indicated. Architect will return four copies. Mark up and retain one returned copy as a Project Record Document. Submit One additional copy if submittal requires engineer's review.

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, unless submittal of Architect's CAD Drawings are otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Dimensions.
    b. Identification of products.
    c. Fabrication and installation drawings.
    d. Roughing-in and setting diagrams.
    e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    f. Shopwork manufacturing instructions.
    g. Templates and patterns.
    h. Schedules.
    i. Design calculations.
    j. Compliance with specified standards.
    k. Notation of coordination requirements.
    l. Notation of dimensions established by field measurement.
    m. Relationship to adjoining construction clearly indicated.
    n. Seal and signature of professional engineer if specified.
    o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm) but no larger than 30 by 40 inches (750 by 1000 mm).
3. Number of Copies: Submit **four** copies of Submittal, unless otherwise indicated. Architect will return **three** copies. Mark up and retain one returned copy as a Project Record Document. Submit One additional copy if submittal requires engineer’s review.

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 appropriate Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

4. Samples for Initial 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 two full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return one submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

   a. Number of Samples: Submit two sets of Samples. Architect will retain one Sample sets; and will return one sample set.

      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

E. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation" for Construction Manager's action.

F. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."

G. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

H. 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:

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.

4. Number of Copies: Submit two copies of subcontractor list, unless otherwise indicated. Architect will return one copy.

    a. Mark up and retain one returned copy as a Project Record Document.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.

1. Number of Copies: Submit one copy of each submittal, unless otherwise indicated. Architect will retain the one copy.
2. Test and Inspection Reports: Comply with requirements specified in Division 01 Section "Quality Requirements."

B. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

D. Product Test Reports: Prepare written reports indicating 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.

E. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

F. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

G. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

H. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

I. Design Data: Prepare 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.

J. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

K. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service 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.

L. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

M. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.

1. Architect will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

2.3 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit four copies of a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. 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. 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.

3.2 ARCHITECT'S/ ACTION

A. General: The Architect will return to the contractor without examination shop drawings, product data and other required submittals, which have not been prepared according to contract requirements. Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
1. No Exceptions Taken
2. Make Corrections Noted
3. Revise and Resubmit
4. Rejected

C. 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.

D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 014100 - SPECIAL INSPECTIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Refer to individual technical specification sections for specific qualifications, inspections, tests, frequency, and standards required.

1.2 GENERAL REQUIREMENTS

A. Special Inspections shall be in accordance with Chapter 17 of the International Building Code.

B. The program of Special Inspection is a system intended to ensure that the work is performed in accordance with the Contract Documents. These services do not relieve the Contractor and/or the Construction Manager of responsibility for compliance with the requirements of the Contract Documents.

C. This specification section is intended to inform the Contractor and/or the Construction Manager of the Owner's Special Inspection program and the extent of the responsibilities. This specification section is also intended to notify the Special Inspector, Testing Company/Testing Laboratory, and other Agents of the Special Inspector of their requirements and responsibilities.

D. Perform inspections in accordance with industry standard referenced for specific material or procedure unless other criteria are specified. In the absence of a referenced standard, perform inspections in accordance with generally accepted industry standards.

E. Failure to detect defective work or materials shall in no way prevent later rejection if defective work or materials are discovered.

1.3 SCHEDULE OF SPECIAL INSPECTIONS

A. Required Special Inspections are described on the Drawings.

1.4 DEFINITIONS

A. Testing: Evaluation of systems, primarily requiring physical manipulation and analysis of materials, in accordance with approved standards.

B. Inspection: Evaluation of systems, primarily requiring observation and judgment.

C. Special Inspection: Special Inspection herein includes items required by the current State Building Code, and other items which in the professional judgment of the Structural Engineer of Record, are critical to the integrity of the building structure.

D. Structural Engineer of Record (SER): The Licensed Engineer in responsible charge of the structural design for the project.

E. Testing Agency (TA):

1. Testing Agency: Approved independent materials testing agency acceptable to the Owner, Architect, and SER.

F. Special Inspector (SI): A licensed professional engineer responsible for administering and performing all Special Inspections required by the Statement of Special Inspections.

G. Agents of Special Inspection (AI): Individual inspectors performing specific Special Inspections on behalf of the Special Inspector.

H. Building Official: The Officer or duly authorized representative charged with the administration and enforcement of the State Building Code.

1.5 QUALIFICATIONS

A. The Special Inspector shall be a licensed Professional Engineer (licensed in state in which project is located) experienced with the type of work requiring Special Inspections, who is approved by the Owner, Structural Engineer of Record (SER) and Building Official.

B. Required inspector's qualifications for the Special Inspector and Agents of the Special Inspector are described in the attached Statement of Special Inspection.

1.6 SUBMITTALS

A. The Special Inspector shall submit to the Owner for review a copy of their qualifications which shall include the names and qualifications of each of the agents of Special Inspection who will be performing inspections.

1.7 PAYMENT

A. The Owner shall engage and pay for the services of the Special Inspector and Agents of the Special Inspector.

B. The Contractor and/or Construction Manager shall be responsible for the cost of any re-inspection of work which fails to comply with the requirements of the Contract Documents.

1.8 RESPONSIBILITIES/AUTHORITY

A. Special Inspection:

1. Special Inspector and Agents of Special Inspections:

    a. Sign the Statement of Special Inspection in conjunction with other responsible parties prior to commencing construction.
    b. Inspect the work assigned for conformance with the contract documents and applicable material and workmanship provisions of the code. Perform inspection in a timely manner to avoid delay of work.
    c. Bring nonconforming items to the immediate attention of the Contractor and/or Construction Manager for correction, then, if uncorrected after a reasonable period of time, to the attention of the Structural Engineer of Record, the Building Official, and to the Owner.
    d. Submit inspection reports to the Contractor and/or Construction Manager, the Structural Engineer of Record, Owner, and other designated persons in accordance with the Statement of Special Inspection.
    e. Submit a final signed report stating whether the work requiring Special Inspection was, to the best of the Special Inspector's knowledge, in conformance with the contract documents and the applicable workmanship provisions of the code.

2. Architect:

    a. Expedite resolution of construction issues.

3. Structural Engineer of Record:

    a. Identify items requiring Special Inspection and define qualifications of Special Inspector required for work.
    b. Prepare and sign the Statement of Special Inspection in conjunction with other responsible parties prior to commencing construction.
    c. Review reports issued by Special Inspector.
    d. Assist in resolution of construction issues identified by Special Inspector.

4. Testing Agency:

    a. When engaged as a Special Inspector, provide Special Inspection services as noted in Item 1.8.A.1.
    b. Copy Special Inspector on all materials testing reports.

5. Contractor/Construction Manager:

    a. Arrange and attend all pre-construction meetings to review scope of Special Inspection. Include the Building Official, Owner, Architect, Structural Engineer of Record, Special Inspector, Testing Agency, and other parties concerned.
    b. Post or make available the Statement of Special Inspection within the project site office. Provide timely notification to those parties designated on the schedule so they may properly prepare for and schedule their work.
    c. Provide Special Inspector access to the approved plans and specifications at the project site.
    d. Review all reports issued by Special Inspector.
    e. Retain at the project site all reports submitted by the Special Inspector for review by the building official upon request.

f. Correct, in a timely manner, deficiencies identified in inspection reports.
g. Provide safe access to the work requiring inspection.
h. Provide labor and facilities to provide access to the work and to facilitate inspection.
i. Sign the Contractor's Statement of Responsibility, if required, prior to commencing construction.

6. Fabricator/Supplier:

a. Submit one copy of all material certificates and other quality assurance documents as required in the Statement of Special Inspections to the Special Inspector.

7. Building Official:

a. Accept and sign completed Statement of Special Inspection.
b. Review the final report submitted by Special Inspector.
c. Determine work, which, in the Building Official's opinion, involves unusual hazards or conditions (IBC 1705.1.1 – Special Cases).

8. Owner:

a. Provide and pay cost of Special Inspection services.
b. Provide Special Inspector with Contract Documents and accepted shop drawings.
c. Provide Special Inspector with full access to the site at all times.
d. Sign the Statement of Special Inspection in conjunction with other responsible parties prior to commencing construction.

1.9 INSPECTION NOTES

A. Contractor and/or Construction Manager provide minimum of 24 hours' notice for all items requiring inspection. Do not construct items requiring inspection services until testing and inspection services are available. Do not enclose or obscure items requiring inspection services until inspection services are performed.

1.10 LIMITS ON AUTHORITY

A. The Special Inspector may not release, revoke, alter, or increase the requirements of the Contract Documents.

B. The Special Inspector will not have control over the Contractor and/or Construction Manager means or methods of construction.

C. The Special Inspector shall not be responsible for construction site safety.

D. The Special Inspector has no authority to stop the work.

1.11 DAILY RECORDS AND REPORTS

A. Detailed daily reports shall be prepared by Special Inspector and Agents of Special Inspection of each inspection and submitted to the Special Inspector. Reports shall include, but not be limited to:

1. Date of inspection.
2. Name of inspector or agent.
3. Location of specific areas inspected.
4. Description of inspection and results.
5. Applicable ASTM standard.
6. Weather conditions.
7. Identification of product and specification section.

B. Any discrepancies from the Contract Documents found during a Special Inspection shall be immediately reported to the Contractor and/or Construction Manager. If the discrepancies are not corrected, the Special Inspector shall notify the Structural Engineer of Record and Owner. Reports shall document all discrepancies identified and the corrective action taken.

C. The Testing Company/Testing Laboratory shall immediately notify the Special Inspector of any test results which fail to comply with the requirements of the Contract Documents.

1.12 MONTHLY REPORTS

A. Monthly reports shall be prepared by the Special Inspector. Reports shall include, but not be limited to:

1. Summary of elements inspected during that month.
2. Copies of all discrepancies noted during that month.
3. Report of status of discrepancies including resolution of discrepancies.
4. Summary of all material certifications and quality assurance documents collected and reviewed during that month.

1.13 FINAL REPORT OF SPECIAL INSPECTIONS

A. The Final Report of Special Inspections shall be completed by the Special Inspector and submitted to the Structural Engineer of Record, Owner, Contractor and/or Construction Manager, and Building Official prior to the issuance of a Certificate of Use and Occupancy.

B. The Final Report of Special Inspections will certify that all required inspections have been performed and will itemize any discrepancies and how those discrepancies were resolved.

END OF SECTION 014100

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."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association, Inc. (The) www.aluminum.org	(703) 358-2960
AAADM	American Association of Automatic Door Manufacturers www.aaadm.com	(216) 241-7333
AABC	Associated Air Balance Council www.aabchq.com	(202) 737-0202
AAMA	American Architectural Manufacturers Association www.aamanet.org	(847) 303-5664
AASHTO	American Association of State Highway and Transportation Officials www.transportation.org	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists (The) www.aatcc.org	(919) 549-8141
ABAA	Air Barrier Association of America www.airbarrier.org	(866) 956-5888

ABMA	American Bearing Manufacturers Association www.abma-dc.org	(202) 367-1155
ACI	ACI International (American Concrete Institute) www.aci-int.org	(248) 848-3700
ACPA	American Concrete Pipe Association www.concrete-pipe.org	(972) 506-7216
AEIC	Association of Edison Illuminating Companies, Inc. (The) www.aeic.org	(205) 257-2530
AF&PA	American Forest & Paper Association www.afandpa.org	(800) 878-8878 (202) 463-2700
AGA	American Gas Association www.aga.org	(202) 824-7000
AGC	Associated General Contractors of America (The) www.agc.org	(703) 548-3118
AHA	American Hardboard Association (Now part of CPA)	
AHAM	Association of Home Appliance Manufacturers www.aham.org	(202) 872-5955
AI	Asphalt Institute www.asphaltinstitute.org	(859) 288-4960
AIA	American Institute of Architects (The) www.aia.org	(800) 242-3837 (202) 626-7300
AISC	American Institute of Steel Construction www.aisc.org	(800) 644-2400 (312) 670-2400
AISI	American Iron and Steel Institute www.steel.org	(202) 452-7100
AITC	American Institute of Timber Construction www.aitc-glulam.org	(303) 792-9559
ALCA	Associated Landscape Contractors of America (Now PLANET - Professional Landcare Network)	
ALSC	American Lumber Standard Committee, Incorporated www.alsc.org	(301) 972-1700
AMCA	Air Movement and Control Association International, Inc.	(847) 394-0150

	www.amca.org	
ANSI	American National Standards Institute www.ansi.org	(202) 293-8020
AOSA	Association of Official Seed Analysts, Inc. www.aosaseed.com	(405) 780-7372
APA	Architectural Precast Association www.archprecast.org	(239) 454-6989
APA	APA - The Engineered Wood Association www.apawood.org	(253) 565-6600
APA EWS	APA - The Engineered Wood Association; Engineered Wood Systems (See APA - The Engineered Wood Association)	
API	American Petroleum Institute www.api.org	(202) 682-8000
ARI	Air-Conditioning & Refrigeration Institute www.ari.org	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association www.asphaltroofing.org	(202) 207-0917
ASCE	American Society of Civil Engineers www.asce.org	(800) 548-2723 (703) 295-6300
ASCE/SEI	American Society of Civil Engineers/Structural Engineering Institute (See ASCE)	
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers www.ashrae.org	(800) 527-4723 (404) 636-8400
ASME	ASME International (The American Society of Mechanical Engineers International) www.asme.org	(800) 843-2763 (973) 882-1170
ASSE	American Society of Sanitary Engineering www.asse-plumbing.org	(440) 835-3040
ASTM	ASTM International (American Society for Testing and Materials International) www.astm.org	(610) 832-9585
AWCI	AWCI International	(703) 534-8300

	(Association of the Wall and Ceiling Industry International) www.awci.org	
AWCMA	American Window Covering Manufacturers Association (Now WCSC)	
AWI	Architectural Woodwork Institute www.awinet.org	(571) 323-3636
AWPA	American Wood-Preservers' Association www.awpa.com	(205) 733-4077
AWS	American Welding Society www.aws.org	(800) 443-9353 (305) 443-9353
AWWA	American Water Works Association www.awwa.org	(800) 926-7337 (303) 794-7711
BHMA	Builders Hardware Manufacturers Association www.buildershardware.com	(212) 297-2122
BIA	Brick Industry Association (The) www.bia.org	(703) 620-0010
BICSI	BICSI www.bicsi.org	(800) 242-7405 (813) 979-1991
BIFMA	BIFMA International (Business and Institutional Furniture Manufacturer's Association International) www.bifma.com	(616) 285-3963
BISSC	Baking Industry Sanitation Standards Committee www.bissc.org	(866) 342-4772
CCC	Carpet Cushion Council www.carpetcushion.org	(610) 527-3880
CDA	Copper Development Association www.copper.org	(800) 232-3282 (212) 251-7200
CEA	Canadian Electricity Association www.canelect.ca	(613) 230-9263
CFFA	Chemical Fabrics & Film Association, Inc. www.chemicalfabricsandfilm.com	(216) 241-7333
CGA	Compressed Gas Association www.cganet.com	(703) 788-2700

CIMA	Cellulose Insulation Manufacturers Association www.cellulose.org	(888) 881-2462 (937) 222-2462
CISCA	Ceilings & Interior Systems Construction Association www.cisca.org	(630) 584-1919
CISPI	Cast Iron Soil Pipe Institute www.cispi.org	(423) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute www.chainlinkinfo.org	(301) 596-2583
CRRC	Cool Roof Rating Council www.coolroofs.org	(866) 465-2523 (510) 485-7175
CPA	Composite Panel Association www.pbmdf.com	(301) 670-0604
CPPA	Corrugated Polyethylene Pipe Association www.cppa-info.org	(800) 510-2772 (202) 462-9607
CRI	Carpet & Rug Institute (The) www.carpet-rug.com	(800) 882-8846 (706) 278-3176
CRSI	Concrete Reinforcing Steel Institute www.crsi.org	(847) 517-1200
CSA	Canadian Standards Association	(800) 463-6727 (416) 747-4000
CSA	CSA International (Formerly: IAS - International Approval Services) www.csa-international.org	(866) 797-4272 (416) 747-4000
CSI	Cast Stone Institute www.caststone.org	(717) 272-3744
CSI	Construction Specifications Institute (The) www.csinet.org	(800) 689-2900 (703) 684-0300
CSSB	Cedar Shake & Shingle Bureau www.cedarbureau.org	(604) 820-7700
CTI	Cooling Technology Institute (Formerly: Cooling Tower Institute) www.cti.org	(281) 583-4087
DHI	Door and Hardware Institute www.dhi.org	(703) 222-2010

EIA	Electronic Industries Alliance www.eia.org	(703) 907-7500
EIMA	EIFS Industry Members Association www.eima.com	(800) 294-3462 (770) 968-7945
EJCDC	Engineers Joint Contract Documents Committee www.ejdc.org	(703) 295-5000
EJMA	Expansion Joint Manufacturers Association, Inc. www.ejma.org	(914) 332-0040
ESD	ESD Association www.esda.org	(315) 339-6937
FIBA	Federation Internationale de Basketball (The International Basketball Federation) www.fiba.com	41 22 545 00 00
FIVB	Federation Internationale de Volleyball (The International Volleyball Federation) www.fivb.ch	41 21 345 35 35
FM Approvals	FM Approvals www.fmglobal.com	(781) 762-4300
FM Global	FM Global (Formerly: FMG - FM Global) www.fmglobal.com	(401) 275-3000
FMRC	Factory Mutual Research (Now FM Global)	
FRSA	Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc. www.floridaroof.com	(407) 671-3772
FSA	Fluid Sealing Association www.fluidsealing.com	(610) 971-4850
FSC	Forest Stewardship Council www.fsc.org	49 228 367 66 0
GA	Gypsum Association www.gypsum.org	(202) 289-5440
GANA	Glass Association of North America www.glasswebsite.com	(785) 271-0208
GRI	(Now GSI)	

GS	Green Seal www.greenseal.org	(202) 872-6400
GSI	Geosynthetic Institute www.geosynthetic-institute.org	(610) 522-8440
HI	Hydraulic Institute www.pumps.org	(888) 786-7744 (973) 267-9700
HI	Hydronics Institute www.gamanet.org	(908) 464-8200
HMMA	Hollow Metal Manufacturers Association (Part of NAAMM)	
HPVA	Hardwood Plywood & Veneer Association www.hpva.org	(703) 435-2900
HPW	H. P. White Laboratory, Inc. www.hpwhite.com	(410) 838-6550
IAS	International Approval Services (Now CSA International)	
IBF	International Badminton Federation www.internationalbadminton.org	(6-03) 9283-7155
ICEA	Insulated Cable Engineers Association, Inc. www.icea.net	(770) 830-0369
ICRI	International Concrete Repair Institute, Inc. www.icri.org	(847) 827-0830
IEC	International Electrotechnical Commission www.iec.ch	41 22 919 02 11
IEEE	Institute of Electrical and Electronics Engineers, Inc. (The) www.ieee.org	(212) 419-7900
IESNA	Illuminating Engineering Society of North America www.iesna.org	(212) 248-5000
IEST	Institute of Environmental Sciences and Technology www.iest.org	(847) 255-1561
IGCC	Insulating Glass Certification Council www.igcc.org	(315) 646-2234
IGMA	Insulating Glass Manufacturers Alliance	(613) 233-1510

	www.igmaonline.org	
ILI	Indiana Limestone Institute of America, Inc. www.iliai.com	(812) 275-4426
ISO	International Organization for Standardization www.iso.ch	41 22 749 01 11
	Available from ANSI www.ansi.org	(202) 293-8020
ISSFA	International Solid Surface Fabricators Association www.issfa.net	(877) 464-7732 (702) 567-8150
ITS	Intertek Testing Service NA www.intertek.com	(972) 238-5591
ITU	International Telecommunication Union www.itu.int/home	41 22 730 51 11
KCMA	Kitchen Cabinet Manufacturers Association www.kcma.org	(703) 264-1690
LMA	Laminating Materials Association (Now part of CPA)	
LPI	Lightning Protection Institute www.lightning.org	(800) 488-6864
MBMA	Metal Building Manufacturers Association www.mbma.com	(216) 241-7333
MFMA	Maple Flooring Manufacturers Association, Inc. www.maplefloor.org	(847) 480-9138
MFMA	Metal Framing Manufacturers Association, Inc. www.metalframingmfg.org	(312) 644-6610
MH	Material Handling (Now MHIA)	
MHIA	Material Handling Industry of America www.mhia.org	(800) 345-1815 (704) 676-1190
MIA	Marble Institute of America www.marble-institute.com	(440) 250-9222
MPI	Master Painters Institute www.paintinfo.com	(888) 674-8937

MSS	Manufacturers Standardization Society of The Valve and Fittings Industry Inc. www.mss-hq.com	(703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers www.naamm.org	(312) 332-0405
NACE	NACE International (National Association of Corrosion Engineers International) www.nace.org	(800) 797-6623 (281) 228-6200
NADCA	National Air Duct Cleaners Association www.nadca.com	(202) 737-2926
NAGWS	National Association for Girls and Women in Sport www.aahperd.org/nagws/	(800) 213-7193, ext. 453
NAIMA	North American Insulation Manufacturers Association www.naima.org	(703) 684-0084
NBGQA	National Building Granite Quarries Association, Inc. www.nbgqa.com	(800) 557-2848
NCAA	National Collegiate Athletic Association (The) www.ncaa.org	(317) 917-6222
NCMA	National Concrete Masonry Association www.ncma.org	(703) 713-1900
NCPI	National Clay Pipe Institute www.ncpi.org	(262) 248-9094
NCTA	National Cable & Telecommunications Association www.ncta.com	(202) 775-3550
NEBB	National Environmental Balancing Bureau www.nebb.org	(301) 977-3698
NECA	National Electrical Contractors Association www.necanet.org	(301) 657-3110
NeLMA	Northeastern Lumber Manufacturers' Association www.nelma.org	(207) 829-6901
NEMA	National Electrical Manufacturers Association www.nema.org	(703) 841-3200
NETA	InterNational Electrical Testing Association www.netaworld.org	(888) 300-6382 (303) 697-8441

NFHS	National Federation of State High School Associations www.nfhs.org	(317) 972-6900
NFPA	NFPA (National Fire Protection Association) www.nfpa.org	(800) 344-3555 (617) 770-3000
NFRC	National Fenestration Rating Council www.nfrc.org	(301) 589-1776
NGA	National Glass Association www.glass.org	(866) 342-5642 (703) 442-4890
NHLA	National Hardwood Lumber Association www.natlhardwood.org	(800) 933-0318 (901) 377-1818
NLGA	National Lumber Grades Authority www.nlga.org	(604) 524-2393
NOFMA	NOFMA: The Wood Flooring Manufacturers Association (Formerly: National Oak Flooring Manufacturers Association) www.nofma.com	(901) 526-5016
NRCA	National Roofing Contractors Association www.nrca.net	(800) 323-9545 (847) 299-9070
NRMCA	National Ready Mixed Concrete Association www.nrmca.org	(888) 846-7622 (301) 587-1400
NSF	NSF International (National Sanitation Foundation International) www.nsf.org	(800) 673-6275 (734) 769-8010
NSSGA	National Stone, Sand & Gravel Association www.nssga.org	(800) 342-1415 (703) 525-8788
NTMA	National Terrazzo & Mosaic Association, Inc. (The) www.ntma.com	(800) 323-9736 (540) 751-0930
NTRMA	National Tile Roofing Manufacturers Association (Now TRI)	
NWWDA	National Wood Window and Door Association (Now WDMA)	
OPL	Omega Point Laboratories, Inc. (Now ITS)	
PCI	Precast/Prestressed Concrete Institute	(312) 786-0300

	www.pci.org	
PDCA	Painting & Decorating Contractors of America www.pdca.com	(800) 332-7322 (314) 514-7322
PDI	Plumbing & Drainage Institute www.pdionline.org	(800) 589-8956 (978) 557-0720
PGI	PVC Geomembrane Institute http://pgi-tp.ce.uiuc.edu	(217) 333-3929
PLANET	Professional Landcare Network (Formerly: ACLA - Associated Landscape Contractors of America) www.landcarenetwork.org	(800) 395-2522 (703) 736-9666
PTI	Post-Tensioning Institute www.post-tensioning.org	(602) 870-7540
RCSC	Research Council on Structural Connections www.boltcouncil.org	
RFCI	Resilient Floor Covering Institute www.rfci.com	(301) 340-8580
RIS	Redwood Inspection Service www.calredwood.org	(888) 225-7339 (415) 382-0662
SAE	SAE International www.sae.org	(877) 606-7323 (724) 776-4841
SDI	Steel Deck Institute www.sdi.org	(847) 458-4647
SDI	Steel Door Institute www.steeldoor.org	(440) 899-0010
SEFA	Scientific Equipment and Furniture Association www.sefalabs.com	(516) 294-5424
SEI/ASCE	Structural Engineering Institute/American Society of Civil Engineers (See ASCE)	
SGCC	Safety Glazing Certification Council www.sgcc.org	(315) 646-2234
SIA	Security Industry Association www.siaonline.org	(703) 683-2075

SIGMA	Sealed Insulating Glass Manufacturers Association (Now IGMA)	
SJI	Steel Joist Institute www.steeljoist.org	(843) 626-1995
SMA	Screen Manufacturers Association www.smacentral.org	(561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association www.smacna.org	(703) 803-2980
SMPTE	Society of Motion Picture and Television Engineers www.smpte.org	(914) 761-1100
SPFA	Spray Polyurethane Foam Alliance (Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division) www.sprayfoam.org	(800) 523-6154
SPIB	Southern Pine Inspection Bureau (The) www.spib.org	(850) 434-2611
SPRI	Single Ply Roofing Industry www.spri.org	(781) 647-7026
SSINA	Specialty Steel Industry of North America www.ssina.com	(800) 982-0355 (202) 342-8630
SSPC	SSPC: The Society for Protective Coatings www.sspc.org	(877) 281-7772 (412) 281-2331
STI	Steel Tank Institute www.steeltank.com	(847) 438-8265
SWI	Steel Window Institute www.steelwindows.com	(216) 241-7333
SWRI	Sealant, Waterproofing, & Restoration Institute www.swrionline.org	(816) 472-7974
TCA	Tile Council of America, Inc. www.tileusa.com	(864) 646-8453
TIA/EIA	Telecommunications Industry Association/Electronic Industries Alliance www.tiaonline.org	(703) 907-7700
TMS	The Masonry Society	(303) 939-9700

	www.masonrysociety.org	
TPI	Truss Plate Institute, Inc. www.tpinst.org	(703) 683-1010
TPI	Turfgrass Producers International www.turfgrasssod.org	(800) 405-8873 (847) 649-5555
TRI	Tile Roofing Institute www.tileroofing.org	(312) 670-4177
UL	Underwriters Laboratories Inc. www.ul.com	(877) 854-3577 (847) 272-8800
UNI	Uni-Bell PVC Pipe Association www.uni-bell.org	(972) 243-3902
USAV	USA Volleyball www.usavolleyball.org	(888) 786-5539 (719) 228-6800
USGBC	U.S. Green Building Council www.usgbc.org	(202) 828-7422
USITT	United States Institute for Theatre Technology, Inc. www.usitt.org	(800) 938-7488 (315) 463-6463
WASTEC	Waste Equipment Technology Association www.wastec.org	(800) 424-2869 (202) 244-4700
WCLIB	West Coast Lumber Inspection Bureau www.wclib.org	(800) 283-1486 (503) 639-0651
WCMA	Window Covering Manufacturers Association (Now WCSC)	
WCSC	Window Covering Safety Council (Formerly: WCMA - Window Covering Manufacturers Association) www.windowcoverings.org	(800) 506-4636 (212) 297-2109
WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association) www.wdma.com	(800) 223-2301 (847) 299-5200
WI	Woodwork Institute (Formerly: WIC - Woodwork Institute of California) www.wicnet.org	(916) 372-9943
WIC	Woodwork Institute of California	

	(Now WI)	
WMMPA	Wood Moulding & Millwork Producers Association www.wmmpa.com	(800) 550-7889 (530) 661-9591
WSRCA	Western States Roofing Contractors Association www.wsrca.com	(800) 725-0333 (650) 570-5441
WWPA	Western Wood Products Association www.wwpa.org	(503) 224-3930

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

BOCA	BOCA International, Inc. (See ICC)	
IAPMO	International Association of Plumbing and Mechanical Officials www.iapmo.org	(909) 472-4100
ICBO	International Conference of Building Officials (See ICC)	
ICBO ES	ICBO Evaluation Service, Inc. (See ICC-ES)	
ICC	International Code Council www.iccsafe.org	(888) 422-7233 (703) 931-4533
ICC-ES	ICC Evaluation Service, Inc. www.icc-es.org	(800) 423-6587 (562) 699-0543
SBCCI	Southern Building Code Congress International, Inc. (See ICC)	
UBC	Uniform Building Code (See ICC)	

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CE	Army Corps of Engineers www.usace.army.mil	
CPSC	Consumer Product Safety Commission www.cpsc.gov	(800) 638-2772 (301) 504-7923
DOC	Department of Commerce www.commerce.gov	(202) 482-2000
DOD	Department of Defense http://.dodssp.daps.dla.mil	(215) 697-6257
DOE	Department of Energy www.energy.gov	(202) 586-9220
EPA	Environmental Protection Agency www.epa.gov	(202) 272-0167
FAA	Federal Aviation Administration www.faa.gov	(866) 835-5322
FCC	Federal Communications Commission www.fcc.gov	(888) 225-5322
FDA	Food and Drug Administration www.fda.gov	(888) 463-6332
GSA	General Services Administration www.gsa.gov	(800) 488-3111
HUD	Department of Housing and Urban Development www.hud.gov	(202) 708-1112
LBL	Lawrence Berkeley National Laboratory www.lbl.gov	(510) 486-4000
NCHRP	National Cooperative Highway Research Program (See TRB)	
NIST	National Institute of Standards and Technology www.nist.gov	(301) 975-6478
OSHA	Occupational Safety & Health Administration www.osha.gov	(800) 321-6742 (202) 693-1999
PBS	Public Building Service (See GSA)	
PHS	Office of Public Health and Science www.osophs.dhhs.gov/ophs	(202) 690-7694

RUS	Rural Utilities Service (See USDA)	(202) 720-9540
SD	State Department www.state.gov	(202) 647-4000
TRB	Transportation Research Board http://gulliver.trb.org	(202) 334-2934
USDA	Department of Agriculture www.usda.gov	(202) 720-2791
USPS	Postal Service www.usps.com	(202) 268-2000

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-0080
CFR	Code of Federal Regulations Available from Government Printing Office www.gpoaccess.gov/cfr/index.html	(866) 512-1800 (202) 512-1800
DOD	Department of Defense Military Specifications and Standards Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664
DSCC	Defense Supply Center Columbus (See FS)	
FED-STD	Federal Standard (See FS)	
FS	Federal Specification Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	(215) 697-2664

	Available from Defense Standardization Program www.dps.dla.mil	
	Available from General Services Administration	(202) 619-8925
	www.gsa.gov	
	Available from National Institute of Building Sciences	(202) 289-7800
	www.wbdg.org/ccb	
FTMS	Federal Test Method Standard (See FS)	
MIL	(See MILSPEC)	
MIL-STD	(See MILSPEC)	
MILSPEC	Military Specification and Standards	(215) 697-2664
	Available from Department of Defense Single Stock Point http://dodssp.daps.dla.mil	
UFAS	Uniform Federal Accessibility Standards	(800) 872-2253
	Available from Access Board	(202) 272-0080
	www.access-board.gov	

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

CBHF	State of California, Department of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation	(800) 952-5210
	www.dca.ca.gov/bhfti	(916) 574-2041
CCR	California Code of Regulations	(916) 323-6815
	www.calregs.com	
CPUC	California Public Utilities Commission	(415) 703-2782
	www.cpuc.ca.gov	
TFS	Texas Forest Service	(979) 458-6650

Forest Resource Development
http://txforestservice.tamu.edu

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Sections include the following:

1. Division 01 Section "Summary" for limitations on utility interruptions and other work restrictions.
2. Division 01 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
3. Division 01 Section "Execution" for progress cleaning requirements.
4. Divisions 02 through 49 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.
5. Division 31 Section "Dewatering" for disposal of ground water at Project site.
6. Division 31 Section "Termite Control" for pest control.
7. Division 31 Section "Asphalt Paving" for construction and maintenance of asphalt paving for temporary roads and paved areas.
8. Division 32 Section "Concrete Paving" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.

1.3 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Architect, Owner, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Pay sewer service use charges for sewer usage by all entities for construction operations.

C. Water Service: Pay water service use charges for water used by all entities for construction operations.

D. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations.

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: Installer of each permanent service shall 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 FOR PHASE I - NEW CONSTRUCTION

A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.76-mm-) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts.

B. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD bottom rails. Provide concrete or galvanized steel bases for supporting posts.

2.2 TEMPORARY FACILITIES

A. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 10 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle

on each wall. Furnish room with conference table, chairs, and 4-foot- (1.2-m-) square tack board.
3. Drinking water and private toilet.
4. Coffee machine and supplies.
5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F (20 to 22 deg C).
6. Lighting fixtures capable of maintaining average illumination of 20 fc (215 lx) at desk height.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

1. Store combustible materials apart from building.

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 testing agency acceptable to authorities having jurisdiction, and marked for intended use.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction.

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.

1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."

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. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. 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.

G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

1. Install electric power service overhead or underground unless directed to provide underground.

H. 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.

I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install at least one telephone line(s) for common field office.

1. Provide additional telephone lines for the following:

a. Provide a dedicated telephone line for each facsimile machine and computer 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. Architect's office.
e. Engineers' offices.
f. Owner's office.
g. Principal subcontractors' field and home offices.

3. Provide superintendent and project manager with cellular telephone or portable two-way radio for use when away from field office.

J. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail, in common-use facilities.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide incombustible construction for offices, shops, and sheds located within or within 30 feet (9 m) of building lines. Comply with NFPA 241.
2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated within construction limits indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.

D. Parking: Provide temporary parking areas for construction personnel.

E. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

F. Project Identification and Temporary Signs: Provide Project identification as indicated in Specification Section 010070 special conditions, and other signs. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.

1. Provide temporary, directional signs for construction personnel and visitors.

2. Maintain and touchup signs so they are legible at all times.

G. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

H. 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 Division 01 Section "Execution" for progress cleaning requirements.

I. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

J. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Do not install permanent retractable stairs to mechanical platform until end of project.

K. Temporary Use of Permanent Stairs: Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that 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 Division 01 Section "Summary."

B. Temporary Erosion and Sedimentation Control: Comply with requirements specified in Division 31 Section "Site Clearing."

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.

1. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

D. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

F. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

G. Site Enclosure Fence: Before construction operations begin furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose the construction of the building. As required to enclose the site to the extent deemed necessary by the contractor relative to the phase of construction and as needed to secure the site for both public safety and protection of materials and equipment.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Owner with one set of keys.

H. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

I. 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.

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.
4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 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. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. 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.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 015000

SECTION 015723 - TEMPORARY STORM WATER POLLUTION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Temporary stormwater pollution controls.

1.2 STORMWATER POLLUTION PREVENTION PLAN

A. The Stormwater Pollution Prevention Plan (SWPPP) is part of the Contract Documents and is bound into this Project Manual.

1.3 INFORMATIONAL SUBMITTALS

A. Stormwater Pollution Prevention Plan (SWPP): Within 15 days of date established for commencement of the Work, submit completed SWPPP.

B. Inspection reports.

1.4 QUALITY ASSURANCE

A. Stormwater Pollution Prevention Plan (SWPPP) Coordinator: Experienced individual or firm with a record of successful water pollution control management coordination of projects with similar requirements.
   1. SWPPP Coordinator shall complete and finalize the SWPPP form.
   2. SWPPP Coordinator shall be responsible for inspections and maintaining of all requirements of the SWPPP.

B. Installers: Trained as indicated in the SWPPP.

PART 2 - PRODUCTS

2.1 TEMPORARY STORMWATER POLLUTION CONTROLS

A. Provide temporary stormwater pollution controls as required by the SWPPP.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with all best management practices, general requirements, performance requirements, reporting requirements, and all other requirements included in the SWPPP.

B. Locate stormwater pollution controls in accordance with the SWPPP.

C. Conduct construction as required to comply with the SWPPP and that minimize possible contamination or pollution or other undesirable effects.
   1. Inspect, repair, and maintain SWPPP controls during construction.
      a. Inspect all SWPPP controls not less than every seven days, and after each occurrence of a storm event, as outlined in the SWPPP.

D. Remove SWPPP controls at completion of construction and restore and stabilize areas disturbed during construction.

END OF SECTION 015723

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. Related Sections include the following:

1. Division 01 Section "Allowances" for products selected under an allowance.
2. Division 01 Section "Alternates" for products selected under an alternate.
3. Division 01 Section "References" for applicable industry standards for products specified.
4. Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.
5. Divisions 02 through 49 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

A. Products: Items purchased 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, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, 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. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," 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 other named manufacturers.

1.4 SUBMITTALS

A. Substitution Requests: Submit three 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 material or product cannot be provided.
b. Coordination information, including a list of changes or modifications 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 comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
g. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
h. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
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 lack of availability or delays in delivery.
j. Cost information, including a proposal of change, if any, in the Contract Sum.

2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within

15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Acceptance: Written Approval by Architect.

B. Comparable Product Requests: Submit three 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. 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 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: Action on Architect’s Submittal Stamp

C. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. 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 ensure compliance with the Contract Documents and to ensure 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 above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.
8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.7 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: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to Divisions 02 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that 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. Where products are accompanied by the term "as selected," Architect will make selection.
4. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
5. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product.
7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified 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 provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

    a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.

10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.

    a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
    b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution if received within 90 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect/Owner.

B. 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:

1. Requested substitution offers Owner an 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.
2. Requested substitution does not require extensive revisions to the Contract Documents.
3. Requested substitution is consistent with the Contract Documents and will produce indicated results.
4. Substitution request is fully documented and properly submitted.
5. Requested substitution will not adversely affect Contractor's Construction Schedule.
6. Requested substitution has received necessary approvals of authorities having jurisdiction.
7. Requested substitution is compatible with other portions of the Work.
8. Requested substitution has been coordinated with other portions of the Work.
9. Requested substitution provides specified warranty.
10. 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.

2.3 COMPARABLE PRODUCTS

A. Conditions: Architect will consider Contractor's request for comparable product 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:

1. Evidence that the proposed product does not require extensive 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 Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Coordination with Work under Other Contracts
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

B. Related Sections include the following:

1. Division 01 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
2. Division 01 Section "Submittal Procedures" for submitting surveys.
3. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 SUBMITTALS

A. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

D. Certified Surveys: Submit two (2) copies signed by land surveyor.

E. Final Property Survey: Submit five (5) copies showing the Work performed and record survey data.

1.4 QUALITY ASSURANCE

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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
3. If existing utilities are uncovered, Contractor can recover cost to relocate as required. Contractor can also recover cost to adjust new utilities to meet of conform with the existing utilities as required.

C. Acceptance of Conditions: 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. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

a. Description of the Work.
b. List of detrimental conditions, including substrates.
c. List of unacceptable installation tolerances.
d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. 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.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. 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 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3. Inform installers of lines and levels to which they must comply.
4. Check the location, level and plumb, of every major element as the Work progresses.
5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two (2) permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by certified land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 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.
4. Maintain minimum headroom clearance of 7 feet in spaces without a suspended ceiling.

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. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. 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.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

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.

H. 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.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 WORK UNDER OTHER CONTRACTS

A. Site Access: Provide access to Project site for Contractors performing work for Owner under other contracts.

B. Coordination: Coordinate construction and operations of the Work with work performed by other Contractors for the Owner.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for work performed by other Contractors for the Owner. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
2. Preinstallation Conferences: Include other Contractors performing work for Owner at preinstallation conferences covering portions of the Work that are to receive other Contractor's work.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. 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 (27 deg C).
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

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. At Substantial Completion, 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 in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

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.

3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.9 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.

3.10 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

B. Related Sections include the following:

1. Divisions 02 through 49 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 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 surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used and firms or entities that will perform the Work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.

6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. 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.

1. Primary operational systems and equipment.
2. Fire-suppression systems.
3. Mechanical systems piping and ducts.
4. Control systems.
5. Communication systems.
6. Electrical wiring systems.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related 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

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Equipment supports.
4. Piping, ductwork, vessels, and equipment.
5. Noise- and vibration-control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces 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.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials 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 match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. 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.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. 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 prevent or minimize interruption to occupied areas.

3.3 PERFORMANCE

A. 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.

B. 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 as small as possible, neatly to 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. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
5. 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.
6. Proceed with patching after construction operations requiring cutting are complete.

C. 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 possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate 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 eliminate 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, apply primer and intermediate paint coats 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.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL`

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 the following:

1. Recycling nonhazardous demolition and construction waste.
2. Disposing of nonhazardous demolition and construction waste.

1.3 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

1.4 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of 75 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials including the following:

1. Demolition Waste:

a. Asphalt paving.
b. Concrete.
c. Concrete reinforcing steel.

d. Concrete masonry units (CMU)
e. Brick
f. Clay Tile Masonry
g. Wood studs.
h. Wood joists.
i. Plywood and oriented strand board.
j. Wood trim and paneling.
k. Structural and miscellaneous steel.
l. Rough hardware.
m. Roofing
n. Insulation
o. Doors and frames.
p. Door hardware.
q. Windows.
r. Glazing.
s. Metal studs.
t. Gypsum board.
u. Acoustical tile panels
v. Acoustical ceiling grid
w. Carpe and carpet pad.
x. Demountable partitions
y. Equipment.
z. Cabinets.
aa. Plumbing fixtures.
bb. Piping.
cc. Supports and hangers.
dd. Valves.
ee. Sprinklers.
ff. Mechanical ductwork
gg. Mechanical equipment.
hh. Refrigerants.
ii. Electrical conduit.
jj. Copper wiring.
kk. Lighting fixtures.
ll. Lamps.
mm. Ballasts.
nn. Electrical devices.
oo. Panelboards.
pp. Transformers

2. Construction Waste:

a. Masonry and CMU
b. Lumber
c. Wood sheet materials.
d. Wood trim.
e. Metals.
f. Roofing.
g. Insulation.

h. Carpet and pad.
i. Gypsum board.
j. Piping.
k. Electrical conduit.
l. Packaging: Regardless of salvage/recycle goal indicated in "General" Paragraph above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

1) Paper.
2) Cardboard.
3) Boxes.
4) Plastic sheet and film.
5) Polystyrene packaging.
6) Wood crates.
7) Plastic pails.

1.5 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: Experienced firm, with a record of successful waste management.

B. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

C. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

1. Review and discuss waste management plan including responsibilities of waste management coordinator.
2. Review requirements for documenting quantities of each type of waste and its disposition.
3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
5. Review waste management requirements for each trade.

1.6 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition and construction waste generated by the Work. Use Form CWM-7 (attached) for construction and demolition waste or standard form as provided by contracted Waste Management facility. Include estimated quantities and assumptions for estimates.

C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
3. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.

1. Distribute waste management plan to everyone concerned within seven days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

E. Waste Management in Historic Zones or Areas: Hauling equipment and other materials shall be of sizes that clear surfaces within historic spaces, areas, rooms, and openings.

F. Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

G. Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

H. Plumbing Fixtures: Separate by type and size.

I. Lighting Fixtures: Separate lamps by type and protect from breakage.

J. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner.

C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.

5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.3 RECYCLING DEMOLITION WASTE

A. Asphalt Paving: Grind asphalt to maximum 4-inch (38-mm) size.

B. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

1. Pulverize concrete to maximum 4-inch (100-mm) size.
2. Crush concrete and screen to comply with requirements in Section 312000 "Earth Moving" for use as satisfactory soil for fill or subbase.

C. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Pulverize masonry to maximum 4-inch (100-mm) size.

2. Clean and stack undamaged, whole masonry units on wood pallets.

D. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

E. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

F. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

G. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

H. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

I. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.

J. Carpet and Pad: Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

K. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

L. Conduit: Reduce conduit to straight lengths and store by type and size.

M. Lamps: Separate lamps by type and store according to requirements in 40 CFR 273.

3.4 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location.

1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

3.5 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT 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.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Inspection procedures.
2. Warranties.
3. Final cleaning.

B. Related Sections include the following:

1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
2. Division 01 Section "Execution" for progress cleaning of Project site.
3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
4. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
5. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

5. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion electronic construction photographs, damage or settlement surveys, property surveys, and similar final record information.
6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
8. Complete startup testing of systems.
9. Submit test/adjust/balance records.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Advise Owner of changeover in heat and other utilities.
12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
13. Complete final cleaning requirements, including touchup painting.
14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. 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.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following (List exceptions in the request):

1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videotapes.
5. Submit an updated final statement, accounting for final additional changes to the Contract Sum.
6. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion or when the Owner took possession of and assumed responsibility for corresponding elements of the Work.
7. Submit consent of surety to final payment (AIA G707).

8. Submit Affidavit of Payment and Debts and Claims (AIA G706).
9. Submit letter on company letterhead stating project clean-up has been completed including removal of temporary facilities and debris.
10. Submit a final liquidated damages settlement statement.
11. Submit specific warranties, guarantees, workmanship bonds, maintenance agreements, final certifications, and similar documents.
13. Submit project record drawings and specifications, operation and maintenance manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information. Final survey shall verify dimensions noted on stake-out plan sheet as well as indicated grading and utilities.
14. Deliver tools, spare parts, extra stock, and similar items.
15. Provide letter on company letterhead stating no asbestos containing material has been installed in the project.
16. Submit Certificate of Final Occupancy.
17. Submit documentation certifying that demonstration and testing of equipment has been scheduled or completed.

B. Inspection: Submit a written request for final inspection for acceptance. 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.

1.5 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documents for the Architect's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.
2. Mark new information that is important to the Owner but was not shown on Contract Drawings or Shop Drawings.
3. Note related change-order numbers where applicable.
4. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.
5. Upon completion of construction, General Contractor and/or subcontractors shall turn over to Architect, a complete record set of drawings, showing all services exactly as built and installed. This includes any changes that are made in partitions, doors, or otherwise on arrangement or construction of building, as well as a complete record of the exact manner in which electrical and mechanical work, piping and underground utilities, are in

stalled. Dimensions shall be included where necessary to accurately locate piping and other items that will be below grade and that it may later be necessary to service.

B. Record Specifications: Maintain one complete copy of the Project Manual, including addenda. Include with the Project Manual one copy of other written construction documents, such as Change Orders and modifications issued in printed form during construction.

1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
3. Note related record drawing information and Product Data.
4. Upon completion of the Work, submit record Specifications to the Architect for the Owner's records.

C. Record Product Data: Maintain one copy of each Product Data submittal. Note related Change Orders and markup of record drawings and Specifications.

1. Mark these documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the site and from the manufacturer's installation instructions and recommendations.
2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.
3. Upon completion of markup, submit complete set of record Product Data to the Architect for the Owner's records.

D. Record Sample Submitted: Immediately prior to Substantial Completion, the Contractor shall meet with the Architect and the Owner's personnel at the Project Site to determine which Samples are to be transmitted to the Owner for record purposes. Comply with the Owner's instructions regarding delivery to the Owner's Sample storage area.

E. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to the Architect for the Owner's records.

F. Maintenance Manuals: Organize operation and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-inch (51-mm), 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:

1. Emergency instructions.
2. Spare parts list.
3. Copies of warranties.
4. Wiring diagrams.
5. Recommended "turn-around" cycles.
6. Inspection procedures.
7. Shop Drawings and Product Data.

1.6 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

C. Preparation: Submit three copies 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.

1.7 WARRANTIES

A. Submittal Time: 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.

B. On advice of Owner's legal counsel, revise first paragraph below to suit Project. Sometimes, extended warranties may be necessary.

C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch 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.

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 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. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.

m. Wipe surfaces of mechanical and electrical equipment, elevator equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Replace parts subject to unusual operating conditions.
o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
p. Replace disposable air filters with clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
q. Clean ducts, blowers, and coils if units were operated without filters during construction.
r. 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.
s. 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. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Operation manuals for systems, subsystems, and equipment.
3. Maintenance manuals for the care and maintenance of products, materials, and finishes, systems and equipment.

B. Related Sections include the following:
1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
4. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

A. Submittal: Submit one copy of each manual in final form within 15 days of Substantial Completion. Architect will return copy with comments within 15 days.

1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

1.5 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

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

2.2 MANUALS, GENERAL

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: Enclose title page in transparent plastic sleeve. 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, address, and telephone number of Contractor.
6. Name and address of Architect.
7. 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.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

    a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. 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 diskettes for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) 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.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
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 MANUAL

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.

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 MANUAL

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.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed 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 videotape, 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. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. 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 manual that provides an organized reference to 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 Division 01 Section "Project Record Documents."

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Sections include the following:

1. Division 01 Section "Closeout Procedures" for general closeout procedures.
2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Divisions 02 through 49 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit two sets of marked-up Record Prints.

B. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of black-line white prints of the Contract Drawings.

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 prepare the 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 understandable drawing technique.
c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

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 Work 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 or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
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. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2.2 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.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. 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

SECTION 024116 - STRUCTURE DEMOLITION

TIPS:

To view non-printing **Editor's Notes** that provide guidance for editing, click on MasterWorks/Single-File Formatting/Toggle/Editor's Notes.

To read **detailed research, technical information about products and materials, and coordination checklists**, click on MasterWorks/Supporting Information.

Content Requests:

<Double click here to submit questions, comments, or suggested edits to this Section.>

Revise this Section by deleting and inserting text to meet Project-specific requirements.

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

Revise list below to suit Project. Retain option in first subparagraph if demolition and removal of some or all site improvements are part of Project and are specified in this Section. Demolition of site improvements may also be specified in Section 311000 "Site Clearing."

1. Demolition and removal of buildings **and site improvements as indicated on Drawings**.
2. **Removing** below-grade construction.
3. Disconnecting, capping or sealing, and **removing** site utilities.
4. Salvaging items for reuse by Owner. Refer to Drawings for items to be salvaged which will include but is not limited to roof decking, heavy timber columns, masonry (brick).

B. Related Requirements:

Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.

1. Section 013200 "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
2. Section 024119 "Selective Demolition" for partial demolition of buildings, structures, and site improvements.

1.2 DEFINITIONS

Retain terms that remain after this Section has been edited for a project.

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and **store**. Include fasteners or brackets needed for reattachment elsewhere.

1.3 MATERIALS OWNERSHIP

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

1.4 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property. Indicate proposed locations and construction of barriers.

Retain "Adjacent Buildings" Subparagraph below if existing buildings to remain are immediately adjacent to demolished buildings. Retain option if demolition activities will interfere with required egress from adjacent occupied buildings.

1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain.

"Schedule of Building Demolition Activities" Paragraph below may be used to track Contractor's progress; it may also be used to determine that building demolition will not interfere with Owner's operations.

B. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.5 QUALITY ASSURANCE

Retain "Refrigerant Recovery Technician Qualifications" Paragraph below if retaining refrigerant removal in Part 3.

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

1.6 FIELD CONDITIONS

A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.

Revise first paragraph below if necessary.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

Retain one of two "Hazardous Materials" paragraphs below, or remove all references to hazardous materials. Insert scope of article to include asbestos, PCBs, and other materials if required. Coordinate statements with the General and Supplementary Conditions. See Evaluations.

C. Hazardous Materials: Present in buildings and structures to be demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.

If retaining first subparagraph below, see discussion in Evaluations about Sections dealing with hazardous materials.

1. Hazardous material remediation is specified elsewhere in the Contract Documents.
2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

Retain subparagraph below if materials are known to be present. Delete if Owner does not have, or will not provide, material safety data sheets for these materials.

3. Owner will provide material safety data sheets for materials that are known to be present in buildings and structures to be demolished because of building operations or processes performed there.

D. On-site storage or sale of removed items or materials is not permitted.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

2.2 SOIL MATERIALS

Retain this article for backfilling voids that result from demolition operations in below-grade areas. Coordinate with requirements in Part 3.

A. Satisfactory Soils: Comply with requirements in Section 312000 "Earth Moving."

PART 3 - EXECUTION

3.1 EXAMINATION

Retain first paragraph below if disconnection of utilities is the Work of other Sections or if Owner performs work.

A. Verify that utilities have been disconnected and capped before starting demolition operations.

Retain first paragraph below if available. Existing condition and hazardous material information may be included in Section 003119 "Existing Condition Information" or Section 003126 "Existing Hazardous Material Information."

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

Usually retain first option in first paragraph below. OSHA regulations require only that a "competent person" perform an engineering survey before building demolition begins. See the Evaluations.

C. [**Perform**] [**Engage a professional engineer to perform**] an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.

Retain "Steel Tendons" Paragraph below if demolition includes pretensioned or post-tensioned concrete slabs.

Retain first paragraph below if hazardous material is known to exist and remediation is not part of the Work of this Contract.

D. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

E. Inventory and record the condition of items to be removed and salvaged.

3.2 PREPARATION

Refrigerant in first paragraph below may be part of equipment such as air-conditioning units, chillers, refrigerators, freezers, icemakers, heat pumps, dehumidifiers, and drinking water coolers.

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

B. Salvaged Items: Comply with the following:

1. Clean salvaged items of dirt and demolition debris.
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 storage area [**designated by Owner**] [**indicated on Drawings**].
5. Protect items from damage during transport and storage.

Insert requirement here to engage a pest exterminator only if it is known that rodents are present in building to be demolished; it is typically unnecessary.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

Retain "Existing Utilities to Be Disconnected" Paragraph below if required. Delete if Owner arranges and performs work.

A. Existing Utilities to Be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished.

Retain first subparagraph below if shutting off utilities is responsibility of Owner. Delete if it is responsibility of Contractor.

1. Owner will arrange to shut off utilities when requested by Contractor.

Retain first subparagraph below if shutting off utilities is responsibility of Contractor. Delete if it is responsibility of Owner.

2. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.4 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.

B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of demolition.

Revise "Temporary Protection" Paragraph below to suit Project. Delete if adequately covered in Section 015000 "Temporary Facilities and Controls."

C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 "Temporary Facilities and Controls."

1. Protect adjacent buildings and facilities from damage due to demolition activities.
2. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.

D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.5 DEMOLITION, GENERAL

A. General: Demolish indicated buildings completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
2. Maintain fire watch during and for at least <**Insert number**> hours after flame-cutting operations.
3. Maintain adequate ventilation when using cutting torches.
4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.

Revise subparagraph below to suit Project.

If retaining "Explosives" Paragraph below, delete "Demolition by Explosives" Article.

C. Explosives: Use of explosives is not permitted.

3.6 DEMOLITION BY MECHANICAL MEANS

A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.

C. Salvage: Items to be removed and salvaged are indicated **on Drawings.**

Retain list below, revised to suit Project, if salvaged items are not indicated on Drawings.

Retain one of three "Below-Grade Construction" paragraphs below. Revise to suit Project.

D. Below-Grade Construction: Demolish foundation walls and other below-grade construction that are within footprint of new construction and extending **5 feet (1.5 m)** outside footprint indicated for new construction. Abandon below-grade construction outside this area.

Retain one of three "Existing Utilities" paragraphs below. Coordinate with other Sections. Revise to suit Project.

E. Existing Utilities: Demolish existing utilities and below-grade utility structures that are within **5 feet (1.5 m)** outside footprint indicated for new construction. Abandon utilities outside this area.

1. Fill abandoned utility structures with **satisfactory soil materials** according to backfill requirements in Section 312000 "Earth Moving."

3.7 SITE RESTORATION

Retain one of two "Below-Grade Areas" paragraphs below; coordinate with Section 312000 "Earth Moving."

A. Below-Grade Areas: Rough grade below-grade areas ready for further excavation or new construction.

B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.8 REPAIRS

A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.9 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site **and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.**

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.

B. Do not burn demolished materials.

3.10 CLEANING

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

1. Clean roadways of debris caused by debris transport.

END OF SECTION 024116

SECTION 024119 - SELECTIVE DEMOLITION

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. Demolition and removal of selected portions of building or structure.
2. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 017300 "Execution" for cutting and patching procedures.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and store for use later in the project as described in the Drawings.

C. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

D. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

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

1.5 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property**, for environmental protection, 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 **building manager'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 or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations.

D. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

E. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.6 FIELD CONDITIONS

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

B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Storage or sale of removed items or materials on-site is not permitted.

D. 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.

1.7 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding. Existing warranties include the following:

1. TPO roof on the entirety of the existing building.

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.

1.8 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

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 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. If utilities have not been disconnected and capped to allow for demolition, it is the Contractor’s responsibility to do so as part of the work.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

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.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Arrange to shut off utilities with utility companies.
   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.

3.3 PROTECTION

A. Temporary Shoring: Design, 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.

B. Remove temporary barricades and protections where hazards no longer exist.

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. 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 portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least 2 hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
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.

B. 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.

C. 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.

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.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

B. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

C. 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. If needed, insert requirements for other materials, products, equipment, and services.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site **and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.**

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.

B. Burning: Do not burn demolished materials.

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 024119

SECTION 031000 - CONCRETE FORMING AND ACCESSORIES

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. Form-facing material for cast-in-place concrete.
2. Form liners.
3. Shoring, bracing, and anchoring.

B. Related Requirements:

1. Section 321313 "Concrete Paving" for formwork related to concrete pavement and walks.

1.3 DEFINITIONS

A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.

B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction, movement, contraction, and isolation joints
c. Forms and form-removal limitations.
d. Shoring and reshoring procedures.
e. Anchor rod and anchorage device installation tolerances.

1.5 ACTION SUBMITTALS

A. Product Data: For each of the following:

1. Exposed surface form-facing material.
2. Concealed surface form-facing material.
3. Forms for cylindrical columns.
4. Form liners.
5. Form ties.
6. Waterstops.
7. Form-release agent.

B. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.

1. For exposed vertical concrete walls, indicate dimensions and form tie locations.
2. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301.

    a. Location of construction joints is subject to approval of the Architect.

3. Indicate location of waterstops.
4. Indicate form liner layout and form line termination details.
5. Indicate proposed schedule and sequence of stripping of forms, shoring removal, and reshoring installation and removal.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing and inspection agency.

B. Research Reports: For insulating concrete forms indicating compliance with International Code Council Acceptance Criteria AC353.

C. Field quality-control reports.

D. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. Testing and Inspection Agency Qualifications: An independent agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Form Liners: Store form liners under cover to protect from sunlight.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

B. Design, engineer, erect, shore, brace, and maintain insulating concrete forms in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design cross ties to transfer the effects of the following loads to the cast-in-place concrete core:

a. Wind Loads: As indicated on Drawings.

1) Horizontal Deflection Limit: Not more than 1/240 of the wall height.

2.2 FORM-FACING MATERIALS

A. As-Cast Surface Form-Facing Material:

1. Provide continuous, true, and smooth concrete surfaces.
2. Furnish in largest practicable sizes to minimize number of joints.
3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete, and as follows:

a. Plywood, metal, or other approved panel materials.
b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

1) APA Structural 1 Plyform, B-B or better; mill oiled and edge sealed.
2) APA Plyform Class I, B-B or better; mill oiled and edge sealed.

B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.

1. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class.

1. Provide forms with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Form Liners:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Architectural Polymers, Inc.
b. Fitzgerald Formliners.
c. Sika Corporation.
d. Spec Formliners, Inc.

2. Face Pattern: Smooth.

2.3 WATERSTOPS

A. Flexible Rubber Waterstops: U.S. Army Corps of Engineers CRD-C 513, for embedding in concrete to prevent passage of fluids through joints, with factory fabricated corners, intersections, and directional changes.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Williams Products, Inc.

2. Profile: Flat dumbbell with center bulb.
3. Dimensions: 4 inches by 3/16 inch thick; nontapered.

B. Flexible PVC Waterstops: U.S. Army Corps of Engineers CRD-C 572, for embedding in concrete to prevent passage of fluids through joints, with factory fabricate corners, intersections, and directional changes.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. BoMetals, Inc.
b. Sika Corporation.
c. Vinylex Waterstop & Accessories.

2. Profile: Flat dumbbell with center bulb.
3. Dimensions: 4 inches by 3/16 inch thick; nontapered.

C. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Carlisle Coatings & Waterproofing Inc.
b. CETCO, a Minerals Technologies company.
c. Concrete Sealants Inc.
d. Sika Corporation.

D. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer-modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Adeka Corporation.
b. CETCO, a Minerals Technologies company.
c. GCP Applied Technologies Inc.
d. Sika Corporation.

2.4 RELATED MATERIALS

A. Reglets: Fabricate reglets of not less than 0.022-inch- thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

B. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034-inch- thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

E. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
2. Form release agent for form liners shall be acceptable to form liner manufacturer.

F. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

A. Comply with ACI 301.

B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-In-Place Concrete" for as-cast finishes.

C. Limit concrete surface irregularities as follows:

1. Surface Finish-1.0: ACI 117 Class D, 1 inch.
2. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.
3. Surface Finish-3.0: ACI 117 Class A, 1/8 inch.

D. Construct forms tight enough to prevent loss of concrete mortar.

1. Minimize joints.
2. Exposed Concrete: Symmetrically align joints in forms.

E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.

1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
3. Install keyways, reglets, recesses, and other accessories, for easy removal.

F. Do not use rust-stained, steel, form-facing material.

G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.

1. Provide and secure units to support screed strips
2. Use strike-off templates or compacting-type screeds.

H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.

1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.

2. Locate temporary openings in forms at inconspicuous locations.

I. Chamfer exterior corners and edges of permanently exposed concrete.

J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.

K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.

1. Determine sizes and locations from trades providing such items.
2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.

L. Construction and Movement Joints:

1. Construct joints true to line with faces perpendicular to surface plane of concrete.
2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
3. Place joints perpendicular to main reinforcement.
4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.

    a. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Space vertical joints in walls as indicated on Drawings.

    a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
4. Install dovetail anchor slots in concrete structures, as indicated on Drawings.
5. Clean embedded items immediately prior to concrete placement.

3.3 INSTALLATION OF WATERSTOPS

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm.

1. Install in longest lengths practicable.
2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
3. Allow clearance between waterstop and reinforcing steel of not less than 2 times the largest concrete aggregate size specified in Section 033000 "Cast-In-Place Concrete."
4. Secure waterstops in correct position at 12 inches on center.
5. Field fabricate joints in accordance with manufacturer's instructions using heat welding.

    a. Miter corners, intersections, and directional changes in waterstops.
    b. Align center bulbs.

6. Clean waterstops immediately prior to placement of concrete.
7. Support and protect exposed waterstops during progress of the Work.

B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated on Drawings, according to manufacturer's written instructions, by adhesive bonding, mechanically fastening, and firmly pressing into place.

1. Install in longest lengths practicable.
2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
3. Protect exposed waterstops during progress of the Work.

3.4 REMOVING AND REUSING FORMS

A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work.

1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
2. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.

1. Align and secure joints to avoid offsets.
2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.5 SHORING AND RESHORING INSTALLATION

A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.

1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.6 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.
2. Inspect insulating concrete forms for shape, location, and dimensions of the concrete member being formed.

END OF SECTION 031000

SECTION 032000 - CONCRETE REINFORCING

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. Steel reinforcement bars.
2. Welded-wire reinforcement.

B. Related Requirements:
1. Section 321313 "Concrete Paving" for reinforcing related to concrete pavement and walks.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction contraction and isolation joints.
c. Steel-reinforcement installation.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Bar supports.
3. Mechanical splice couplers.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M

B. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement:

a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.

2. Mechanical splice couplers.

C. Field quality-control reports.

D. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1. Store reinforcement to avoid contact with earth.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.

B. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

C. Low-Alloy Steel Reinforcing Bars: ASTM A706/A706M, deformed.

D. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.2 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

C. Mechanical Splice Couplers: ACI 318 Type 1, same material of reinforcing bar being spliced; tension-compression type.

D. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.

1. Finish: Plain.

2.3 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:

1. Do not cut or puncture vapor retarder.
2. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.

B. Accurately position, support, and secure reinforcement against displacement.

1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 318.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Splices: Lap splices as indicated on Drawings.

1. Bars indicated to be continuous, and all vertical bars shall be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
2. Stagger splices in accordance with ACI 318.
3. Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.
4. Weld reinforcing bars in accordance with AWS D1.4/D 1.4M, where indicated on Drawings.

G. Install welded-wire reinforcement in longest practicable lengths.

1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."

    a. For reinforcement less than W4.0 or D4.0, continuous support spacing shall not exceed 12 inches.

2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire.
3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
4. Lace overlaps with wire.

3.3 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement.
2. Continue reinforcement across construction joints unless otherwise indicated.
3. Do not continue reinforcement through sides of strip placements of floors and slabs.

B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

3.4 INSTALLATION TOLERANCES

A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel-reinforcement placement.
2. Steel-reinforcement mechanical splice couplers.
3. Steel-reinforcement welding.

END OF SECTION 032000

SECTION 033000 - CAST-IN-PLACE CONCRETE

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. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 031000 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.
2. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
3. Section 312000 "Earth Moving" for drainage fill under slabs-on-ground.
4. Section 321313 "Concrete Paving" for concrete pavement and walks.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with fly ash.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete Subcontractor.

2. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction joints, control joints, isolation joints, and joint-filler strips.
c. Semirigid joint fillers.
d. Vapor-retarder installation.
e. Anchor rod and anchorage device installation tolerances.
f. Cold and hot weather concreting procedures.
g. Concrete finishes and finishing.
h. Curing procedures.
i. Forms and form-removal limitations.
j. Shoring and reshoring procedures.
k. Methods for achieving specified floor and slab flatness and levelness.
l. Floor and slab flatness and levelness measurements.
m. Concrete repair procedures.
n. Concrete protection.
o. Initial curing and field curing of field test cylinders (ASTM C31/C31M.)
p. Protection of field cured field test cylinders.

1.5 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Aggregates.
4. Admixtures:

    a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.

5. Vapor retarders.
6. Floor and slab treatments.
7. Liquid floor treatments.
8. Curing materials.
9. Joint fillers.
10. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Calculated equilibrium unit weight, for lightweight concrete.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.

9. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
10. Intended placement method.
11. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

    a. Location of construction joints is subject to approval of the Engineer of Record.

D. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Final finish for floors.
6. Curing process.
7. Floor treatment if any.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.
3. Testing agency: Include copies of applicable ACI certificates.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Floor and slab treatments.
5. Bonding agents.
6. Adhesives.
7. Vapor retarders.
8. Semirigid joint filler.
9. Joint-filler strips.
10. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.

3. Aggregates.

D. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.

E. Research Reports:

1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
2. For sheet vapor retarder/termite barrier, showing compliance with ICC AC380.

F. Minutes of preinstallation conference.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician.

1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.9 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Regional Materials: Concrete shall be manufactured within 100 miles of Project site from aggregates and cementitious materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

B. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

C. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I/II, gray.
2. Fly Ash: ASTM C618, Class C or F.

D. Normal-Weight Aggregates: ASTM C33/C33M, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source.

1. Alkali-Silica Reaction: Comply with one of the following:

   a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
   b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
   c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.

2. Maximum Coarse-Aggregate Size: 3/4 inch nominal.

3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

E. Lightweight Aggregate: ASTM C330/C330M, 3/4-inch nominal maximum aggregate size.

F. Air-Entraining Admixture: ASTM C260/C260M.

G. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

H. Water and Water Used to Make Ice: ASTM C94/C94M, potable.

2.3 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A; not less than 15 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Barrier-Bac; Inteplast Group.
b. ISI Building Products.
c. Poly-America, L.P.
d. Reef Industries, Inc.
e. Stego Industries, LLC.
f. Tex-Trude.
g. W.R. Meadows, Inc.

2.4 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. BASF Corporation.
b. ChemMasters, Inc.
c. ChemTec International.
d. Concrete Sealers USA.

e. Dayton Superior.
f. Euclid Chemical Company (The); an RPM company.
g. Kaufman Products, Inc.
h. Laticrete International, Inc.
i. Nox-Crete Products Group.
j. PROSOCO, Inc.
k. SpecChem, LLC.
l. US SPEC, Division of US MIX Company.
m. Vexcon Chemicals Inc.
n. V-Seal Concrete Sealers & Specialty Coatings.
o. W.R. Meadows, Inc.

2. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.5 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. BASF Corporation.
b. Bon Tool Co.
c. ChemMasters, Inc.
d. Dayton Superior.
e. Euclid Chemical Company (The); an RPM company.
f. Kaufman Products, Inc.
g. Lambert Corporation.
h. Laticrete International, Inc.
i. Metalcrete Industries.
j. Nox-Crete Products Group.
k. Sika Corporation.
l. SpecChem, LLC.
m. TK Products.
n. Vexcon Chemicals Inc.
o. W.R. Meadows, Inc.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

1. Color:

a. Ambient Temperature Below 50 deg F: Black.
b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
c. Ambient Temperature Above 85 deg F: White.

C. Water: Potable or complying with ASTM C1602/C1602M.

D. Clear, Waterborne, Membrane-Forming, Non-dissipating Curing Compound: ASTM C309, Type 1, Class B, certified by curing compound manufacturer to not interfere with bonding of floor covering.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Anti-Hydro International, Inc.
b. BASF Corporation.
c. ChemMasters, Inc.
d. Dayton Superior.
e. Euclid Chemical Company (The); an RPM company.
f. Kaufman Products, Inc.
g. Lambert Corporation.
h. Laticrete International, Inc.
i. Metalcrete Industries.
j. Nox-Crete Products Group.
k. SpecChem, LLC.
l. TK Products.
m. Vexcon Chemicals Inc.
n. W.R. Meadows, Inc.

E. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. ChemMasters, Inc.
b. Concrete Sealers USA.
c. Dayton Superior.
d. Euclid Chemical Company (The); an RPM company.
e. Kaufman Products, Inc.
f. Lambert Corporation.
g. Laticrete International, Inc.
h. Metalcrete Industries.
i. Nox-Crete Products Group.
j. Right Pointe.
k. SpecChem, LLC.
l. TK Products.
m. Vexcon Chemicals Inc.
n. W.R. Meadows, Inc.

2. Products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.6 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 in accordance with ASTM D2240.

C. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.7 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand, as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4,100 psi at 28 days when tested in accordance with ASTM C109/C109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5,000 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.8 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing, or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for parking structure slabs, and concrete with a w/cm below 0.50.

2.9 CONCRETE MIXTURES

A. Class A: Normal-weight concrete used for footings.

1. Exposure Class: ACI 318 F0, S0, W0, C0.
2. Minimum Compressive Strength: 3,000 psi at 28 days.
3. Maximum w/cm: 0.55.
4. Slump Limit: 4 inches, plus or minus 1 inch, before adding high-range water-reducing or plasticizing admixtures at the Project site (8 inches, plus or minus 1 inch thereafter).
5. Air Content: 2.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4 inch nominal maximum aggregate size.
6. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

B. Class B: Normal-weight concrete used for foundation walls.

1. Exposure Class: ACI 318 F1, S0, W0, C0.
2. Minimum Compressive Strength: 4,500 psi at 28 days.
3. Maximum w/cm: 0.45.
4. Slump Limit: 4 inches, plus or minus 1 inch, before adding high-range water-reducing or plasticizing admixtures at the Project site (8 inches, plus or minus 1 inch thereafter).
5. Air Content:

    a. Exposure Class F1: 5.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.

6. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

C. Class C: Normal-weight concrete used for interior slabs-on-ground.

1. Exposure Class: ACI 318 F0, S0, W0, C0.
2. Minimum Compressive Strength: 3,000 psi at 28 days.
3. Maximum w/cm: 0.55.
4. Minimum Cementitious Materials Content: 540 lb/cu. yd.
5. Slump Limit:4 inches, plus or minus 1 inch, before adding high-range water-reducing or plasticizing admixtures at the Project site (8 inches, plus or minus 1 inch thereafter).

6. Air Content: Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
7. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

D. Class E: Structural lightweight concrete used for interior suspended slabs and concrete toppings/pads over suspended slabs.

1. Exposure Class: ACI 318 F0, S0, W0, C0.
2. Minimum Compressive Strength: 4,000 psi at 28 days.
3. Calculated Equilibrium Unit Weight: 115 lb/cu. ft., plus or minus 3 lb/cu. ft. as determined by ASTM C567/C567M.
4. Slump Limit:3 inches, plus or minus 1 inch, before adding high-range water-reducing or plasticizing admixtures at the Project site (8 inches, plus or minus 1 inch thereafter).
5. Air Content: Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
6. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

E. Class F: Normal-weight concrete used for exterior slabs-on-ground, concrete toppings/pads over slabs-on-ground, and exterior pads.

1. Exposure Class: ACI 318 F2, S0, W1, C0.
2. Minimum Compressive Strength: 4,500 psi at 28 days.
3. Maximum w/cm: 0.45.
4. Minimum Cementitious Materials Content: 540 lb/cu. yd.
5. Slump Limit: 4 inches, plus or minus 1 inch.
6. Air Content:

    a. Exposure Classes F2 and F3: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.

7. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

F. Class I: Normal-weight concrete used for interior metal pan stairs and landings:

1. Exposure Class: ACI 318 F0, S0, W0, C0.
2. Minimum Compressive Strength: 2,500 psi at 28 days.
3. Maximum w/cm: 0.65.
4. Minimum Cementitious Materials Content: 470 lb/cu. yd.
5. Maximum Size Aggregate: 1/2 inch.
6. Slump Limit: 2.5 inches, plus or minus 1.5 inches.
7. Air Content: 0 percent, plus or minus 0.5 percent at point of delivery.
8. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.
9. Retarding Admixture: Not allowed.
10. Accelerating Admixture: Not allowed.

G. Class J: Normal-weight concrete used for exterior retaining walls.

1. Exposure Class: ACI 318 F2, S0, W0, C0.
2. Minimum Compressive Strength: 4,500 psi at 28 days.
3. Maximum w/cm: 0.45.
4. Slump Limit:4 inches, plus or minus 1 inch, before adding high-range water-reducing or plasticizing admixtures at the Project site (8 inches, plus or minus 1 inch thereafter).
5. Air Content:

    a. Exposure Classes F2 and F3: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.

6. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.4 INSTALLATION OF VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.

1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
2. Face laps away from exposed direction of concrete pour.
3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
4. Lap joints 6 inches and seal with manufacturer's recommended tape.
5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
7. Protect vapor retarder during placement of reinforcement and concrete.

    a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

3.5 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by the Engineer of Record.
2. Place joints perpendicular to main reinforcement.

    a. Continue reinforcement across construction joints unless otherwise indicated.
    b. Do not continue reinforcement through sides of strip placements of floors and slabs.

3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints:

1. Install dowel bars and support assemblies at joints where indicated on Drawings.
2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

B. Notify Engineer of Record and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Engineer of Record in writing, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.

a. Do not use vibrators to transport concrete inside forms.
b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Do not place concrete floors and slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

3.7 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.

    a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
    b. Remove projections larger than 1 inch.
    c. Tie holes do not require patching.
    d. Surface Tolerance: ACI 117 Class D.
    e. Apply to concrete surfaces not exposed to public view.

2. ACI 301 Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.

    a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
    b. Remove projections larger than 1/4 inch.
    c. Patch tie holes.
    d. Surface Tolerance: ACI 117 Class B.
    e. Locations: Apply to concrete surfaces as indicated.

3. ACI 301 Surface Finish SF-3.0:

    a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
    b. Remove projections larger than 1/8 inch.
    c. Patch tie holes.
    d. Surface Tolerance: ACI 117 Class A.
    e. Locations: Apply to concrete surfaces as indicated.

B. Rubbed Finish: Apply the following to as cast surface finishes where indicated on Drawings:

1. Smooth-Rubbed Finish:

    a. Perform no later than one day after form removal.
    b. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture.
    c. If sufficient cement paste cannot be drawn from the concrete by the rubbing process, use a grout made from the same cementitious materials used in the in-place concrete.
    d. Maintain required patterns or variances as shown on Drawings or to match field sample panels.

2. Grout-Cleaned Rubbed Finish:

    a. Clean concrete surfaces after contiguous surfaces are completed and accessible.
    b. Do not clean concrete surfaces as Work progresses.
    c. Mix 1 part portland cement to 1-1/2 parts fine sand, complying with ASTM C144 or ASTM C404, by volume, with sufficient water to produce a mixture with the consistency of thick paint. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces.
    d. Wet concrete surfaces.
    e. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap, and keep surface damp by fog spray for at least 36 hours.
    f. Maintain required patterns or variances as shown on Drawings or to match field sample panels.

3. Cork-Floated Finish:

    a. Mix 1 part portland cement to 1 part fine sand, complying with ASTM C144 or ASTM C404, by volume, with sufficient water to produce a mixture with the consistency of thick paint.
    b. Mix 1 part portland cement and 1 part fine sand with sufficient water to produce a mixture of stiff grout. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces.
    c. Wet concrete surfaces.
    d. Compress grout into voids by grinding surface.
    e. In a swirling motion, finish surface with a cork float.
    f. Maintain required patterns or variances as shown on Drawings or to match field sample panels.

4. Scrubbed Finish: After concrete has achieved a compressive strength of from 1,000 to 1,500 psi, apply scrubbed finish.

    a. Wet concrete surfaces thoroughly and scrub with stiff fiber or wire brushes, using water freely, until top mortar surface is removed and aggregate is uniformly exposed.
    b. Rinse scrubbed surfaces with clean water.
    c. Maintain continuity of finish on each surface or area of Work.
    d. Remove only enough concrete mortar from surfaces to match field sample panels.

C. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish:

1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch in one direction.
3. Apply scratch finish to surfaces to receive concrete floor toppings and to receive mortar setting beds for bonded cementitious floor finishes.

C. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 (ACI A117M) tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

D. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:

    a. Slabs on Ground:

        1) Specified overall values of flatness, F_F 35; and of levelness, F_L 25; with minimum local values of flatness, F_F 24; and of levelness, F_L 17.

    b. Suspended Slabs:

        1) Specified overall values of flatness, F_F 35; and of levelness, F_L 20; with minimum local values of flatness, F_F 24; and of levelness, F_L 15. Levelness requirements may be waived for slabs on metal deck.

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thinset method. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.

1. Coordinate required final finish with Architect before application.
2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
2. Coordinate required final finish with Architect before application.

3.9 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 4 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Minimum Compressive Strength: As indicated herein.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. Prior to pouring concrete, place and secure anchorage devices.

    a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
    b. Cast anchor-bolt insert into bases.
    c. Install anchor bolts to elevations required for proper attachment to supported equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.

1. Cast-in inserts and accessories, as shown on Drawings.
2. Reinforce interior stairs that use concrete fill for the landings and/or treads with either microsynthetic monofilament fibers (at a minimum dosage rate of 1.0 lbs/cy) or 4x4-W1.4xW1.4 welded wire fabric.
3. Screed, tamp, and trowel finish concrete surfaces.

3.10 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305.1, before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. If forms remain during curing period, moist cure after loosening forms.
3. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:

    a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
    b. Continuous Sprinkling: Maintain concrete surface continuously wet.
    c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
    d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
    e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.

        1) Recoat areas subject to heavy rainfall within three hours after initial application.
        2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:

1. Begin curing immediately after finishing concrete.
2. Interior Concrete Floors:

    a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:

        1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

            a) Lap edges and ends of absorptive cover not less than 12-inches.
            b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

        2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

            a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
            b) Cure for not less than seven days.

3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.
b) Continuous water-fog spray.

b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:

1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

a) Lap edges and ends of absorptive cover not less than 12 inches.
b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.

a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
b) Cure for not less than seven days.

3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.
b) Continuous water-fog spray.

c. Floors to Receive Polished Finish: Contractor has option of the following:

1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.

a) Lap edges and ends of absorptive cover not less than 12 inches.
b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:

a) Water.
b) Continuous water-fog spray.

d. Floors to Receive Curing Compound:

1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Maintain continuity of coating, and repair damage during curing period.
4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

e. Floors to Receive Curing and Sealing Compound:

1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Repeat process 24 hours later and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.11 TOLERANCES

A. Conform to ACI 117.

3.12 APPLICATION OF LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment in accordance with manufacturer's written instructions.

1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
2. Do not apply to concrete that is less than seven days' old.
3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing.
4. Rinse with water; remove excess material until surface is dry.
5. Apply a second coat in a similar manner if surface is rough or porous.

3.13 JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month.
2. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.

D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Architect.
2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.

a. Limit cut depth to 3/4 inch.
b. Make edges of cuts perpendicular to concrete surface.
c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
d. Fill and compact with patching mortar before bonding agent has dried.
e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.

a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
b. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.

a. Correct low and high areas.
b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate

to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.

    a. Finish repaired areas to blend into adjacent concrete.

5. Correct other low areas scheduled to remain exposed with repair topping.

    a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
    b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.

    a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
    b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
    c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
    d. Place, compact, and finish to blend with adjacent finished concrete.
    e. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.

    a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
    b. Dampen cleaned concrete surfaces and apply bonding agent.
    c. Place patching mortar before bonding agent has dried.
    d. Compact patching mortar and finish to match adjacent concrete.
    e. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency shall be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
2. Testing agency shall immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency shall report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.

    a. Test reports shall include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:

        1) Project name.
        2) Name of testing agency.
        3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
        4) Name of concrete manufacturer.
        5) Date and time of inspection, sampling, and field testing.
        6) Date and time of concrete placement.
        7) Location in Work of concrete represented by samples.
        8) Date and time sample was obtained.
        9) Truck and batch ticket numbers.
        10) Design compressive strength at 28 days.
        11) Concrete mixture designation, proportions, and materials.
        12) Field test results.
        13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
        14) Type of fracture and compressive break strengths at seven days and 28 days.

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

D. Inspections:

1. Headed bolts and studs.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.
5. Verification of concrete strength before removal of shores and forms from beams and slabs.

E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M shall be performed in accordance with the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C143/C143M:

   a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   b. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete; ASTM C173/C173M volumetric method, for structural lightweight concrete.

   a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature: ASTM C1064/C1064M:

   a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.

5. Unit Weight: ASTM C567/C567M fresh unit weight of structural lightweight concrete.

   a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

6. Compression Test Specimens: ASTM C31/C31M:

   a. Cast and laboratory cure two sets of four 6-inch by 12-inch or 4-inch by 8-inch cylinder specimens for each composite sample.

7. Compressive-Strength Tests: ASTM C39/C39M.

   a. Test one set of two laboratory-cured specimens at seven days and three sets of two specimens at 28 days.
   b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5,000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5,000 psi.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

11. Additional Tests:

    a. Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed byEngineer of Record.
    b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed byEngineer of Record.

        1) Acceptance criteria for concrete strength shall be in accordance with ACI 301, section 1.6.6.3.

12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 24 hours of completion of floor finishing and promptly report test results to Architect.

3.16 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 033000

SECTION 042000 - UNIT MASONRY

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. This Section includes unit masonry assemblies consisting of the following:
   1. Mortar and grout.
   2. Reinforcing steel.
   3. Masonry joint reinforcement.
   4. Ties and anchors.
   5. Embedded flashing.
   6. Miscellaneous masonry accessories.

B. Related Sections include the following:

   1. Division 07 Section "Sheet Metal Flashing and Trim" for exposed sheet metal flashing.
   2. Division 07 Section "Joint Sealants" for sealing control and expansion joints in unit masonry.

C. Products installed, but not furnished, under this Section include the following:

   1. Steel lintels for unit masonry, furnished under Division 05 Section “Metal Fabrications”
   2. Manufactured reglets in masonry joints for metal flashing, furnished under Division 07 Section "Sheet Metal Flashing and Trim."

1.3 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths (f'_m) at 28 days.

B. Determine net-area compressive strength (f'_m) of masonry by testing masonry prisms according to ASTM C 1314.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

C. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:

1. Masonry units.

a. Include material test reports substantiating compliance with requirements.
b. For exposed brick, include material test report for efflorescence according to ASTM C 67.
c. For masonry include data and calculations establishing average net-area compressive strength of units.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface.
2. Locate mock-up panel(s) where indicated by Architect. Mock up is not to be placed where the finished face of the mock up faces a Northerly direction.
3. Clean exposed faces of mockups with masonry cleaner as indicated.
4. Protect accepted mockups from the elements with weather-resistant membrane.
5. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar; tooling of joints; and aesthetic qualities of workmanship.

a. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver pre-blended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store pre-blended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 PROJECT CONDITIONS

A. Protection of Masonry: During construction, 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.

B. 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 from mortar splatter by spreading coverings 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 onto completed masonry.

C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost

or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.2 BRICK

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
5. Refer to drawings for specific special shapes and sizes required at window head conditions.

B. Clay Face Brick: Facing brick complying with ASTM C 216

1. Products: Subject to compliance with requirements, provide the following:
   a. Cunningham Brick Company, Inc. “Silverstone”. (Basis of Design)
   b. Interstate Brick – Ash L-4.
   c. Approved Equal – Substitutions must be submitted to the Architect minimum 10 days prior to bid date for review and approval.
2. Grade: SW
3. Type: FBS.

4. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
5. Size (Actual Dimensions): Monarch 11 5/8” x 3-5/8” x 2-1/4”
6. Color and Texture: Color and texture to match Architects sample. Sample is available for viewing upon request.
7. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.

2.3 MORTAR AND GROUT MATERIALS

A. Masonry Cement: ASTM C 91, Type S for Brick and ASTM C 270.

1. Mortar color to be selected from manufacturer’s full range including custom colors. Design intent is for mortar to match brick color.

    a. Capital Materials Corporation
    b. Holcim (US) Inc.;
    c. Lafarge North America Inc.;
    d. Lehigh Cement Company;
    e. National Cement Company, Inc.; Coosa Masonry Cement.

2. Pigments shall not exceed 5 percent of masonry cement by weight.

3. For colored-aggregate mortar, use natural color of white cement as necessary to produce required mortar color.

B. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. White-Mortar Aggregates: Natural white sand or crushed white stone.
3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

C. Aggregate for Grout: ASTM C 404.

D. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Products:

    a. Addiment Incorporated; Mortar Kick.
    b. Euclid Chemical Company (The); Accelguard 80.
    c. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Morset.
    d. Sonneborn, Div. of ChemRex; Trimix-NCA.

E. Water: Potable.

2.4 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.
   1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating.
   2. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 (Z180) zinc coating.
   3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch (16-mm) cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches (50 mm) parallel to face of veneer.

C. Adjustable Anchors for Connecting to Steel Columns: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

   1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- (6.4-mm-) diameter, hot-dip galvanized steel.
   2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.25-inch- (6.4-mm-) diameter, hot-dip galvanized steel wire.

D. Adjustable Masonry-Veneer Anchors

   1. General: Provide anchors that allow vertical adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to metal studs, and as follows:

      a. Structural Performance Characteristics: Capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1.3 mm).

   2. Screw-Attached, Masonry-Veneer Anchors: Units consisting of a wire tie and a metal anchor section for anchorage to Metal Stud Backup.

      a. Available Products:
         1) Heckmann Building Products Inc.; Pos-I-Tie, Heckmann No.75 Self Drilling Screw

      b. Anchor Section: Barrel Materials

         Heckmann No. 75 Pos-I-Tie: One-Piece Screw consisting of a 92% Zamac 2 Zinc barrel, neoprene washer, flanged head and eye to receive Pos-I-Tie® wire tie; designed to seat barrel directly on structural portion of backup, with flanged head covering fastener hole.

         1) Provide barrel shaft length 2 inch with insulation directly over studs and screws to suit substrate.
         2) Provide barrel shaft length 5/8 inch with sheathing substrate and screws to suit substrate.

c. Masonry Wire Ties: Provide minimum 2 inches embedment in mortar
   1) Wire 3/16 inch (4.75 mm) diameter.
   2) Hot-Dip Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A 153/A 153M, Class B-2.
   3) No. 75 Pos-I-Tie Triangle Wire Tie

2.5 MISCELLANEOUS ANCHORS

A. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

B. Post-installed Anchors: Provide chemical or torque-controlled expansion anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).

2.6 EMBEDDED FLASHING MATERIALS

A. Self-adhesive Composite Flexible Flashing with Termination Bar system: Self-adhesive cold-applied sheet consisting of 32 mils of rubberized asphalt integrally bonded to an 8 mil, high density, cross-laminated polyethylene film.

B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.

1. Meet or exceed the VOC limits of South Coast Air Quality Management District Rule #1168.
   a. Current VOC limit for contact adhesive: 250 grams of VOC per liter of adhesive.

2. Self-adhesive Composite Flexible Flashing with Termination Bar system: For use with exterior wall assemblies with metal stud and foam-plastic board insulation sheathing back-up behind masonry veneer walls:

   a. Dur-O-Barrier; Dur-O-Wal, Inc.
   b. Everlastic MF-400; Williams Products, Inc.
   c. Perm-A-Barrier Wall Flashing; W.R. Grace & Co., Construction Products Division
   d. Poly-Barrier Self-Adhering Wall Flashing; Polytite Manufacturing Corp.
   e. Polyguard 300; Polyguard Products, Inc.
   f. Textroflash; Hohmann & Bernard, Inc.Fabricate

C. COLD WEATHER Through-Wall Flashing OPTION – with termination bar system APPROVED BY ARCHITECT: Manufacturer's standard through-wall flashing of type indicated below:

1. EPDM Flashing: Sheet flashing product made from ethylene-propylene-diene terpolymer, complying with ASTM D 4637, 0.040 inch (1.0 mm) thick.

a. Use only where flashing is fully concealed in masonry.
b. For use at exterior wall assemblies with brick veneers and CMU back-up walls.
c. Provide one of the following Products:

1) Carlisle Coatings & Waterproofing; Pre-Kleened EPDM Thru-Wall Flashing.
2) Firestone Building Products; FlashGuard.
3) Heckmann Building Products Inc.; No. 81 EPDM Thru-Wall Flashing.

D. Metal Termination Bar:

1. Stainless Steel Termination Bar 1/8" Thick by 1" Wide by 8 feet length.

E. Clear Plastic for Masonry Stain Prevention:

1. High density polyethylene (HDPE), 30 mils (0.8 mm) thick.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Weep/Vent Products: Use the following, unless otherwise indicated:

1. Wicking Material: Absorbent rope, made from cotton or UV-resistant synthetic fiber, 1/4 to 3/8 inch (6 to 10 mm) in diameter, in length required to produce 2-inch (50-mm) exposure on exterior and 18 inches (450 mm) in cavity between wythes. Use only for weeps.

2.8 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers:

a. Diedrich Technologies, Inc.
b. EaCo Chem, Inc.
c. ProSoCo, Inc.

2.9 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated:

1. For masonry below grade or in contact with earth, use Type N
2. For reinforced masonry, use Type S
3. For conditions not otherwise indicated use Type S

D. Grout for Unit Masonry: Comply with ASTM C 476

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 601 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143/C 143M.

2.10 SOURCE QUALITY CONTROL

A. Owner may engage a qualified independent testing agency to perform source quality-control testing indicated below:

1. Payment for these services will be made by Owner.
2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.
3. Contractor is to also provide testing of Mortar and Grout to the extent the Contractor deems necessary to assure requirements of this specification are being met.

B. Concrete Masonry Unit Test: For each type of unit furnished, per ASTM C 140.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

H. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.
7. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond and in bond patterns indicated on Drawings; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches (100-mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.

G. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint), unless otherwise indicated.

3.5 COMPOSITE MASONRY

A. Bond wythes of composite masonry together using one of the following methods:

1. Masonry Joint Reinforcement: Installed in horizontal mortar joints.

a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
b. Where bed joints of wythes do not align or wythes of wall are built seperately, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.

B. Collar Joints: Solidly fill collar joints by parging face of first wythe that is laid and shoving units of other wythe into place.

C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:

1. Provide continuity with masonry joint reinforcement by using prefabricated T-shaped units.

3.6 CAVITY WALLS

A. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

3.7 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls. Lap reinforcement a minimum of 6 inches (150 mm).

1. Space reinforcement not more than 16 inches (406 mm) o.c.
2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls.

B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.8 ANCHORING MASONRY VENEERS

A. Anchor masonry veneers to wall framing with masonry-veneer anchors to comply with the following requirements:

1. Self-Drilling Screw: Use a standard drill with a variable clutch adjustment and a Pos-I-Tie® Chuck Adapter. Place the barrel end of the screw in the chuck adapter, drill through the sheathing or insulation and into the metal stud.
2. Configure ties to prevent flow of water to anchor and to transfer lateral loads without excess mechanical play or deformation.
3. Embed tie sections in masonry joints. Provide typically a minimum of 1 3/4 inches (50 mm) of air space between back of masonry veneer and face of sheathing or insulation and at no condition such as at the recessed brick veneer wall panels less than ¾” inch of air space between back of masonry veneer and face of sheathing or insulation
4. Locate anchor sections to allow maximum vertical differential movement of ties up and down.
5. Space anchors as indicated, but not less than 16 inches (458 mm) o.c. vertically and 16 inches (610 mm) o.c. horizontally, with not less than 1 anchor for each 2 sq. ft. (0.2 sq. m) of wall area. Install anchors typically 8” from bottom and top of veneer but not more than 12” from bottom and top of veneer when anchors are being located to avoid flashing or at other non-typical conditions.

3.9 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form expansion joints in brick made from clay or shale as follows:

1. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch (10 mm) for installation of sealant and backer rod specified in Division 07 Section "Joint Sealants."

3.10 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels where shown and where openings of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches (200 mm) at each jamb, unless otherwise indicated.

3.11 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Install flashing as follows, unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. **At masonry-veneer walls, extend flashing through veneer, across air space behind veneer, and up face of insulation board at least 8 inches (200 mm); with upper edge anchored with termination bar with fasteners to each metal stud and with upper edge taped with tape lapping over board insulation, termination bar, and flashing as detailed on drawings.**
3. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches (38 mm) or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 07 Section "Joint Sealants" for application indicated.
5. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.

C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.

D. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep product to form weep holes.

2. Space weep holes 24 inches (600 mm) o.c., unless otherwise indicated.
3. Cut rope weeps with face of brick after masonry is cleaned and architect has observed their installation.

3.12 FIELD QUALITY CONTROL

A. Inspectors: Owner will engage qualified independent inspectors to perform inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform inspections.

1. Place grout only after inspectors have verified compliance of clean grout spaces and grades, sizes, and locations of reinforcement.

B. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:

1. Payment for these services will be made by Owner.
2. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

C. Testing Frequency: One set of tests for each 5000 sq. ft. (465 sq. m) of wall area or portion thereof.

D. Concrete Masonry Unit Test: For each type of unit provided, per ASTM C 140.

E. Mortar Test (Property Specification): For each mix provided, per ASTM C 780. Test mortar for compressive strength.

F. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

G. Prism Test: For each type of construction provided, per ASTM C 1314 at 7 days and at 28 days.

3.13 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean stone trim to comply with stone supplier's written instructions.

3.14 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 1 1/2 inches (100 mm) in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 31 Section "Earth Moving."
3. Do not dispose of masonry waste as fill within 18 inches (450 mm) of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 051200 - STRUCTURAL STEEL FRAMING

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. Structural steel.
2. Shear stud connectors.
3. Shrinkage-resistant grout.

B. Related Requirements:

1. Section 051213 "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.
2. Section 053100 "Steel Decking" for field installation of shear stud connectors through deck.
3. Section 055000 "Metal Fabrications" for miscellaneous steel fabrications and other steel items not defined as structural steel.
4. Section 099600 "High-Performance Coatings" for painting requirements.

1.3 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303 “Code of Standard Practice for Steel Buildings and Bridges”.

1.4 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Shear stud connectors.
4. Anchor rods.
5. Threaded rods.
6. Shop primer.
7. Shrinkage-resistant grout.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.

C. Delegated-Design Submittal: For structural-steel connections indicated on Drawings to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data:

1. For Fabricator, see either 1.8.A.1 or 1.8.A.2 for informational submittals needed to satisfy qualification requirements.
2. For Erector, see either 1.8.B.1 or 1.8.B.2 for informational submittals needed to satisfy qualification requirements.

B. Welding certificates, as used by either the Fabricator or the Erector.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural-steel materials, including chemical and physical properties.

E. Product Test Reports: For the following:

1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shear stud connectors.

1.8 QUALITY CONTROL

A. Fabricator Qualifications: The Fabricator must meet at least one of the two following requirements.

1. A Fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Accreditation Criteria 172). The Fabricator shall also have a minimum of 5 years of experience in fabricating structural steel like that indicated for this project (with a record of successful service performance) and sufficient capacity to fabricate the structural steel without delaying the work. Qualification requirements shall be satisfied by submittal of the following:

    a. Completed project history for Fabricator, specifically focused on projects whose structural steel is like that for this project. Project history shall include Owner and Structural Engineer (as well as primary contacts) for each project listed. This qualification requirement shall be submitted as part of the bidding process.
    b. Current AISC or IAS certification documents.

2. A Fabricator that has an established and maintained quality control program to ensure that the work is performed in accordance with the requirements in ANSI/AISC 303 “Code of Standard Practice for Steel Buildings and Bridges”, ANSI/AISC 360 “Specification for Structural Steel Buildings”, and the Contract Documents. Program shall at a minimum address inspection of the items noted in ANSI/AISC 360 N2. The Fabricator shall also have a minimum of 5 years of experience in fabricating structural steel like that indicated for this project (with a record of successful service performance) and sufficient capacity to fabricate the structural steel without delaying the work. Qualification requirements shall be satisfied by submittal of the following:

    a. Completed project history for Fabricator, specifically focused on projects whose structural steel is like that for this project. Project history shall include Owner and Structural Engineer (as well as primary contacts) for each project listed. This qualification requirement shall be submitted as part of the bidding process.
    b. A written quality control manual that shall include (at a minimum) procedures for material control, inspection, and non-conformances.
    c. Quality Control Inspector (QCI) qualifications.

B. Erector Qualifications: The Erector must meet at least one of the two following requirements.

1. An Erector who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE. The Erector shall also have a minimum of 5 years of experience in erecting structural steel like that indicated for this project (with a record of successful service performance) and sufficient capacity to erect the structural

steel without delaying the work. Qualification requirements shall be satisfied by submittal of the following:

a. Completed project history for Erector, specifically focused on projects whose structural steel is like that for this project. Project history shall include Owner and Structural Engineer (as well as primary contacts) for each project listed. This qualification requirement shall be submitted as part of the bidding process.
b. Current AISC certification documents.

2. An Erector that has an established and maintained quality control program to ensure that the work is performed in accordance with the requirements in ANSI/AISC 303 “Code of Standard Practice for Steel Buildings and Bridges”, ANSI/AISC 360 “Specification for Structural Steel Buildings”, and the Contract Documents. Program shall at a minimum address inspection of the items noted in ANSI/AISC 360 N2. The Erector shall also have a minimum of 5 years of experience in erecting structural steel like that indicated for this project (with a record of successful service performance) and sufficient capacity to erect the structural steel without delaying the work. Qualification requirements shall be satisfied by submittal of the following:

a. Completed project history for Erector, specifically focused on projects whose structural steel is like that for this project. Project history shall include Owner and Structural Engineer (as well as primary contacts) for each project listed. This qualification requirement shall be submitted as part of the bidding process.
b. A written quality control manual that shall include (at a minimum) procedures for material control, inspection, and non-conformances.
c. Quality Control Inspector (QCI) qualifications.

C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and re-lubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303 “Code of Standard Practice for Steel Buildings and Bridges”.
2. ANSI/AISC 360 “Specification for Structural Steel Buildings”.
3. RCSC's "Specification for Structural Joints Using High-Strength Bolts".

B. Connection Design Information:

1. Design connections and final configuration of member reinforcement at connections in accordance with ANSI/AISC 303 by fabricator's qualified professional engineer.

a. Use Load and Resistance Factor Design; data are given at factored-load level.

C. Moment Connections: Type PR, partially restrained.

D. Construction: As indicated.

2.2 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A992/A992M.

B. Channels, Angles: ASTM A36/A36M.

C. Plate and Bar: ASTM A36/A36M, and ASTM A572/A572M, Grade 50 as indicated.

D. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade B structural tubing.

E. Steel Pipe: ASTM A500/A500M, Grade B.

1. Weight Class: Standard, or as indicated.
2. Finish: Black except where indicated to be galvanized.

F. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.

B. High-Strength A490 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A490, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.

C. Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

2.4 RODS

A. Unheaded Anchor Rods: ASTM F1554, Grade 36, or Grades 55 and 105 as indicated on the Drawings.

1. Configuration: Straight.
2. Nuts: ASTM A563 heavy-hex carbon steel.
3. Plate Washers: ASTM A36/A36M carbon steel.
4. Washers: ASTM F436, Type 1, hardened carbon steel.
5. Finish: Hot-dip zinc coating, ASTM A153/A153M, Class C.

B. Headed Anchor Rods: ASTM F1554, Grade 36, or Grades 55 and 105 as indicated on the Drawings.

1. Configuration: Straight.
2. Nuts: ASTM A563 heavy-hex carbon steel.
3. Plate Washers: ASTM A36/A36M carbon steel.
4. Washers: ASTM F436, Type 1, hardened carbon steel.
5. Finish: Hot-dip zinc coating, ASTM A153/A153M, Class C.

C. Threaded Rods: ASTM A36/A36M.

1. Nuts: ASTM A 63 heavy-hex carbon steel.
2. Washers: ASTM F436, Type 1, hardened carbon steel.
3. Finish: Hot-dip zinc coating, ASTM A153/A153M, Class C.

2.5 PRIMER

A. Steel Primer:

1. Fabricator's standard lead- and chromate-free, non-asphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

B. Galvanized-Steel Primer: MPI#134.

1. Etching Cleaner: MPI#25, for galvanized steel.
2. Galvanizing Repair Paint: ASTM A780/A780M.

2.6 SHRINKAGE-RESISTANT GROUT

A. Non-metallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, non-metallic aggregate grout, non-corrosive and non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

2.7 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 1.

F. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using automatic end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural-steel frame. Straighten as required to provide uniform, square, and true members in completed wall framing. Build up welded framing, weld exposed joints continuously, and grind smooth.

H. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

I. Inspection Requirements: Quality control inspection tasks shall be performed by the Fabricator’s QCI in accordance with ANSI/AISC 360 N5.4 (Inspection of Welding), N5.6 (Inspection of High-Strength Bolting), and N5.7 (Inspection of Galvanized Structural Steel Main Members). Tasks in Tables N5.4-1 through N5.4-3 and Tables N5.6-1 through N5.6-3 listed for quality control (QC) are those inspections performed by the QCI(s) to ensure that the work is performed in accordance with the Contract Documents.

1. Non-destructive testing (NDT) of welded joints provided during fabrication shall be performed by either an independent and qualified testing agency or the qualified QCI(s). All testing reports shall be submitted to the Owner for review.

    a. Conduct NDT of all welded joints primarily supporting gravity loads (i.e. cantilevers). Reduction in the rate of NDT per N5.5e is prohibited.
    b. For Risk Category II structures, conduct NDT of 10% of remaining CJP groove welds for materials 5/16" thick and greater per ANSI/AISC 360 N5.5b.
    c. For Risk Category III and IV structures, conduct NDT of all remaining CJP groove welds for materials 5/16" thick and greater per ANSI/AISC 360 N5.5b.
    d. Conduct NDT of all welded joints subject to fatigue, where required by ANSI/AISC 360 Appendix 3, Table A-3.1. Reduction in the rate of NDT per N5.5e is prohibited.

J. Special Inspections: Where special inspections are required by the Contract Documents, the Owner will engage the Special Inspector to perform an audit of the fabrication and quality control practices employed by the Fabricator. Where the Fabricator is qualified through the option noted in 1.8.A.1, the requirement for this audit during fabrication shall be waived.

1. The Fabricator shall meet all requirements of ANSI/AISC 303 8.5 to accommodate an audit of the fabrication shop.
2. Prior to the commencement of fabrication, the Special Inspector shall submit to the Owner for review a written plan identifying the frequency and extent of visits to the fabrication shop.
3. At a minimum, the audit by the Special Inspector shall include review of the following:

    a. The Fabricator's quality control manual and procedures for material control, inspection, and non-conformances.
    b. Material test reports for all members, fasteners, and consumables.
    c. The steel fabrication process including member fit-up, material selection, welding procedures and personnel, etc. Records need to be maintained for all material sources, members using the noted materials, consumables used, welder(s) employed, dates of completion, and when the QCI completed the inspection.
    d. Inspections representing a sampling of the before, during, and after QA tasks noted in ANSI/AISC 360 N5.5, N5.6, and N5.8.

K. At the completion of fabrication, the Fabricator shall submit a certificate of compliance to the Owner stating that the materials supplied and work performed by the Fabricator are in accordance with the Contract Documents. All testing/inspection reports generated as part of 2.7.I or 2.7.J shall also be submitted for review at the completion of fabrication.

2.8 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

2.9 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.

1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize items as indicated on the Drawings.

2.10 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.

B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:

1. SSPC-SP 3, typical.
2. SSPC-SP 6, as noted on the structural drawings for removal of corrosion at existing members.

C. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.

1. Do not remove temporary shoring supporting composite deck construction and structural-steel framing until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Base Plates, Bearing Plates, and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Inspection Requirements: Quality control inspection tasks shall be performed by the Erector's QCI in accordance with ANSI/AISC 360 N5.4 (Inspection of Welding), N5.6 (Inspection of High-Strength Bolting), and N5.7 (Inspection of Galvanized Structural Steel Main Members). Tasks in Tables N5.4-1 through N5.4-3 and Tables N5.6-1 through N5.6-3 listed for quality control (QC) are those inspections performed by the QCI(s) to ensure that the work is performed in accordance with the Contract Documents.

1. Non-destructive testing (NDT) of welded joints provided during erection shall be performed by an independent and qualified testing agency (see 3.3.J). All testing reports shall be submitted to the Owner for review.

    a. Conduct NDT of all welded joints primarily supporting gravity loads (i.e. cantilevers). Reduction in the rate of NDT per N5.5e is prohibited.
    b. For Risk Category II structures, conduct NDT of 10% of remaining CJP groove welds for materials 5/16" thick and greater per ANSI/AISC 360 N5.5b.
    c. For Risk Category III and IV structures, conduct NDT of all remaining CJP groove welds for materials 5/16" thick and greater per ANSI/AISC 360 N5.5b.
    d. Conduct NDT of all welded joints subject to fatigue, where required by ANSI/AISC 360 Appendix 3, Table A-3.1. Reduction in the rate of NDT per N5.5e is prohibited.

I. Special Inspections: Where special inspections are required by the Contract Documents, the Owner will engage a Special Inspector to perform the tasks noted in the Statement of Special Inspections during erection. These inspections shall be considered to satisfy the quality assurance requirements of ANSI/AISC 360 Chapter N.

J. Testing Agency: The Owner will engage an independent and qualified testing agency to perform tests and inspections.

1. Bolted Connections: Inspect and test bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts".
2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M. Non-destructive testing (NDT) methods (as required) are as follows:

    a. Liquid Penetrant Inspection: ASTM E165/E165M.
    b. Magnetic Particle Inspection: ASTM E709, performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not acceptable.
    c. Ultrasonic Inspection: ASTM E164.
    d. Radiographic Inspection: ASTM E94/E94M.

K. At the completion of erection, the approved Erector shall submit a certificate of compliance to the Owner stating that the materials supplied and work performed by the Erector are in accordance with the Contract Documents.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

3.5 PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

END OF SECTION 051200

SECTION 053100 - STEEL DECKING

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. Roof deck.
2. Composite floor deck.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated mechanical fasteners.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

C. Recycled Content of Steel Products: Post-consumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.

2.2 ROOF DECK

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Canam Steel Corporation; Canam Group, Inc.
2. Cordeck.
3. DACS, Inc.
4. Epic Metals Corporation.
5. Marlyn Steel Decks, Inc.
6. New Millennium Building Systems, LLC.
7. Nucor Corp.
8. Roof Deck, Inc.
9. Valley Joist.

B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, G60 zinc coating.
2. Deck Profile: As indicated.
3. Profile Depth: As indicated.
4. Design Uncoated-Steel Thickness: As indicated.
5. Span Condition: As indicated.
6. Side Laps: Overlapped or interlocking seam at Contractor's option.

2.3 COMPOSITE FLOOR DECK

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Canam Steel Corporation; Canam Group, Inc.
2. Cordeck.
3. DACS, Inc.
4. Epic Metals Corporation.
5. Marlyn Steel Decks, Inc.
6. New Millennium Building Systems, LLC.
7. Nucor Corp.
8. Roof Deck, Inc.

B. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:

1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 50, G60 zinc coating.
2. Profile Depth: As indicated.
3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: As indicated.

2.4 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0747 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

I. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

J. Galvanizing Repair Paint: ASTM A780/A780M.

K. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF DECK INSTALLATION

A. Fasten roof deck panels to steel supporting members as indicated.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports as indicated.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum or butted at Contractor's option.

D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and mechanically fasten.

E. Miscellaneous Roof Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof deck panels unless otherwise indicated.

F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FLOOR DECK INSTALLATION

A. Fasten floor deck panels to steel supporting members as indicated.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports as indicated.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped or butted at Contractor's option.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

E. Floor Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field welds will be subject to inspection.

C. Prepare test and inspection reports.

3.6 PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

END OF SECTION 053100

SECTION 055000 - METAL FABRICATIONS

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. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Loose Steel Lintels.
4. Metal downspout boots.

B. Products furnished, but not installed, under this Section:

1. Loose steel lintels.
2. Anchor bolts to be cast into concrete or built into unit masonry.
3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" for installing anchor bolts, and other items cast into concrete.
2. Division 04 Section "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
3. Division 05 Section "Structural Steel Framing."

1.3 SUBMITTALS

A. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

B. Product Data: For the following:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Paint products.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.6 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including 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.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.

D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

E. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

F. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

G. Steel Tubing: ASTM A 500, cold-formed steel tubing.

H. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.

I. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Material: Galvanized steel, ASTM A 653/A 653M.

J. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 or Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening aluminum.
2. Provide stainless-steel fasteners for fastening stainless steel.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3 (ASTM A 325M, Type 3); with hex nuts, ASTM A 563, Grade C3 (ASTM A 563M, Class 8S3); and, where indicated, flat washers.

D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593 (ASTM F 738M); with hex nuts, ASTM F 594 (ASTM F 836M); and, where indicated, flat washers; Alloy Group 1 (A1).

E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Eyebolts: ASTM A 489.

G. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

H. Lag Screws: ASME B18.2.1 (ASME B18.2.3.8M).

I. Wood Screws: Flat head, ASME B18.6.1.

J. Plain Washers: Round, ASME B18.22.1 (ASME B18.22M).

K. Lock Washers: Helical, spring type, ASME B18.21.1 (ASME B18.21.2M).

L. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

M. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

N. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

O. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches (41 by 22 mm) by length indicated with anchor straps or studs not less than 3 inches (75 mm) long at not more than 8 inches (200 mm) o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

E. Concrete: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.

2.7 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and bent plate shapes of size indicated for openings and recesses in veneer as indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches (200 mm) unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

D. Field paint bottom of lintels to match adjacent CMU block. Color to be selected by architect from full range of Sherwin Williams colors.

2.8 METAL DOWNSPOUT BOOTS

A. Provide downspout boots made from cast iron in heights indicated with inlets of size and shape to suit downspouts. Provide units with flanges and holes for countersunk anchor bolts.

1. Outlet: Vertical, to discharge into pipe

B. Prime cast iron downspout boots with zinc-rich primer.

C. Match existing downspout boots installed on adjacent building.

2.9 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.10 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be galvanized.

1. Shop prime with universal shop primer unless indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Other Items: SSPC-SP 3, "Power Tool Cleaning."

D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

SECTION 055113 - METAL PAN STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes Interior and Exterior:

1. Preassembled steel stairs with **concrete-filled** treads.
2. **Steel tube** railings and guards attached to metal stairs.
3. **Steel tube** handrails attached to walls adjacent to metal stairs.
4. Railing gates at the level of exit discharge.

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for metal stairs**, railings, and guards**.

1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, **blocking for attachment of wall-mounted handrails,** and items with integral anchors, that are to be embedded in concrete or masonry.
2. Deliver such items to Project site in time for installation.

C. Coordinate locations of hanger rods and struts with other work so they do not encroach on required stair width and are within fire-resistance-rated stair enclosure.

D. Schedule installation of railings and guards so wall attachments are made only to completed walls.

1. Do not support railings and guards temporarily by any means that do not satisfy structural performance requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For metal pan stairs and the following:
1. All Products

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
3. Include plan at each level.

4. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails.

C. Delegated Design Submittal: For stairs, **railings and guards,** including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer's experience with providing delegated design engineering services of the kind indicated, including documentation that engineer is licensed in the **jurisdiction** in which Project is located.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification.

1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
2. Protect steel members and packaged materials from corrosion and deterioration.
3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.

a. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stairs, **railings and guards,**, including attachment to building construction.

B. Structural Performance of Stairs: Metal stairs withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Uniform Load: 100 lbf/sq. ft. (4.79 kN/sq. m).
2. Concentrated Load: 300 lbf (1.33 kN) applied on an area of 4 sq. in. (2580 sq. mm).
3. Uniform and concentrated loads need not be assumed to act concurrently.
4. Stair Framing: Capable of withstanding stresses resulting from railing and guard loads in addition to loads specified above.
5. Limit deflection of treads, platforms, and framing members to **L/360** or 1/4 inch (6.4 mm), whichever is less.

C. Structural Performance of Railings and Guards: Railings and guards, including attachment to building construction, withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
b. Infill load and other loads need not be assumed to act concurrently.

3. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

2.2 METALS

A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.

C. Steel Tubing for Railings and Guards: **ASTM A500/A500M (cold formed) or ASTM A513/A513M**.
1. Provide galvanized finish for exterior installations and where indicated.

D. Uncoated, Cold-Rolled Steel Sheet: ASTM A1008/A1008M, structural steel, Grade 25 (Grade 170), unless another grade is required by design loads; exposed.

E. Galvanized Steel Sheet: ASTM A653/A653M, G90 (Z275) coating, structural steel, Grade 33 (Grade 230), unless another grade is required by design loads.

2.3 ABRASIVE NOSINGS

A. Extruded Units: Aluminum units with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.

a. Amstep Products (Basis of Design – Item 231A)
b. Balco Inc.
c. Safe-T-Metal Company, Inc.
d. Wooster Products Inc.

2. Provide ribbed units, with abrasive filler strips projecting 1/16 inch (1.5 mm) above aluminum extrusion.
3. Nosings: Square-back units, 3 inches wide, without lip.

B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

C. Apply bituminous paint to concealed surfaces of cast-metal units set into concrete.

D. Apply strontium aluminate photoluminescent strip full length of nosing to provide luminance during emergency and low light situations.

2.4 MISCELLANEOUS MATERIALS

A. Welding Electrodes: Comply with AWS requirements.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish system indicated.

D. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for [**interior**] [**exterior**] use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.
1. Nonslip-Aggregate Concrete Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and nonglazing; unaffected by freezing, moisture, or cleaning materials.
2. Plain Steel Welded-Wire Reinforcement: ASTM A1064/A10645M, **steel,** 6 by 6 inches (152 by 152 mm), W1.4 by W1.4, unless otherwise indicated on Drawings.

3. Reinforcement Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening welded-wire reinforcement in place.

a. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete.

E. For galvanized reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.5 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, **railings and guards,** clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.

B. Assemble stairs**, railings, and guards** in shop to greatest extent possible.

1. Disassemble units only as necessary for shipping and handling limitations.
2. Clearly mark units for reassembly and coordinated installation.

C. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

E. Form exposed work with accurate angles and surfaces and straight edges.

F. Weld connections to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld exposed corners and seams continuously unless otherwise indicated.
5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.

1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
2. Locate joints where least conspicuous.

3. Fabricate joints that will be exposed to weather in a manner to exclude water.
4. Provide weep holes where water may accumulate internally.

2.6 FABRICATION OF STEEL-FRAMED STAIRS

A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for **Commercial** Class, unless more stringent requirements are indicated.

B. Stair Framing:

1. Stringers: Fabricate of **steel channels**.

    a. Stringer Size: **As required to comply with "Performance Requirements" Article**. See also item 6 below.
    b. Provide closures for exposed ends of channel and rectangular tube stringers.
    c. Finish: **Shop primed (Interior Stairs) Galvanized (Exterior Stairs)**.

2. Platforms: Construct of **steel channel or steel rectangular tube** headers and miscellaneous framing members as **required to comply with "Performance Requirements" Article**. See also item 6 below.

    a. Provide closures for exposed ends of channel and rectangular tube framing.
    b. Finish: **Shop primed (Interior) Galvanized (Exterior)**.

3. Weld **or bolt** stringers to headers; weld **or bolt** framing members to stringers and headers. **If using bolts, fabricate and join so bolts are not exposed on finished surfaces.**
4. Where stairs are enclosed by gypsum board assemblies, provide hanger rods or struts to support landings from floor construction above or below.

    a. Locate hanger rods and struts where they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.

5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

6. Refer to Drawings for design intent of stair framing. Notify Architect prior if shapes are not feasible for structural support of stair. If shapes are not feasible, manufacturer shall collaborate with Architect to design shapes meeting design intent.

C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.067 inch (1.7 mm).

1. Fabricate treads and landing subplatforms of exterior stairs so finished walking surfaces slope to drain.
2. Steel Sheet, Uncoated: **Cold**-rolled steel sheet **unless otherwise indicated**.
3. Galvanized Steel Sheet: Galvanized steel sheet**, at exterior stairs**.

4. Directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by concrete fill. Do not weld risers to stringers.
5. Attach abrasive nosings to risers.
6. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

2.7 FABRICATION OF STAIR RAILINGS AND GUARDS

A. Fabricate railings and guards to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of member, post spacings, wall bracket spacing, and anchorage, but not less than that needed to withstand indicated loads. Refer to Drawings for stairs which have wood handrails in lieu of metal.

1. Rails and Posts: **1-5/8-inch- (41-mm-) diameter** top and bottom rails and 1-1/2-inch- (38-mm-) round posts.
2. Picket Infill: **1/2-inch- (13-mm) round** pickets spaced to prohibit the passage of a 4-inch (100-mm) diameter sphere.
3. Gates: Form gates from steel tube of same size and shape as top rails, with infill to match guards. Provide with **cam-type, self-closing spring** hinges for fastening to wall and overlapping stop with rubber bumper to prevent gate from opening in direction opposite egress.

B. Welded Connections: Fabricate railings and guards with welded connections.

1. Fabricate connections that are exposed to weather in a manner that excludes water.

    a. Provide weep holes where water may accumulate internally.

2. Cope components at connections to provide close fit, or use fittings designed for this purpose.
3. Weld all around at connections, including at fittings.
4. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
5. Obtain fusion without undercut or overlap.
6. Remove flux immediately.

C. Form changes in direction of railings and guards as follows:
1. By bending

D. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

E. Close exposed ends of railing and guard members with prefabricated end fittings.

F. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.

1. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

G. Connect posts to stair framing by direct welding unless otherwise indicated.

H. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.

1. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
2. (Exterior) For galvanized railings and guards, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous-metal components.
3. (Interior) For nongalvanized railings and guards, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
4. Provide type of bracket **with flange tapped for concealed anchorage to threaded hanger bolt** and that provides 1-1/2-inch (38-mm) clearance from inside face of handrail to finished wall surface.

I. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports.

1. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.8 FINISHES

A. Finish metal stairs after assembly.

B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
1. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

C. Preparation for Shop Priming: Prepare uncoated, ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

D. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.

1. For wall-mounted railings, verify locations of concealed reinforcement within gypsum board and plaster assemblies.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF METAL PAN STAIRS

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.

1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.

1. Grouted Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates.

a. Clean bottom surface of plates.
b. Set plates for structural members on wedges, shims, or setting nuts.
c. Tighten anchor bolts after supported members have been positioned and plumbed.
d. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
e. Promptly pack grout solidly between bearing surfaces and plates so no voids remain.

1) Neatly finish exposed surfaces; protect grout and allow to cure.
2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Fit exposed connections accurately together to form hairline joints.

1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
2. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
3. Comply with requirements for welding in "Fabrication, General" Article.

F. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."

1. Install abrasive nosings with anchors fully embedded in concrete.
2. Center nosings on tread width.

G. Install precast concrete treads with adhesive supplied by manufacturer.

H. Install precast terrazzo treads according to manufacturer's written instructions.

3.3 INSTALLATION OF RAILINGS AND GUARDS

A. Adjust railing and guard systems before anchoring to ensure matching alignment at abutting joints with tight, hairline joints.

1. Space posts at spacing indicated or, if not indicated, as required by design loads.
2. Plumb posts in each direction, within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
3. Align rails and guards so variations from level for horizontal members and variations from parallel with rake of stairs for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).
4. Secure posts, rail ends, and guard ends to building construction as follows:

    a. Anchor posts to steel by **welding** to steel supporting members.
    b. Anchor handrail and guard ends to concrete and masonry with steel round flanges welded to rail and guard ends and anchored with post-installed anchors and bolts.

B. Install railing gates level, plumb, and secure for full opening without interference.

1. Attach hardware using tamper-resistant or concealed means.
2. Adjust hardware for smooth operation.

C. Attach handrails to wall with wall brackets.

1. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
2. Secure wall brackets to building construction as **required to comply with performance requirements.**

3.4 REPAIR

A. Touchup Painting:

B. Repair of Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 055113

SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel pipe and tube railings.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
b. Infill load and other loads need not be assumed to act concurrently.

C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Manufacturer's product lines of mechanically connected railings.
2. Railing brackets.
3. Grout, anchoring cement, and paint products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each type of exposed finish required.

D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.5 COORDINATION AND SCHEDULING

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorages for railings. 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.

Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Steel Pipe and Tube Railings:

a. Pisor Industries, Inc.
b. Wagner, R & B, Inc.; a division of the Wagner Companies.
c. Approved Equal

2.2 METALS, GENERAL

A. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.3 STEEL AND IRON

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Tubing: ASTM A 500 (cold formed).

C. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.

D. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.4 MISCELLANEOUS MATERIALS

A. Fasteners: Provide the following:

1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5 for zinc coating.
2. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating.

B. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

E. Shop Primers: Provide primers that comply with Division 09 painting Sections and Division 09 Section "High-Performance Coatings."

F. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION

A. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

B. Form work true to line and level with accurate angles and surfaces.

C. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

D. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.

E. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

F. Form changes in direction by bending.

G. Bend members in jigs to produce uniform curvature without buckling or otherwise deforming exposed surfaces.

H. Close exposed ends of railing members with prefabricated end fittings.

I. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.

J. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers to transfer loads through wall finishes.

2.6 STEEL AND IRON FINISHES

A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

B. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Do not apply primer to galvanized surfaces.

C. High-Performance Coating: Comply with Division 09 painting Sections and Division 09 Section "High-Performance Coatings."

1. Color: As selected by Architect from manufacturer's full range.

D. Baked-Enamel or Powder-Coat Finish (ST02 and ST06): AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

B. Anchor posts in concrete by inserting into preset metal pipe sleeves and grouting annular space.

C. Anchor posts to metal surfaces with oval flanges.

D. Anchor railing ends at walls with round flanges anchored to wall construction.

E. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces.

F. Secure wall brackets and railing end flanges to building construction as follows:
1. For steel-framed partitions, use hanger or lag bolts set into fire-retardant-treated wood backing between studs. Coordinate with stud installation to locate backing members.

3.2 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055213

SECTION 061053 - MISCELLANEOUS ROUGH CARPENTRY

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. This Section includes the following:
   1. Wood blocking nailers and furring strips.
   2. Plywood backing panels for electrical or communications panels and equipment.

1.3 DEFINITIONS

A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless otherwise specified.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

   1. NeLMA: Northeastern Lumber Manufacturers' Association.
   2. NHLA: National Hardwood Lumber Association.
   3. NLGA: National Lumber Grades Authority.
   4. SPIB: The Southern Pine Inspection Bureau.
   5. WCLIB: West Coast Lumber Inspection Bureau.
   6. WWPA: Western Wood Products Association.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

B. Deliver interior wood materials tow which finished carpentry is anchored only after building is enclosed and weatherproof, wet work other than painting is dry, and HVAC system is operating and maintaining temperature and humidity at occupancy levels.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA C2, except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX)].

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat the following miscellaneous rough carpentry:

1. Wood nailers, curbs, blocking, and similar members in connection with roofing and flashing.

2. Wood nailers, and blocking in exterior cavity walls and installed for anchorage of exterior windows and doors.

2.3 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 15 percent maximum moisture content and any of the following species:

1. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. For exposed boards, provide lumber with 15 percent maximum moisture content.

1. Mixed southern pine, No. 1 grade; SPIB.

D. For concealed boards, provide lumber with 19 percent maximum moisture for lumber not to receive wood preservative treatment

1. Mixed southern pine, No. 2 grade; SPIB.

E. For blocking not used for attachment of other construction Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

F. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

G. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.4 PLYWOOD BACKING PANELS

A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel or hot-dip zinc coating per ASTM A 153.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

G. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers.

2.6 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Self-adhesive, rubberized-asphalt compound, bonded to a high-density, polyethylene film to produce an overall thickness of not less than 0.025 inch (0.6 mm).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

C. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

D. Metal Framing Anchors: Install metal framing to comply with manufacturer's written instructions.

E. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

F. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

H. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

I. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

3.3 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061053

SECTION 061600 – SHEATHING

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. Parapet Sheathing (cementitious backer board)

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
   3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
   4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

   1. Wood-preservative-treated plywood.
   2. Fire-retardant-treated plywood.
   3. Foam-plastic sheathing.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that

periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: As tested according to ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 WALL SHEATHING

A. Glass-Mat Gypsum Sheathing: ASTM C 1177/1177M.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Georgia-Pacific Gypsum; "DensGlass Sheathing" or a comparable product by one of the following:
a. CertainTeed Corp.
b. National Gypsum Company.
c. USG Corporation.
2. Type and Thickness: Regular, 5/8 inch thick.
3. Size: As recommended by the manufacturer for the application indicated in the Drawings.

2.3 PARAPET SHEATHING

A. Cementitious Backer Units, Parapets: ASTM C1325, Type A.
1. Thickness: 5/8 inch (15.9 mm) and as indicated on the Drawings.
2. Size: As recommended by the manufacturer for the application indicated in the Drawings.

2.4 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For wall and parapet sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

2. For wall sheathing and parapet, provide fasteners with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

B. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached.

1. For steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C 1002.
2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.

2.5 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

2.6 MISCELLANEOUS MATERIALS

1. Adhesives shall have a VOC content of 50 g/L or less.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.9.1, "Fastening Schedule," in the ICC's International Building Code.

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.
   1. Fasten gypsum sheathing to cold-formed metal framing with screws.
   2. Install panels with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
   3. Install panels with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.

   1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of panels.
   2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

D. Seal sheathing joints according to sheathing manufacturer's written instructions.

   1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
   2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3.3 INSTALLATION OF CEMENTITIOUS BACKER UNITS

A. Install panels and treat joints in accordance with ANSI A108.11 and manufacturer's written instructions for type of application indicated.

END OF SECTION 061600

SECTION 071113 - BITUMINOUS DAMPPROOFING

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 SUMMARY

A. This Section includes cold-applied, emulsified- asphalt dampproofing applied to the following surfaces:

1. Back side of brick parapet walls where new roofing is being installed.
2. Where indicated on the Drawings.

B. Related Sections include Division 7 Section "Self Adhering Sheet Waterproofing" for waterproofing.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.

B. Material Certificates: For each product, signed by manufacturers.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

1.5 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit asphalt dampproofing to be performed according to manufacturers' written instructions.

B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has thoroughly cured.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cold-Applied, Emulsified-Asphalt Dampproofing:

a. Euclid Chemical Company (The).
b. Karnak Corporation.
c. Koppers Industries, Inc.
d. Meadows, W. R., Inc.
e. Sonneborn, Div. of ChemRex, Inc.

2. Protection Course, Asphalt-Board Type:

a. Grace, W. R. & Co.; Construction Products Div.
b. Meadows, W. R., Inc.
c. Sonneborn, Div. of ChemRex, Inc.

2.2 BITUMINOUS DAMPPROOFING

A. Cold-Applied, Emulsified-Asphalt Dampproofing:

1. Trowel Coats: ASTM D 1227, Type II, Class 1.
2. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
3. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

2.3 MISCELLANEOUS MATERIALS

A. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended by manufacturer.

B. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.

C. Protection Course, Asphalt-Board Type: Premolded, 1/8-inch- (3-mm-) thick, multi-ply, semirigid board consisting of a mineral-stabilized asphalt core sandwiched between layers of asphalt-saturated felt, and faced on 1 side with polyethylene film.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Applicator present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.

1. Begin dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protection of Other Work: Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

B. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

3.3 APPLICATION, GENERAL

A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.

1. Apply additional coats if recommended by manufacturer or required to achieve coverages indicated.
2. Allow each coat of dampproofing to cure 24 hours before applying subsequent coats.

B. Apply dampproofing below grade to back side of concrete retaining walls, under deck slab on grade, where exterior grade is lower than deck slab on grade.

1. Apply from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches (150 mm) over outside face of footing.
2. Extend 12 inches (300 mm) onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
3. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch- (200-mm-) wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat required for embedding fabric is in addition to other coats required.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

A. On Backs of Concrete Retaining Walls: Apply one brush or spray coat at not less than 1.25 gal./100 sq. ft. (0.5 L/sq. m).

3.5 INSTALLATION OF PROTECTION COURSE OVER BELOW GRADE DAMPROOFING

A. Install protection course over completed-and-cured damp proofing below grade. Comply with dampproofing material manufacturer's written recommendations for attaching protection course. Support protection course with spot application of trowel-grade mastic where not otherwise indicated.

3.6 CLEANING

A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

END OF SECTION ~~071150~~ ***071113***

OSE COMMENT REVISION

SECTION 071326 - SELF-ADHERING SHEET WATERPROOFING

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. Modified bituminous sheet waterproofing.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

1. Include setting drawings showing layout, sizes, sections, profiles, and joint details of pedestal-supported concrete pavers.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard materials-only warranty in which manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty Period: **Ten** years from date of Substantial Completion.

B. Installer's Special Warranty: Specified form, on warranty form at end of this Section, signed by Installer, covering Work of this Section, for warranty period of two years.

1. Warranty includes removing and reinstalling protection board, drainage panels, and, insulation.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials, protection course, and molded-sheet drainage panels from single source from single manufacturer.

2.2 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet: Minimum 60-mil (1.5-mm) nominal thickness, self-adhering sheet consisting of 56 mils (1.4 mm) of rubberized asphalt laminated on one side to a 4-mil- (0.10-mm-) thick, polyethylene-film reinforcement, and with release liner on adhesive side; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.

1. Products: Subject to compliance with requirements, provide the following:
   a. Carlisle Coatings & Waterproofing Inc.; CCW MiraDRI 860/861.
   b. Meadows, W. R., Inc.; SealTight Mel-Rol.
   c. Nervastral, Inc.; BITU-MEM.
   d. Tamko Building Products, Inc.; TW-60.

2. Physical Properties:

   a. Tensile Strength, Membrane: 325 psi minimum; ASTM D 412.
   b. Ultimate Elongation: 300 percent minimum; ASTM D 412.
   c. Low-Temperature Flexibility: Pass at minus 20 deg F (minus 29 deg C); ASTM D 1970.
   d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch (3-mm) movement; ASTM C 836.
   e. Puncture Resistance: 40 lbf (180 N) minimum; ASTM E 154.
   f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F (21 deg C); ASTM D 570.
   g. Water Vapor Permeance: 0.05 perms (2.9 ng/Pa x s x sq. m) maximum; ASTM E 96/E 96M, Water Method.
   h. Hydrostatic-Head Resistance: 200 feet (60 m) minimum; ASTM D 5385.

3. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

2.3 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

   1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne primer recommended for substrate by sheet-waterproofing material manufacturer.

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.

D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.

E. Substrate Patching Membrane: Low-viscosity, two-component, modified asphalt coating.

F. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick, predrilled at 9-inch (229-mm) centers.

G. Protection Course: ASTM D 6506, semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:

1. Thickness: 1/4 inch (6 mm), nominal.
2. Adhesive: Rubber-based solvent type recommended by waterproofing manufacturer for protection course type.

2.4 MOLDED-SHEET DRAINAGE PANELS

A. Molded-Sheet Drainage Panel: Comply with Section 334600 "Subdrainage."

B. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21-mm) sieve laminated to one side of the core; and with a vertical flow rate of 9 to 15 gpm per ft. (112 to 188 L/min. per m).

1. Products: Subject to compliance with requirements, provide one of the following:

a. American Hydrotech, Inc.;
b. Carlisle Coatings & Waterproofing Inc.; CCW MiraDRAIN 6200
c. Protecto Wrap Company; Protecto Drain 2000-V.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the waterproofing.

1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
3. Verify that compacted subgrade is dry, smooth, sound, and ready to receive waterproofing sheet.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing 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. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Install sheet strips of width according to manufacturer's written instructions and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch (1.6 mm)

F. Bridge and cover discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips of widths according to manufacturer's written instructions.

1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.

G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

1. Install membrane strips centered over vertical inside corners. Install 3/4-inch (19-mm) fillets of liquid membrane on horizontal inside corners and as follows:

a. At footing-to-wall intersections, extend liquid membrane in each direction from corner or install membrane strip centered over corner.
b. At plaza-deck-to-wall intersections, extend liquid membrane or sheet strips onto deck waterproofing and to finished height of sheet flashing.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.3 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- (64-mm-) minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.

1. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and plus 5 deg C), install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F (16 deg C).

D. Two-Ply Application: Install sheets to form a membrane with lap widths not less than 50 percent of sheet widths, to provide a minimum of two thicknesses of sheet membrane over areas to receive waterproofing.

E. Horizontal Application: Apply sheets from low to high points of decks to ensure that laps shed water.

F. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.

G. Seal edges of sheet-waterproofing terminations with mastic.

H. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.

I. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches (150 mm) beyond repaired areas in all directions.

J. Immediately install protection course with butted joints over waterproofing membrane.

1. Molded-sheet drainage panels may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer and installed immediately.

3.4 MOLDED-SHEET DRAINAGE-PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives or other methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

1. For vertical applications, install protection course before installing drainage panels.

3.5 FIELD QUALITY CONTROL

A. Engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish daily reports to Architect.

B. Prepare test and inspection reports.

3.6 PROTECTION, REPAIR, AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Protect installed work from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

D. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

E. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071326

SECTION 071616 - CRYSTALLINE WATERPROOFING

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. This Section includes crystalline waterproofing on slabs of elevator pits as described in the Drawings.

B. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete" for formwork, waterstops,[concrete slabs serving as floor toppings to protect waterproofing,] and finishing concrete walls and slabs to receive waterproofing.
2. Division 07 Section "Joint Sealants" for elastomeric and preformed sealants in concrete and masonry walls and floors.

1.3 SUBMITTALS

A. Product Data: Include material descriptions and installation instructions for crystalline waterproofing.

B. Product Certificates: For crystalline waterproofing, signed by product manufacturer.

C. Qualification Data: For Installer and manufacturer.

D. Material Test Reports: For crystalline waterproofing, from independent testing laboratory, demonstrating that the waterproofing system complies with requirements of this Section.

E. Manufacturer's inspection reports of completed installation.

F. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. ISO 9001 certified.
2. Having at least 25 years experience in the manufacture of cementitious crystalline waterproofing materials.

B. Installer Qualifications: An employer of workers trained and approved by manufacturer.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to crystalline waterproofing including, but not limited to, the following:

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. Review required certifying procedures.

1.5 PROJECT CONDITIONS

A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit crystalline waterproofing to be performed according to manufacturer's written instructions and warranty requirements.

B. Proceed with waterproofing work only after pipe sleeves, vents, curbs, inserts, drains, and other projections through the substrate to be waterproofed have been completed. Proceed only after concrete and masonry substrate defects, including honeycombs, voids, and cracks, have been repaired to provide a sound substrate free of forming materials, including reveal inserts.

C. Ambient Conditions: Proceed with waterproofing work only if temperature is maintained at 40 deg F or above during work and cure period, and space is well ventilated and kept free of water.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which Installer agrees to repair or replace components of crystalline waterproofing that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to maintain watertight conditions within specified warranty period.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

B. Products: Subject to compliance with requirements, provide one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide the specified product made by Xypex Chemical Corporation, or a comparable product by one of the other manufacturers listed:

1. Crystalline Waterproofing: Basis-of-Design Product: Xypex Chemical Corporation.

   a. Xypex Chemical Corporation; Xypex Concentrate.

   b. W.R. Meadows: CEM-KOTE CW PLUS.
   c. Euclid Chemical: HEY'DI K-11.

2. Plugging and Patching for Leak Repair: Basis-of-Design Product: Xypex Chemical Corporation

   a. Xypex Chemical Corporation; Patch 'n Plug

   b. W.R. Meadows: patching: 820 Rapid-Set, plugging: Meadow-Patch 5
   c. Euclid Chemical: Speed Crete Red Line.

2.2 MATERIALS

A. Crystalline Waterproofing: A prepackaged, proprietary blend of portland cement, specially treated sand, and active chemicals that, when mixed with water and applied, penetrates by capillary action into concrete or masonry and reacts chemically with free lime in the presence of water to develop crystalline growth within concrete or masonry capillaries to produce an impervious, dense, waterproof concrete or masonry with properties meeting or exceeding the following criteria:

1. Permeability: 0 for water at 405 feet when tested according to CE CRD-C 48.
2. Compressive Strength: 3000 psi when tested according to ASTM C 109/C 109M.

B. Patching Compound: Cementitious waterproofing and repair mortar for filling and patching tie holes, honeycombs, reveals, and other imperfections; with properties meeting or exceeding the following criteria:

1. Compressive Strength: 7600 psi at 28 days when tested according to ASTM C 109/C 109M.
2. Flexural Strength: 710 psi at 28 days when tested according to ASTM C 348.
3. Shrinkage: Minus 0.093 percent at 28 days and plus 0.073 percent at 90 days when tested according to ASTM C 596.

C. Plugging Compound: Cementitious compound with hydrophobic properties; resistant to water and moisture but vapor permeable for all standard applications (vertical, overhead and horizontal surfaces not exposed to vehicular traffic); with properties meeting or exceeding the following criteria:
1. Compressive Strength: 4500 psi at 28 days when tested according to ASTM C 109/C 109M.

D. Water: Potable.

2.3 PROPORTION AND DESIGN OF PROTECTIVE TOPPING MIX

A. Protective Topping: Measure, batch, and mix portland cement and sand in the proportion of 1:3 and water. Blend together with mechanical mixer to required consistency.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Acceptance of Conditions: Examine substrates, with Applicator present, where waterproofing is to be applied.

1. Proceed with application only after unsatisfactory conditions have been corrected.
2. Notify Architect in writing of active leaks or structural defects that would affect system performance.

3.2 PREPARATION

A. Protect other work from damage from cleaning, preparation, and application of crystalline waterproofing. Provide temporary enclosure to confine spraying operation and to ensure adequate ambient temperatures and ventilation conditions for application.

B. Stop active water leaks according to waterproofing manufacturer's written instructions.

C. Repair damaged or unsatisfactory concrete or masonry according to manufacturer's written instructions.

D. Surface Preparation: Comply with waterproofing manufacturer's written instructions to remove efflorescence, chalk, dust, dirt, mortar spatter, grease, oils, curing compounds, and form-release agents to ensure that waterproofing bonds to concrete or masonry surfaces.

1. Clean concrete surfaces according to ASTM D 4258.

a. Scratch- and Float-Finished Concrete: Etch with 10 percent muriatic (hydrochloric) acid solution according to ASTM D 4260 or pressure wash using 3,000 to 4,000 psi water stream.
b. Prepare smooth-formed and trowel-finished concrete by mechanical abrading or abrasive-blast cleaning according to ASTM D 4259.
c. Wood-Formed Vertical Concrete Surfaces: Pressure wash, lightly sandblast, or acid etch with muriatic (hydrochloric) acid to provide a clean, absorbent surface.

2. Concrete Joints: Clean reveals according to waterproofing manufacturer's written instructions.

3.3 APPLICATION

A. General: Comply with waterproofing manufacturer's written instructions for application.

1. Saturate concrete substrate with clean water to ensure migration of crystalline chemicals into voids and capillary tracts of concrete. Remove free surface water before application.
2. Maintain damp condition until applying waterproofing.
3. Number of Coats: Two for spray application.
4. Dampen surface between coats.

B. Final Coat Finish: Spray Textured

C. Moist-cure waterproofing for two days immediately after application has set, followed by two days of air drying as recommended in writing by manufacturer.

D. Waterproofing Treatment Extensions: Extend waterproofing treatment as follows:

1. Onto every substrate in areas indicated for treatment, including but not limited to, pits, sumps, and similar offsets and features.

3.4 PROTECTION

A. Protect applied crystalline waterproofing from rapid drying, severe weather exposure, traffic and water accumulation. Maintain completed Work in moist condition for not less than two days by procedures recommended in writing by waterproofing manufacturer. Protect waterproofing from temperatures below 36 deg F. Take measures to protect completed crystalline waterproofing coating from damage for at least 2 weeks after application.

3.5 FIELD QUALITY CONTROL

A. Inspection: Manufacturer's representative to inspect completed application and to provide a written report that application complies with manufacturer's written instructions.

END OF SECTION 071616

SECTION 072100 - THERMAL INSULATION

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. Glass-fiber blanket insulation.
   2. Mineral-wool blanket insulation.

B. Related Sections:

   1. Section 042000 "Unit Masonry" for insulation installed in cavity walls.
   2. Section 078446 "Fire-Resistive Joint Systems" for insulation installed as part of a perimeter fire-resistive joint system.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

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.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CertainTeed Corporation.
2. Johns Manville.
3. Knauf Insulation.
4. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

C. Insulation Characteristics:
1. Thickness: 3 ½" or as indicated on the Drawings
2. R-Value: Min. R-Value of 11 for 3 ½" thickness insulation.

D. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:

1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

2.2 MINERAL-WOOL BLANKET INSULATION (SOUND ATTENUATION)

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fibrex Insulations Inc.

2. Owens Corning.
3. Roxul Inc.
4. Thermafiber.

B. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 0, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

C. Basis of Design: Thermafiber Sound Attenuation Fire Blanket (SAFB).
   1) Facing: Unfaced only.
   2) Density: 2.5 pcf (nominal) for thicknesses greater than 1".

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. 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.

D. 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 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. Glass-Fiber or Mineral-Wool 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 (76-mm) 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 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

3.4 PROTECTION

A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 072600 - VAPOR RETARDERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Underslab vapor retarders.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 VAPOR RETARDERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Typical underslab vapor barrier:

a. Stego Industries, Stego Wrap, 15 mil. (Basis of Design)
b. Manufactures with products meeting the vapor barrier requirements indicated below.

2. Vapor barrier requirements:

1) Water Vapor Transmission Rate: ASTM E 96 – 0.006WVTR or lower
2) Water Vapor Barrier: ASTM E 1745 - Meets Class A (Plastics)
3) Seam Tape: ASTM E 96 – 0.3 perms or lower

2.2 ACCESSORIES

A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by insulation manufacturers for sealing joints and penetrations in vapor-retarder facings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to vapor retarders, including removing projections capable of puncturing vapor retarders.

3.2 INSTALLATION OF VAPOR RETARDERS

A. Preparation: Earth and stone substrates shall be well compacted to produce an even, solid substrate. Remove loose aggregate or sharp protrusions.

B. General: Extend vapor retarder to extremities of slab areas and turn up along edges.

C. Installation of integrally bonded vapor barrier shall be in accordance with manufacturer's instructions and ASTM E 1643–98, including but not limited to, the following:

1. Apply membrane with the HDPE film facing the prepared substrate. Remove the release liner during application.

2. Apply succeeding sheets by overlapping the previous sheet 50-mm (2 in.) along the marked lap line. End Laps should be staggered to avoid a build up of layers.

a. Taped Lap Method - Use manufacturer's recommended tape to secure and seal the overlaps. Overband the lap with tape using the lap line for alignment. Remove plastic release liner to ensure bond to concrete.

3. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor barrier with vapor-retarder tape to create an airtight seal between penetrating objects and vapor barrier. Repair any tears or punctures in vapor barriers immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor barrier.

3. Mix and apply manufacturer's recommended liquid detailing compound to seal around penetrations such as drainage pipes.

4. Coordinate concrete placement to occur within thirty days of removal of release liner.

5. Lap joints 6 inches minimum.

3.3 PROTECTION

A. Protect vapor retarders from damage until concealed by permanent construction.

END OF SECTION 072600

SECTION 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

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 fluid-applied, vapor-permeable membrane air barriers.

1.3 DEFINITIONS

A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.

B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.

C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

B. Shop Drawings: For air-barrier assemblies.

1. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
2. Include details of interfaces with other materials that form part of air barrier.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.

C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.

B. Mockups: Build mockups to set quality standards for materials and execution.

1. Build integrated mockups of exterior wall assembly as shown on Drawings, incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.

    a. Coordinate construction of mockups to permit inspection by Owner's testing agency of air barrier before external insulation and cladding are installed.
    b. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Protect stored materials from direct sunlight.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.

1. Protect substrates from environmental conditions that affect air-barrier performance.
2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

B. VOC Content: 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and complying with VOC content limits of authorities having jurisdiction.

2.2 PERFORMANCE REQUIREMENTS

A. General: Air barrier shall be capable of performing as a continuous vapor-permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 2357.

2.3 VAPOR-PERMEABLE MEMBRANE AIR-BARRIER

A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: acrylic membrane.

a. Basis of Design is Airlok Flex WG by Polyguard
b. Grace – Perm-A-Barrier VP
c. Approved Equal

2. Physical and Performance Properties:

a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
b. Vapor Permeance: Minimum 10 perms; ASTM E 96/E 96M.
c. Ultimate Elongation: Minimum 500 percent; ASTM D 412, Die C.
d. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.

2.4 ACCESSORY MATERIALS

A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier material. All products recommended by the air barrier manufacturer to provide a complete air barrier system are to be provided and isntalled whether specified or not.

B. Primer: Liquid primer recommended for substrate by air-barrier material manufacturer.

C. Counterflashing Strip: Modified bituminous, 40-mil thick, self-adhering sheet consisting of 32 mils of rubberized asphalt laminated to an 8-mil thick, cross-laminated polyethylene film with release liner backing.

D. Modified Bituminous Strip: Vapor retarding, 40 mils (1.0 mm) thick, smooth surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick polyethylene film with release liner backing.

E. Joint Reinforcing Strip: Air-barrier manufacturer's glass-fiber-mesh tape.

F. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.

G. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.

H. Sprayed Polyurethane Foam Sealant: One- or two-component, foamed-in-place, polyurethane foam sealant, 1.5- to 2.0-lb/cu. ft density; flame-spread index of 25 or less according to ASTM E 162; with primer and noncorrosive substrate cleaner recommended by foam sealant manufacturer.

I. Modified Bituminous Transition Strip: Vapor retarding, 40 mils (1.0 mm) thick, smooth surfaced, self-adhering; consisting of 36 mils (0.9 mm) of rubberized asphalt laminated to a 4-mil- (0.1-mm-) thick polyethylene film with release liner backing.

J. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 079200 "Joint Sealants."

K. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

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 JOINT TREATMENT

A. Gypsum Sheathing: Fill joints greater than 1/4 inch (6 mm) with sealant according to ASTM C 1193 and air-barrier manufacturer's written instructions. Apply first layer of fluid air-barrier material at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air-barrier material over joint reinforcing strip.

3.4 TRANSITION STRIP INSTALLATION

A. General: Install strips, transition strips, and accessory materials according to air-barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.

1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
2. Install modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches (75 mm) of coverage is achieved over each substrate.

B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.

1. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats recommended by air barrier manufacturer to achieve required bond, with adequate drying time between coats.

C. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.

E. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

F. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply modified bituminous transition strip so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.

1. Modified Bituminous Transition Strip: Roll firmly to enhance adhesion.

G. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, and doors, and miscellaneous penetrations of air-barrier material with foam sealant.

H. Seal top of through-wall flashings to air barrier with an additional 6-inch wide, modified bituminous strip.

I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.

J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.5 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. Per manufacturers recommendations, 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-Permeable Membrane Air Barrier: Total dry film thickness as recommended in writing by manufacturer to meet performance requirements, but not less than 40-mil dry film thickness, applied in two equal coats.

C. Apply strip and transition strip a minimum of 1 inch (25 mm) onto cured air-barrier material according to air-barrier manufacturer's written instructions.

D. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.

E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will 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. Tests: As determined by Owner's testing agency from among the following tests:
   1. Quantitative Air-Leakage Testing: Air-barrier assemblies will be tested for air leakage according to ASTM E 783.

D. 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.

E. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

3.7 CLEANING AND PROTECTION

A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.

1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than 30 days, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.

B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.

C. Remove masking materials after installation.

END OF SECTION 072726

SECTION 074113 - METAL ROOF PANELS

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. Standing-seam metal roof panels.

B. Related Sections:

1. Section 076200 "Sheet Metal Flashing and Trim" for field-formed fasciae, flashings**,** and other sheet metal work not part of metal roof panel assemblies.
2. Section 079200 "Joint Sealants" for field-applied sealants not otherwise specified in this Section.

1.3 DEFINITIONS

A. Metal Roof Panel Assembly: Metal roof panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight roofing system.

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Metal roof panels shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction.

B. Delegated Design: Design metal roof panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

A. Air Infiltration: The panel system shall be tested in accordance with ASTM E331, and meet or exceed the following performance requirements:

Pressure	Area Leakage Rate
6.24 PSF	0.006 cfm/sq.ft.
12.0 PSF	0.012 cfm/sq.ft.
15.0 PSF	0.015 cfm/sq.ft.

B. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.

C. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.

D. Structural Performance: Provide metal roof panel assemblies capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 1592:

1. Wind Loads: Determine loads based on the applicable local codes:
2. Snow Loads: 10 lbf/sq. ft. (479 Pa)
3. Live Loads: 20 lbf/sq. ft. (958 Pa)
4. Deflection Limits: Metal roof panel assemblies shall withstand wind and snow loads with vertical deflections no greater than 1/180 of the span.

E. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss. The design temperature differential shall be not less than 220 degrees Fahrenheit.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of roof panel and accessory.

B. Shop Drawings: Show fabrication and installation layouts of metal roof panels; details of edge conditions, side-seam and endlap joints, panel profiles, corners, anchorages, trim, flashings, closures, and accessories; and special details. Distinguish between factory- and field-assembled work.

1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:

a. Flashing and trim.
b. Gutters.
c. Downspouts.
d. Roof curbs.

C. Samples for Initial Selection: For each type of metal roof panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Metal Roof and Soffit Panels: 12 inches long by actual panel width. Include fasteners, clips, battens, closures, and other metal roof panel accessories.

2. Trim and Closures: 12 inches long. Include fasteners and other exposed accessories.
3. Accessories: 12-inch long Samples for each type of accessory.

E. Delegated-Design Submittal: For metal roof panel assembly indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof plans, drawn to scale, on which the following are shown and coordinated with each other, based on input from installers of the items involved:

1. Roof panels and attachments.
2. Purlins and rafters.
3. Roof-mounted items including roof hatches, equipment supports, pipe supports and penetrations, lighting fixtures, snow guards, and items mounted on roof curbs.

B. Manufacturer Certificates: Signed by manufacturer certifying that roof panels comply with energy performance requirements specified in "Performance Requirements" Article.

1. Submit evidence of meeting performance requirements.

C. Qualification Data: For qualified Installer.

D. Material Certificates: For thermal insulation, from manufacturer.

E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

F. Field quality-control reports.

G. Warranties: Samples of special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal roof panels to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

C. Source Limitations: Obtain each type of metal roof panels from single source from single manufacturer.

D. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal roof panel Installer, metal roof panel manufacturer's representative, deck installer, and installers whose work interfaces with or affects metal roof panels including installers of roof accessories and roof-mounted equipment.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal roof panel installation, including manufacturer's written instructions.
4. Examine deck substrate conditions for compliance with requirements, including flatness and attachment to structural members.
5. Review structural loading limitations of deck during and after roofing.
6. Review flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.
7. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
8. Review temporary protection requirements for metal roof panel assembly during and after installation.
9. Review roof observation and repair procedures after metal roof panel installation.
10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, metal roof panels, and other manufactured items so as not to be damaged or deformed. Package metal roof panels for protection during transportation and handling.

B. Unload, store, and erect metal roof panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal roof panels on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal roof panels to ensure dryness. Do not store metal roof panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Protect strippable protective covering on metal roof panels from exposure to sunlight and high humidity, except to extent necessary for period of metal roof panel installation.

1.10 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit metal roof panel work to be performed according to manufacturer's written instructions and warranty requirements.

B. Field Measurements: Verify actual dimensions of construction contiguous with metal roof panels by field measurements before fabrication.

1.11 COORDINATION

A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

B. Coordinate metal roof panels with rain drainage work, flashing, trim, and construction of decks, parapets, walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal roof panel assemblies that fail in materials or workmanship within specified warranty period.

B. Endorse and forward to owner the following warranties:
1. 20 year watertight warranty, jointly signed by the installer and the manufacturer.
2. Manufacturer's standard 20 year finish warranty covering checking, crazing, peeling, chalking, fading, and adhesion.
3. Installer's 3 year warranty covering roof panel system installation and watertightness.
4. Warranties shall commence on date of substantial completion.
5. Failures include, but are not limited to, the following:
a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

A. Metallic-Coated Steel Sheet: Restricted flatness steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.
2. Surface: Smooth, flat finish.
3. Exposed Coil-Coated Finish:
a. 2-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
b. Color to be selected by the Architect from Manufacturers full range of options.

4. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.2 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: 40 mils thick minimum, consisting of slip-resisting, polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 240 deg F; ASTM D 1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
3. Products: Subject to compliance with requirements, provide one of the following:
   a. Grace Construction Products; a unit of Grace, W. R. & Co.; Ice and Water Shield.

2.3 MISCELLANEOUS MATERIALS

A. Panel Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal roof panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

2.4 STANDING-SEAM METAL ROOF PANELS

A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.

B. Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and flat pan between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels and engaging opposite edge of adjacent panels, and snapping panels together.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide Panel shall be IMETCO PermLok 1.5 roof panel system as manufactured by Innovative Metals Company, Inc. or an equal or better product by one of the manufacturers listed below.
   a. AEP-Span.
   b. CENTRIA Architectural Systems.

c. Petersen Aluminum Corporation.
d. Ultra Seam Incorporated.

3. Material: 24 ga G90 galvanized steel sheet.
   a. Color: As selected by Architect from Manufacturers full range of options.

4. Batten: Same material, finish, and color as roof panels.
5. Clips: Floating to accommodate thermal movement.

   a. Material: 0.064-inch nominal thickness, zinc-coated (galvanized) steel sheet.

6. Panel Coverage: 18 inches

2.5 ACCESSORIES

A. Roof Panel Accessories: Provide components approved by roof panel manufacturer and as required for a complete metal roof panel assembly including trim, copings, fasciae, corner units, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

   1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal roof panels.
   2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
   3. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

B. Flashing and Trim: Formed from same material as roof panels, prepainted with coil coating, minimum 0.018 inch thick. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal roof panels.

C. Downspouts: Formed from same material as roof panels. Fabricate in 10-foot long sections, complete with formed elbows and offsets, of size and metal thickness according to SMACNA's "Architectural Sheet Metal Manual". Finish downspouts to match gutters.

D. Roof Curbs: Fabricated from same material as roof panels, minimum 0.048 inch thick; with bottom of skirt profiled to match roof panel profiles, and welded top box and integral full-length cricket. Fabricate curb subframing of minimum 0.0598-inch thick, angle-, C-, or Z-shaped steel sheet. Fabricate curb and subframing to withstand indicated loads, of size and height indicated. Finish roof curbs to match metal roof panels.

   1. Insulate roof curb with 2-inch thick, rigid insulation.

2.6 FABRICATION

A. Fabricate and finish metal roof panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes and as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal roof panel side laps with factory-installed captive gaskets or separator strips that provide a tight seal and prevent metal-to-metal contact, in a manner that will seal weathertight and minimize noise from movements within panel assembly.

D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. End Seams for Other Than Aluminum: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
3. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
5. Fabricate cleats and attachment devices of size and metal thickness recommended by SMACNA's "Architectural Sheet Metal Manual" or by metal roof panel manufacturer for application, but not less than thickness of metal being secured.

2.7 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the Work.

B. Examine roughing-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of metal roof panels before metal roof panel installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.

B. Miscellaneous Framing: Install subpurlins, eave angles, furring, and other miscellaneous roof panel support members and anchorage according to metal roof panel manufacturer's written instructions.

1. Soffit Framing: Clip furring channels to supports**,** as required to comply with requirements for assemblies indicated.

3.3 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated on Drawings, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.

B. Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

3.4 THERMAL INSULATION INSTALLATION

A. Board Insulation: Extend insulation in thickness indicated to cover entire roof. Comply with installation requirements in Section 072100 "Thermal Insulation."

1. Erect insulation and hold in place with Z-shaped furring members spaced 24 inches o.c. as recommended by the roofing manufacturers. Securely attach narrow flanges of furring members to roof deck with screws spaced 24 inches o.c.

3.5 METAL ROOF PANEL INSTALLATION, GENERAL

A. Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.

B. Thermal Movement. Rigidly fasten metal roof panels to structure at one and only one location for each panel. Allow remainder of panel to move freely for thermal expansion and contraction. Predrill panels for fasteners.

1. Point of Fixity: Fasten each panel along a single line of fixing located as recommended by the roofing manufacturer.
2. Avoid attaching accessories through roof panels in a manner that will inhibit thermal movement.

C. Install metal roof panels as follows:

1. Commence metal roof panel installation and install minimum of 300 sq. ft. in presence of factory-authorized representative.
2. Field cutting of metal panels by torch is not permitted.
3. Locate and space fastenings in uniform vertical and horizontal alignment.
4. Provide metal closures at rake edges and each side of ridge and hip caps.
5. Flash and seal metal roof panels with weather closures at eaves, rakes, and perimeter of all openings.
6. Install ridge caps as metal roof panel work proceeds.
7. End Splices: Locate panel end splices over, but not attached to, structural supports. Stagger panel end splices to avoid a four-panel splice condition.
8. Install metal flashing to allow moisture to run over and off metal roof panels.

D. Fasteners:

1. Steel Roof Panels: Use stainless-steel fasteners for surfaces exposed to the exterior and galvanized-steel fasteners for surfaces exposed to the interior.

E. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

F. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

1. Coat back side of roof panels with bituminous coating where roof panels will contact wood, ferrous metal, or cementitious construction.

G. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal roof panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal roof panel manufacturer.

1. Seal metal roof panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal roof panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.6 METAL ROOF PANEL INSTALLATION

A. Standing-Seam Metal Roof Panels: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended by manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
4. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.

3.7 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal roof panel assembly including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

C. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 36 inches (914 mm) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

D. Downspouts: Join sections with telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1500 mm) o.c. in between.

1. Provide elbows at base of downspouts to direct water away from building.
2. Connect downspouts to underground drainage system indicated.

E. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet metal roof panels.

F. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.8 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal roof panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.9 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where inspections indicate that they do not comply with specified requirements.

C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 CLEANING

A. Remove temporary protective coverings and strippable films, if any, as metal roof panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal roof panel installation, clean finished surfaces as recommended by metal roof panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal roof panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113

SECTION 07 42 13.19 - INSULATED METAL WALL PANELS

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. Procedures for compliance with certain "Green Globes for New Construction 2021," requirements may apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Foamed-insulation-core horizontal and vertical metal wall panels with integral reveals and related metal trim and accessories including metal sub-framing framing to support the panels.

1.3 RELATED REQUIREMENTS

A. Division 07 Section "Fluid-Applied Membrane Air Barriers" for air/moisture barrier behind metal panels

B. Division 07 Section "Sheet Metal Flashing and Trim" for sheet metal copings, flashings, reglets and roof drainage items.

C. Division 07 Section "Joint Sealants" for field-applied joint sealants.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, metal panel Installer, metal panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal panels.

6. Review temporary protection requirements for metal panel assembly during and after installation.
7. Review procedures for repair of metal panels damaged after installation.
8. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Foamed-insulation-core metal wall panels.

B. Product Data Submittals: For each product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

C. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

D. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

E. Samples for Verification: For each type of exposed finish, prepared on Samples of size indicated below.

1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. First Install In-Place Mockup:

1. Build mockups to set quality standards for fabrication and installation of building components.
2. Water-Spray Test: Conduct water-spray test of metal panel assembly mockup, testing for water penetration in accordance with AAMA 501.2.
3. Subject to compliance with requirements, approved of First Install In-Place mockups are to become part of the completed Work.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed in accordance with manufacturers' written instructions and warranty requirements.

1.11 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested in accordance with ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing in accordance with ASTM E72:

1. Wind Loads: As indicated on drawing A-S0.2
2. Other Design Loads: As indicated on drawing A-S0.2
3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested in accordance with ASTM E283 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

C. Water Penetration under Static Pressure: No water penetration when tested in accordance with ASTM E331 at the following test-pressure difference:

1. Test-Pressure Difference: 15 lbf/sq. ft. (720 Pa).

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 180 deg F (100 deg C), material surfaces.

E. Fire-Test-Response Characteristics: Provide metal wall panels and system components with the following fire-test-response characteristics, as determined by testing identical panels and system components per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

1. Fire-Resistance Characteristics: Provide materials and construction tested for fire resistance per ASTM E119.
2. Intermediate-Scale Multistory Fire Test: Tested mockup, representative of completed multistory wall assembly of which wall panel is a part, complies with NFPA 285 for test method and required fire-test-response characteristics of exterior non-load-bearing wall panel assemblies.
3. Radiant Heat Exposure: No ignition when tested in accordance with NFPA 268.
4. Potential Heat: Acceptable level when tested in accordance with NFPA 259.
5. Surface-Burning Characteristics: Provide wall panels with a flame-spread index of 25 or less and a smoke-developed index of 450 or less, per ASTM E84.
6. UL 263 - Fire Tests of Building Construction and Materials.
7. UL 1040 - Fire Test of Insulated Wall Construction.

2.2 FOAMED-INSULATION-CORE METAL WALL PANELS

A. General: Provide factory-formed and -assembled metal wall panels fabricated from two metal facing sheets and insulation core foamed in place during fabrication, and with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.

1. Insulation Core: Modified isocyanurate or polyurethane foam using a non-CFC blowing agent, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.

a. Closed-Cell Content: 90 percent when tested in accordance with ASTM D6226.
b. Density: 2.5 to 3.5 lb/cu. ft. (32 to 42 kg/cu. m) when tested in accordance with ASTM D1622.
c. Compressive Strength: Minimum 20 psi (140 kPa) when tested in accordance with ASTM D1621.
d. Shear Strength: 26 psi (179 kPa) when tested in accordance with ASTM C273/C273M.

B. Metallic-Coated Steel Sheet: Facings of zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.

1. Nominal Thickness Exterior Sheet: 0.022 inch (0.56 mm).
2. Nominal Thickness Interior Liner Sheet: 0.018 inch (0.46 mm).
3. Exterior Finish: Two-coat fluoropolymer system. 02. mil primer with 0.8 mil 70 percent PVDF fluoropolymer color coat, AAM 621

    a. Color: As selected by Architect from manufacturer's full range and custom colors.

4. Interior Linear Panel Finish: 0.2 mil primer with 0.6 mil acrylic color coat.

    a. Color: As selected by Architect from manufacturer's full range.

5. Panel Coverage: See basis of design products listed below.
6. Thermal-Resistance Value (R-Value): In accordance with ASTM C1363.

    a. 2-inch thick Panels: R-16

C. **Concealed-Fastener, Foamed-Insulation-Core Metal Wall Panels** formed with tongue-and-groove panel edges; designed for sequential installation by interlocking panel edges and mechanically attaching panels to supports using concealed clips or fasteners. **Basis of Design Products as Follows for Each Condition:**

1. **Vertical Building Wall Panels:** CENTRIA FWDS, Vertical Panels, 2-inch thick by 32-inch wide, with exterior flat embossed sheet and interior embossed-planked sheet, custom color exterior finish.

D. Manufacturers: Provide the Basis of Design product or equal product acceptable to the Architect by one of the following manufacturers:

1. ATAS International
2. Metl Span, Nucor Company

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A792/A792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. **Provide manufacturer's standard sections as required for support and alignment of metal panel system.**

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fascia, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure

strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide concealed fasteners.

E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.4 FABRICATION

A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

1. Panel Bow Tolerance: Not more than 0.5 percent of panel width or length.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

3. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
4. Conceal fasteners and expansion provisions.

    a. Exposed fasteners are not allowed on faces of accessories exposed to view.

5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. 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 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.

C. Steel Panels and Accessories:

1. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

1. Examine steel framing at screen walls to verify that girts, angles, studs, channels, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.

2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.

    a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages in accordance with ASTM C754 and metal panel manufacturer's written recommendations.

3.3 INSTALLATION OF METAL PANELS

A. General: Install metal panels in accordance with manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weathertight performance of metal wall panel assemblies. Provide types of gaskets, fillers, and

sealants indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal wall panel manufacturer.

1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.4 INSTALLATION OF INSULATION-CORE METAL WALL PANELS

A. General: Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels for weather seal.

1. Fasten foamed-insulation-core metal wall panels to supports with concealed fasteners at each lapped joint at location and spacing and with fasteners recommended by manufacturer.
2. Apply panels and associated items true to line for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
3. Provide sealant tape at lapped joints of insulated metal wall panels and between panels and protruding equipment, vents, and accessories.
4. Apply a continuous ribbon of sealant tape to panel side laps and elsewhere as needed to make panels weathertight.

B. Foamed-Insulation-Core Metal Wall Panels: Fasten metal wall panels to supports with concealed clips at each joint at location and spacing and with fasteners recommended by manufacturer. Fully engage tongue and groove of adjacent panels.

1. Install clips to supports with self-tapping fasteners.

C. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

D. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches

(610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Water-Spray Test: After installation, test for water penetration in accordance with AAMA 501.2.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal wall panel installation, including accessories.

D. Metal wall panels will be considered defective if they do not pass test and inspections.

E. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

F. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 42 13.19

SECTION 074293 - SOFFIT PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal soffit panels.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Metal soffit panels.

B. Product Data Submittals:

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

C. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

D. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

E. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Metal Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal panel accessories.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

C. Sample Warranties: For special warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panels to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

E. Copper Panels: Wear gloves when handling to prevent fingerprints and soiling of surface.

1.7 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.8 COORDINATION

A. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of walls, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: **Two** years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:

1. Wind Loads: As indicated on Drawings.
2. Deflection Limits: For wind loads, no greater than **1/180** of the span.

2.2 METAL SOFFIT PANELS

A. Provide metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

B. Metal Soffit Panels:

1. Finish: Selected by Architect from Manufacturers Full Range of options.
2. Sealant: Factory applied within interlocking joint.

C. Flush-Profile Metal Soffit Panels **Solid or Perforated as indicated on the Drawings** panels formed with vertical panel edges and **intermediate stiffening ribs symmetrically spaced** between panel edges; with flush joint between panels.

1. Basis of Design is the FW Panel by McElroy Metal.
   a. Approved Alternate Manufacturers
      1) Pac-Clad
      2) MBCI
2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653/A653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755/A755M.

   a. Nominal Thickness: **0.028 inch (0.71 mm)**.
   b. Exterior Finish: Kynar 500.
   c. Color: **As selected by Architect from manufacturer's full range**

3. Panel Coverage: **12 inches (305 mm)**.
4. Panel Height: **1.5 inches (38 mm)**.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C645, cold-formed, metallic-coated steel sheet, ASTM A653/A653M, G90 (Z275) hot-dip galvanized coating designation or ASTM A792/A792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Finish flashing and trim with same finish system as adjacent metal panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.
3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

2.4 FABRICATION

A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal soffit panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. 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 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.

C. Steel Panels and Accessories:
   1. Siliconized Polyester: Epoxy primer and silicone-modified, polyester-enamel topcoat; with a dry film thickness of not less than 0.2 mil (0.005 mm) for primer and 0.8 mil (0.02 mm) for topcoat.
   2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.

   1. Examine framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal panel manufacturer.
   2. Examine sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal panel manufacturer.

      a. Verify that air- or water-resistive barriers been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

1. Soffit Framing: Wire tie[**or clip**] furring channels to supports[**, as required to comply with requirements for assemblies indicated**].

3.3 INSTALLATION OF METAL SOFFIT PANELS

A. Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
2. Aluminum Panels: Use aluminum or stainless steel fasteners for surfaces exposed to the exterior; use aluminum or galvanized-steel fasteners for surfaces exposed to the interior.
3. Copper Panels: Use copper, stainless steel, or hardware-bronze fasteners.
4. Stainless Steel Panels: Use stainless steel fasteners.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Apply panels and associated items true to line for neat and weathertight enclosure.
2. Provide metal-backed washers under heads of exposed fasteners bearing on weather side of metal panels.
3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

E. Watertight Installation:

1. Apply a continuous ribbon of sealant or tape to seal lapped joints of metal panels, using sealant or tape as recommend by manufacturer on side laps of nesting-type panels and elsewhere as needed to make panels watertight.
2. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
3. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal panel manufacturer; or, if not indicated, provide types recommended by metal panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling, and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to achieve waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (610 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. After metal panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074293

SECTION 074600 – FIBER CEMENT SIDING AND SOFFIT

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. Fiber-cement siding attached with recommended fasteners and associated trim pieces for each application indicated.
2. Fiber-cement soffit.
3. Head, Jamb and Sill flashing around exterior window and door openings behind siding.

B. Related Sections:

1. Section 061000 "Rough Carpentry" for wood furring, grounds, nailers, and blocking.
2. Section 061600 "Sheathing" for wall sheathing.
3. Section 072500 “Weather Barriers” for weather-resistive barriers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
1. Provide weight of siding material to engineer sizing anchors for fastening sheathing through rigid insulation to back up sheathing.

B. Samples for Verification: For each type, color, texture, and pattern required.

1. 12-inch long-by-actual-width Sample of siding.

2. 12-inch long-by-actual-width Sample of soffit.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of siding and soffit and related accessories to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.

B. Source Limitations: Obtain each type, color, texture, and pattern of siding and soffit, including related accessories, from single source from single manufacturer.

C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall area as indicated by architect.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials in a dry, well-ventilated, weather-tight place.

1.8 COORDINATION

A. Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.

1.9 WARRANTY

A. Special Warranty: Standard form in which manufacturer agrees to repair or replace siding and soffit that fail(s) in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including cracking, deforming.
2. Warranty Period: 50 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIBER-CEMENT SIDING

A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cemplank.
b. CertainTeed Corp.
c. GAF Materials Corporation.
d. James Hardie.
e. MaxiTile, Inc; a California corporation.
f. Nichiha Fiber Cement. (Basis of Design –AWP1818 vertical siding with fiber cement trim as indicated on drawings)

2. Sizes as follows, smooth texture
a. Vertical siding: 5/16” thick, 18” x 72” panels

3. Factory Priming: Manufacturer's standard acrylic primer.
4. Panel Surface: Pre-finished and machine applied. Profiled along all four edges, such that both horizontal and vertical joints between the installed panels are ship-lapped.
5. Color: Factory finished. Color to be selected by Architect from manufacturers full range of colors.
6. Layout: As indicated on Drawings.
7. Accessories: See accessories section.
8. Corner Shapes: Provide special corner shaped pieces as indicated on Drawings to conceal nail holes at corners.

2.2 FIBER-CEMENT SOFFIT

A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
1. Nichiha Fiber Cement; NichiSoffit.
2. Cemplank
3. CertainTeed Corp
4. GAF Materials Corporation

B. Nominal Thickness: Not less than 1/4 inch (6.35 mm).

C. Pattern: 24-inch- (600-mm-) wide sheets with smooth texture.

D. Ventilation: Provide perforated soffit where indicated on the Drawings.

E. Factory Priming: Manufacturer's standard acrylic primer. Soffit to be field painted to match adjacent trim color.

F. Accessories: See accessories section.

2.3 EMBEDDED FLASHING MATERIALS

A. Head, Jamb and Sill self-adhesive Composite Flexible Flashing with Termination Bar system at Head and Sill: Self-adhesive cold-applied sheet consisting of 32 mils of rubberized asphalt integrally bonded to an 8 mil, high density, cross-laminated polyethylene film.

B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by the flashing manufacturer for bonding flashing sheets to each other and to substrates.

1. Meet or exceed the VOC limits of South Coast Air Quality Management District Rule #1168.
   a. Current VOC limit for contact adhesive: 250 grams of VOC per liter of adhesive.

2. Self-adhesive Composite Flexible Flashing: For use over wood nailers and sheathing at the head, jamb and sill of window and door openings in wood siding.

   a. Dur-O-Barrier; Dur-O-Wal, Inc.
   b. Everlastic MF-400; Williams Products, Inc.
   c. Perm-A-Barrier Wall Flashing; W.R. Grace & Co., Construction Products Division
   d. Poly-Barrier Self-Adhering Wall Flashing; Polytite Manufacturing Corp.
   e. Polyguard 300; Polyguard Products, Inc.
   f. Textroflash; Hohmann & Bernard, Inc.Fabricate.

2.2 ACCESSORIES

A. Siding and Soffit Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.

1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.

B. Metal Flashing: Provide aluminum flashing complying with Section 076200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.
1. Finish for Aluminum Flashing: Factory-prime coating, to match adjacent boards. Field paint to match final finish of boards as indicated on drawings.

C. Fasteners:

1. For fastening to wood, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1 inch into substrate. For batten trim pieces, use 2” minimum, 16 ga. finish nails as recommended by manufacturer.

2. For fastening fiber cement, use hot-dip galvanized fasteners.
3. Performance Requirements

    a. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design fastener.
    b. Any fasteners penetrating insulation board shall be engineered to support cladding systems, resist wind pressure and seismic forces. Contractor shall specify fastener type, depth, and spacing.
    c. Fastener length and size shall be based on wall sheathing thickness, see drawings, and shall provide the proper imbed depth into framing to resist forces.
    d. Structural Loads:

        1) Wind Loads: As indicated on Drawings.
        2) Other Design Loads: Weight of all materials supported by fasteners including fiber cement board siding.

    e. Seismic Loads: As indicated on Drawings.

D. Soffit Accessories, Insect Screening for Soffit Vents: Aluminum, 18-by-16 (1.4-by-1.6-mm) mesh.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of siding and soffit and related accessories.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION

A. General: Comply with siding and soffit manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

1. Do not install damaged components.
2. Center nails in elongated nailing slots without binding siding to allow for thermal movement.

B. Install fiber-cement siding and soffit and related accessories.

1. Install fasteners as recommended by manufacturer.

C. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

D. Flashing around Window and Door Openings: Install embedded flashing around the full perimeter of window openings extending under and behind the window or door frame to the back interior side of the frame, over the wood nailers, and to turn back and lap over and extend a minimum of 4-inches over the exterior sheathing which is immediately behind the siding and trim.

E. Lap head flashing over jamb flashing and lap jamb flashing over sill flashing.

3.4 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074600

SECTION 075423 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

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. Adhered TPO membrane roofing system.
2. Vapor retarder.
3. Roof insulation.

B. Related Sections:

1. Division 06 Section “Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
2. Division 07 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
3. Division 07 Section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
4. Division 22 Section "Storm Drainage Piping Specialties" for roof drains.

1.3 DEFINITIONS

A. TPO: Thermoplastic polyolefin.

B. Roofing Terminology: See ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.

C. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.

D. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.

1. Fire/Windstorm Classification: Class 1A-90.

E. Energy Performance: Provide roofing system with initial Solar Reflectance Index not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

F. Energy Performance: Provide roofing system that is listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low-slope roof products.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.

C. Samples for Verification: For the following products:

1. Sheet roofing, of color specified, including T-shaped side and end lap seam.

D. Qualification Data: For qualified Installer and manufacturer.

E. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of compliance with performance requirements.

F. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

G. Field quality-control reports.

H. Maintenance Data: For roofing system to include in maintenance manuals.

I. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is FM Approvals approved for membrane roofing system identical to that used for this Project.

B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

C. Source Limitations: Obtain components including roof insulation for membrane roofing system from same manufacturer as membrane roofing or approved by membrane roofing manufacturer.

D. Exterior Fire-Test Exposure: ASTM E 108, Class A for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

E. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
4. Review structural loading limitations of roof deck during and after roofing.
5. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
6. Review governing regulations and requirements for insurance and certificates if applicable.
7. Review temporary protection requirements for roofing system during and after installation.
8. Review roof observation and repair procedures after roofing installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.8 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, and roofing accessories, walkway products, and other components of membrane roofing system.

a. Peak gust wind speeds up to 90 mph (m/sec.)

2. Warranty Period: 20 years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of membrane roofing system such as membrane roofing, base flashing, roof insulation, fasteners, and walkway products, for the following warranty period:

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TPO MEMBRANE ROOFING

A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D 6878, internally fabric or scrim reinforced, uniform, flexible TPO sheet.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following.

a. Carlisle SynTec Incorporated.
b. Custom Seal Roofing.
c. Firestone Building Products Company.
d. GAF Materials Corporation.
e. GenFlex Roofing Systems.
f. Johns Manville.

g. Mule-Hide Products Co., Inc.
h. Stevens Roofing Systems; Division of JPS Elastomerics.
i. Versico Incorporated.

2. Thickness: 60 mils (1.5 mm) nominal.
3. Exposed Face Color: White.

2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Plastic Foam Adhesives: 50 g/L.
b. Gypsum Board and Panel Adhesives: 50 g/L.
c. Multipurpose Construction Adhesives: 70 g/L.
d. Fiberglass Adhesives: 80 g/L.
e. Contact Adhesive: 80 g/L.
f. Other Adhesives: 250 g/L.
g. Single-Ply Roof Membrane Sealants: 450 g/L.
h. Nonmembrane Roof Sealants: 300 g/L.
i. Sealant Primers for Nonporous Substrates: 250 g/L.
j. Sealant Primers for Porous Substrates: 775 g/L.

B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils (1.4 mm) thick, minimum, of same color as sheet membrane.

C. Bonding Adhesive: Manufacturer's standard

D. Slip Sheet: Manufacturer's standard, of thickness required for application.

E. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick; with anchors.

F. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch thick (25 mm wide by 1.3 mm thick), prepunched.

G. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

H. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.3 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by TPO membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicatedand that produce FM Approvals-approved roof insulation.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class I, Grade 3, felt or glass-fiber mat facer on both major surfaces.

C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) typical unless otherwise indicated.

D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.4 INSULATION ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

C. Full-Spread Applied Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to another insulation layer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 05 Section "Steel Decking."

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.
   1. roof according to membrane roofing system manufacturers' written instructions.

3.3 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (68 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.

   1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

G. Mechanically Fastened and Adhered Insulation: Install each layer of insulation and secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

   1. Fasten first layer of insulation according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
   2. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
   3. Set each subsequent layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.

3.4 ADHERED MEMBRANE ROOFING INSTALLATION

A. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.

B. Start installation of membrane roofing in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.

E. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.

F. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

H. Spread sealant bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

3.5 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.6 FIELD QUALITY CONTROL

A. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

B. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

C. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.8 ROOFING INSTALLER'S WARRANTY

A. WHEREAS <**Insert name**> of <**Insert address**>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:

1. Owner: <**Insert name of Owner**>.
2. Address: <**Insert address**>.
3. Building Name/Type: <**Insert information**>.
4. Address: <**Insert address**>.
5. Area of Work: <**Insert information**>.
6. Acceptance Date: <**Insert date**>.
7. Warranty Period: <**Insert time**>.
8. Expiration Date: <**Insert date**>.

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:

    a. Lightning;
    b. Peak gust wind speed exceeding 90 mph (m/sec);
    c. Fire;
    d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
    e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
    f. Vapor condensation on bottom of roofing; and
    g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this <**Insert day**> day of <**Insert month**>, <**Insert year**>.

1. Authorized Signature: <**Insert signature**>.
2. Name: <**Insert name**>.
3. Title: <**Insert title**>.

END OF SECTION 075423

SECTION 076200 - SHEET METAL FLASHING AND TRIM

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. Manufactured Products:
   a. Manufactured reglets and counterflashing.
   b. Roof-drainage sheet metal fabrications.

2. Formed Products:
   a. Formed roof sheet metal fabrications.

1.3 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C) material surfaces.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at the Project Site as part of the Roofing Pre-installation Meeting.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:

1. Identification of material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
4. Details of termination points and assemblies, including fixed points.
5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
6. Details of edge conditions, including and counterflashings as applicable.
7. Details of special conditions.
8. Details of connections to adjoining work.
9. Detail formed flashing and trim at a scale of not less than 3 inches per 12 inches (1:5).

C. Samples for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.

D. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

E. Warranty: Sample of special warranty.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

C. Preinstallation Conference: Conduct conference as part of Pre-Roof Conference.

1. Review methods and procedures related to sheet metal flashing and trim.
2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
4. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.8 WARRANTY

A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.

1. Surface: Smooth, flat.
2. Custom Color selected by the Architect. Refer to section 074113 for finish requirements.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane, polysulfide or silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

F. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

G. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions, with interlocking counterflashing on exterior face, of same metal as reglet.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Cheney Flashing Company.
b. Fry Reglet Corporation.
c. Heckmann Building Products Inc.
d. Hickman, W. P. Company.
e. Hohmann & Barnard, Inc.; STF Sawtooth Flashing.
f. Keystone Flashing Company, Inc.
g. National Sheet Metal Systems, Inc.

h. Sandell Manufacturing Company, Inc.

2. Material: Aluminum, 0.024 inch (0.61 mm) thick.
3. Accessories:
   a. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where Drawings show reglet without metal counterflashing.
   b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.
4. Finish: Clear Anodized Aluminum.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

E. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

G. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

H. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

I. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF SHEET METAL FABRICATIONS

A. Roof to Wall Transition fabricate from the following materials:
   1. Aluminum: 0.050 inch (1.27 mm) thick.

B. Counterflashing: Fabricate from the following materials:
   1. Aluminum: 0.032 inch (0.81 mm) thick.

C. Flashing Receivers: Fabricate from the following materials:
   1. Aluminum: 0.032 inch (0.81 mm) thick.

D. Roof-Penetration Flashing: Fabricate from the following materials:
   1. Copper: 16 oz./sq. ft. (0.55 mm) thick
   2. Stainless Steel: 0.019 inch (0.48 mm) thick.
   3. Zinc-Tin Alloy-Coated Stainless Steel: 0.018 inch (0.46 mm) thick.

E. Roof-Drain Flashing: Fabricate from the following materials:
   1. Copper: 12 oz./sq. ft. (0.41 mm) thick.
   2. Stainless Steel: 0.016 inch (0.40 mm) thick.
   3. Zinc-Tin Alloy-Coated Stainless Steel: 0.015 inch (0.38 mm) thick.

F. Downspouts: Fabricate round downspouts to match in size, material, and configuration to those on the existing building, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors.

G. Conductor Heads: Fabricate conductor heads with flanged back and stiffened top edge and of dimensions and shape required, complete with outlet tubes, exterior flange trim. Fabricate from the same materials as the downspouts described above.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.

   1. Verify compliance with requirements for installation tolerances of substrates.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches (300 mm) apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
5. Install sealant tape where indicated on shop drawings.
6. Torch cutting of sheet metal flashing and trim is not permitted.
7. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

1. Coat back side of uncoated aluminum and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.

D. Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws and metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal joints as shown and as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm), except reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder metallic-coated steel and aluminum sheet.
2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
3. Copper Soldering: Tin edges of uncoated copper sheets using solder for copper.

G. Rivets: Rivet joints in uncoated aluminum where indicated and where necessary for strength.

3.3 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

B. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap counterflashing joints a minimum of 4 inches (100 mm) and bed with sealant. Secure in a waterproof manner by means of snap-in installation and sealant.

C. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric or butyl sealant and clamp flashing to pipes that penetrate roof.

3.5 MISCELLANEOUS FLASHING INSTALLATION

A. Overhead-Piping Safety Pans: Suspend pans independent from structure above as indicated on Drawings. Pipe and install drain line to plumbing waste or drainage system.

B. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.6 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.7 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 078413 - PENETRATION FIRESTOPPING

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. This Section includes through-penetration firestop systems for penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items.

B. Related Sections include the following:
   1. Division 21 Sections specifying fire-suppression piping penetrations.
   2. Division 22 and 23 Sections specifying duct and piping penetrations.
   3. Division 26, 27, and 28 Sections specifying cable and conduit penetrations.

1.3 PERFORMANCE REQUIREMENTS

A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.

   1. Fire-resistance-rated walls.

B. Rated Systems: Provide through-penetration firestop systems with the following ratings determined per ASTM E 814 or UL 1479:

   1. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.
   2. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:

      a. Penetrations located outside wall cavities.
      b. Penetrations located outside fire-resistance-rated shaft enclosures.

C. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.

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 (100 mm) in width and exposed to possible loading and traffic, provide firestop systems capable of supporting 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.

D. For through-penetration firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.4 SUBMITTALS

A. Product Data: For each type of through-penetration firestop system product provided. For each through-penetration firestop system, show each kind of construction condition penetrated, relationships to adjoining construction, and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, ITS or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
2. Through-penetration firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:

a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:

1) UL in its "Fire Resistance Directory."
2) ITS in its "Directory of Listed Products."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Notify Architect at least seven days in advance of through-penetration firestop system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by Architect and building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide through-penetration firestop systems for each application by one of the following manufacturers:

1. A/D Fire Protection Systems Inc.
2. Grace, W. R. & Co. - Conn.
3. Hilti, Inc.
4. Johns Manville.
5. Nelson Firestop Products.
6. NUCO Inc.
7. RectorSeal Corporation (The).
8. Specified Technologies Inc.
9. 3M; Fire Protection Products Division.
10. Tremco; Sealant/Weatherproofing Division.
11. USG Corporation.

2.2 FIRESTOPPING, GENERAL

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

1. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.

    a. Slag-/rock-wool-fiber insulation.
    b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
    c. Fire-rated form board.
    d. Fillers for sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.3 FILL MATERIALS

A. General: Provide through-penetration firestop systems for ratings indicated on drawings. UL Rated Design Assemblies proposed in product data submittal will indicate type of fill material used to achieve indicated ratings. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.

B. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.

I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
   1. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

2.4 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system 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 through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify through-penetration firestop systems with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of edge of the firestop systems so that labels will be visible to anyone seeking to remove penetrating items or firestop systems. Use mechanical fasteners for metal labels. For plastic labels, use self-adhering type with adhesives capable of permanently bonding labels to surfaces on which labels are placed and, in combination with label material, will result in partial destruction of label if removal is attempted. Include the following information on labels:

1. The words "Warning - Through-Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

3.5 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce systems complying with specified requirements.

3.6 THROUGH-PENETRATION FIRESTOP SYSTEMS:

A. UL-classified systems are indicated, they refer to alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ.

B. ITS-listed systems are indicated, they refer to design numbers listed in ITS's "Directory of Listed Products," "Firestop Systems" Section.

END OF SECTION 078413

SECTION 078446 - FIRE-RESISTIVE JOINT SYSTEMS

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. This Section includes fire-resistive joint systems for the following:

1. Head-of-wall joints.
2. Fire sealant joints at base of walls at floor slabs.
3. Fire rated joints between new fire rated walls and existing construction.

B. Related Sections include the following:

1. Division 07 Section "Penetration Firestopping" for systems installed in openings in walls and floors with and without penetrating items.
2. Division 07 Section "Joint Sealants" for non-fire-resistive joint sealants.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed.

B. Joint Systems in and between Fire-Resistance-Rated Constructions: Provide systems with assembly ratings equaling or exceeding the fire-resistance ratings of construction that they join, indicated as determined by UL 2079.

1. Load-bearing capabilities as determined by evaluation during the time of test.

C. For fire-resistive systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.4 SUBMITTALS

A. Product Data: For each type of product provided. For each fire-resistive joint system, show each kind of construction condition in which joints are installed and relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.
2. Product Data: For sealants, indicating VOC content.
3. Laboratory Test Reports: For sealants, indicating compliance with requirements for low-emitting materials.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain fire-resistive joint systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.

B. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Fire-resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for fire-resistive joint systems acceptable to authorities having jurisdiction.
2. Fire-resistive joint systems are identical to those tested per methods indicated in Part 1 "Performance Requirements" Article and comply with the following:

    a. Fire-resistive joint system products bear classification marking of qualified testing and inspecting agency.
    b. Fire-resistive joint systems correspond to those indicated by referencing system designations of the qualified testing and inspecting agency.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver fire-resistive joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate fire-resistive joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

C. Notify Owner's inspecting agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up fire-resistive joint system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector of authorities having jurisdiction have examined each installation.

PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:

C. Manufacturers: Subject to compliance with requirements, provide fire-resistive joint systems for each application on Drawings by one of the following manufacturers or equal products by another manufacturer.

1. A/D Fire Protection Systems Inc.
2. DAP Inc.
3. Firestop Systems Inc.
4. Hilti, Inc.
5. International Protective Coatings Corp.
6. ISOLATEK International.
7. Nelson Firestop Products.
8. NUCO Industries.
9. RectorSeal Corporation (The).
10. Specified Technologies Inc.
11. 3M Fire Protection Products.
12. Tremco, Inc.
13. United States Gypsum Company.

2.2 FIRE-RESISTIVE JOINT SYSTEMS, GENERAL

A. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.

B. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1. **Provide a paintable fire caulk at exposed conditions in a neutral color such as white, off-white, grey, beige and NOT red.**
2. Verify sealant has a VOC content of 250 g/L or less.
3. Verify sealant complies with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and acetaldehyde concentration does not exceed 9 mcg/cu. m.

C. Accessories: Provide components of fire-resistive joint systems, including forming materials that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

2.3 FIRE-RESISTIVE JOINT SYSTEMS

A. UL-classified fire-resistive joint systems refer to alphanumeric designations listed in UL's "Fire Resistance Directory" under product Category XHBN.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.

2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system 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 fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates or damaging adjoining surfaces.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.

B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes and joint systems have been inspected by Architect and local authorities having jurisdiction.

D. Joints Exposed to View: At Fire-Resistive Joint Systems exposed to view provide a well-crafted well tooled concave joint prepared to receive a painted finish.

1. Do not paint fire caulk until fire resistive joint systems have been inspected by architect, owner’s testing agency and code official.

3.4 FIELD QUALITY CONTROL

A. Remove and replace fire-resistive joint systems where inspections indicate that they do not comply with specified requirements.

B. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and fire-resistive joint systems comply with requirements.

3.5 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

END OF SECTION 078446

SECTION 079200 - JOINT SEALANTS

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. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Acoustical joint sealants.
5. Butyl-Rubber.

B. Related Sections:
1. Division 08 Section "Glazing" for glazing sealants.
2. Division 32 Section "Concrete Paving Joint Sealants" for sealing joints in pavements, walkways, and curbing.

1.3 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant color. Column for color to be filled out by Architect.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

1.4 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

E. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.

1. Products: Subject to compliance with requirements, provide product most suitable for conditions. Available products that may be incorporated into the Work include, but are not limited to, the following manufacturers:

    a. BASF Building Systems; Omniseal 50.
    b. Dow Corning Corporation.
    c. GE Advanced Materials – Silicones.
    d. May National Associates, Inc.
    e. Pecora Corporation.
    f. Polymeric Systems, Inc.
    g. Sika Corporation, Construction Products Division.
    h. Tremco Incorporated.

B. Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use T.

1. Products: Subject to compliance with requirements, provide product most suitable with conditions. Available products that may be incorporated into the Work include, but are not limited to, the following manufacturers:

    a. Dow Corning Corporation.
    b. May National Associates, Inc.
    c. Pecora Corporation.
    d. Tremco Incorporated.

C. Single-Component, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade P, Class 100/50, for Use T.

1. Products: Subject to compliance with requirements, provide product most suitable for conditions. Available products that may be incorporated into the Work include, but are not limited to, the following manufacturers:

    a. Dow Corning Corporation.
    b. May National Associates, Inc.
    c. Pecora Corporation.
    d. Tremco Incorporated.

D. Multicomponent, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.

1. Products: Subject to compliance with requirements, provide product most suitable for conditions. Available products that may be incorporated into the Work include, but are not limited to, the following manufacturers:

    a. Tremco Incorporated.

E. Multicomponent, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type M, Grade P, Class 100/50, for Use T.

1. Products: Subject to compliance with requirements, provide product most suitable for conditions. Available products that may be incorporated into the Work include, but are not limited to, the following manufacturers:

    a. Dow Corning Corporation.
    b. May National Associates, Inc.

F. Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, provide product most suitable for conditions. Available products that may be incorporated into the Work include, but are not limited to, the following manufacturers:

    a. Pecora Corporation.

2.3 URETHANE JOINT SEALANTS

A. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.

1. Products: Subject to compliance with requirements, provide product most suitable for conditions. Available products that may be incorporated into the Work include, but are not limited to, the following manufacturers:

    a. Pacific Polymers International, Inc.
    b. Polymeric Systems, Inc.

B. Single-Component, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920. Type S, Grade NS, Class 25, for Use T.

1. Products: Subject to compliance with requirements, provide product most suitable for conditions. Available products that may be incorporated into the Work include, but are not limited to, the following manufacturers:

    a. BASF Building Systems.
    b. May National Associates, Inc.
    c. Pacific Polymers International, Inc.
    d. Sika Corporation.
    e. Tremco Incorporated.

C. Single-Component, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.

1. Products: Subject to compliance with requirements, provide product most suitable for conditions. Available products that may be incorporated into the Work include, but are not limited to, the following manufacturers:

a. BASF Building Systems.
b. Bostik, Inc.
c. May National Associates, Inc.
d. Pecora Corporation.
e. Polymeric Systems, Inc.
f. Schnee-Morehead, Inc.
g. Sika Corporation.
h. Tremco Incorporated.

D. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.

1. Products: Subject to compliance with requirements, provide product most suitable for conditions. Available products that may be incorporated into the Work include, but are not limited to, the following manufacturers:

a. Pecora Corporation.
b. Polymeric Systems, Inc.
c. Tremco Incorporated.

E. Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use T.

1. Products: Subject to compliance with requirements, provide product most suitable for conditions. Available products that may be incorporated into the Work include, but are not limited to, the following manufacturers:

a. BASF Building Systems.
b. LymTal International, Inc.
c. May National Associates, Inc.
d. Pacific Polymers International, Inc.
e. Pecora Corporation.
f. Sika Corporation, Construction Products Division.
g. Tremco Incorporated.

2.4 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, provide product most suitable for conditions. Available products that may be incorporated into the Work include, but are not limited to, the following manufacturers:

    a. BASF Building Systems.
    b. Bostik, Inc.
    c. May National Associates, Inc.
    d. Pecora Corporation.
    e. Schnee-Morehead, Inc.
    f. Tremco Incorporated.

2.5 SOLVENT-RELEASE-CURING JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealant: ASTM C 1311.

1. Products: Subject to compliance with requirements, provide product most suitable for conditions. Available products that may be incorporated into the Work include, but are not limited to, the following manufacturers:

    a. Bostik, Inc.
    b. Pecora Corporation.
    c. Tremco Incorporated.

2.6 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, provide available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Pecora Corporation; AC-20 FTR.
    b. USG Corporation; SHEETROCK Acoustical Sealant.

2.7 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.

d. Direct applied exterior finish systems.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

a. Metal.
b. Glass.
c. Porcelain enamel.
d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.

a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

a. Perform 1 tests for the first 10 feet of joint length for each kind of sealant and joint substrate.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

a. Whether sealants filled joint cavities and are free of voids.
b. Whether sealant dimensions and configurations comply with specified requirements.
c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

4. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.

1. Joint Locations:

    a. Isolation and contraction joints in cast-in-place concrete slabs.
    b. Tile control and expansion joints.

2. Silicone Joint Sealant: Single component, nonsag, traffic grade, neutral curing, Single component, pourable, traffic grade, neutral curing or Multicomponent, pourable, traffic grade, neutral curing.
3. Urethane Joint Sealant: Single component, nonsag, traffic grade or Single component, pourable, traffic grade or Multicomponent, nonsag, traffic grade, Class 50.

B. Joint-Sealant Application: Exterior joints in vertical surfaces.

1. Joint Locations:

    a. Control and expansion joints in unit masonry.
    b. Joints in direct applied finish systems.
    c. Joints between different materials listed above.
    d. Perimeter joints between materials listed above and frames of doors, windows and louvers.

e. Control and expansion joints in overhead surfaces of materials listed above.

2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 50 or Multicomponent, nonsag, neutral curing.
3. Urethane Joint Sealant: Single component, nonsag, Class 50 or Multicomponent, nonsag, Class 50.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

a. Isolation joints in cast-in-place concrete slabs.
b. Control and expansion joints in stone flooring.
c. Control and expansion joints in tile flooring.

2. Silicone Joint Sealant: Single component, nonsag, traffic grade, neutral curing; Single component, pourable, traffic grade, neutral curing or Multicomponent, pourable, traffic grade, neutral curing.
3. Urethane Joint Sealant: Single component, nonsag, traffic grade; Single component, pourable, traffic grade or Multicomponent, nonsag, traffic grade, Class 50.

D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Perimeter joints of exterior openings where indicated.
c. Tile control and expansion joints.
d. Vertical joints on exposed surfaces of walls and partitions.
e. Perimeter joints between interior wall surfaces and frames of interior doors, windows and elevator entrances.

2. Joint Sealant: Latex.

E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Sealant Location:

a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
b. Tile control and expansion joints where indicated.

2. Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, Silicone.

F. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Location:

a. Acoustical joints where indicated.

2. Joint Sealant: Acoustical.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

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. Standard and custom hollow metal doors and frames.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Division 09 Sections "Interior Painting" for field painting hollow metal doors and frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

C. Custom Hollow Metal Work: Hollow metal work fabricated according to ANSI/NAAMM-HMMA 861.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.

9. Details of conduit and preparations for intrusion detection system

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252.

1. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.

C. Smoke-Control Door Assemblies: Comply with NFPA 105 and UL 1784.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to finish of factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- (102-mm-) high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.7 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 75 percent.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amweld Building Products, LLC.
2. Benchmark; a division of Therma-Tru Corporation.
3. Ceco Door Products; an Assa Abloy Group company.
4. Curries Company; an Assa Abloy Group company.
5. Deansteel Manufacturing Company, Inc.
6. Firedoor Corporation.
7. Fleming Door Products Ltd.; an Assa Abloy Group company.
8. Habersham Metal Products Company.
9. Karpen Steel Custom Doors & Frames.
10. Kewanee Corporation (The).
11. Mesker Door Inc.
12. Pioneer Industries, Inc.
13. Security Metal Products Corp.
14. Steelcraft; an Ingersoll-Rand company.
15. Windsor Republic Doors.

2.3 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 (ZF120) metallic coating.

D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. (96- to 192-kg/cu. m) density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

G. Glazing: Comply with requirements in Division 08 Section "Glazing."

H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.4 HOLLOW METAL DOORS AND FRAMES

A. General: Provide Standard Hollow Metal Doors and Frames may be provided where Manufacturers standard hollow metal doors and frames meet requirements. Provide Custom Hollow Metal Doors and Frames where Manufacturers standard hollow metal doors and frames do NOT meet requirements.

2.5 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

1. Design: Flush panel.
2. Core Construction: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core.

    a. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 4.0 deg F x h x sq. ft./Btu (0.704 K x sq. m/W) when tested according to ASTM C 1363.

        1) Locations: Exterior doors.

3. Vertical Edges for Single-Acting Doors: Manufacturer's standard.
4. Top and Bottom Edges: Closed with flush or inverted 0.042-inch- (1.0-mm-) thick, end closures or channels of same material as face sheets.
5. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

1. Level 3 and Physical Performance Level A (Heavy Duty), Model 2 (Seamless).

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.6 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Exterior Frames: Fabricated from metallic-coated steel sheet.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as full profile welded unless otherwise indicated.
3. Frames for Level 2 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.
4. Frames for Level 3 Steel Doors: 0.053-inch- (1.3-mm-) thick steel sheet.

C. Interior Frames: Fabricated from cold-rolled steel sheet.

1. Fabricate frames with mitered or coped corners.
2. Fabricate frames as full profile welded unless otherwise indicated.
3. Frames for Wood Doors: 0.053-inch- (1.3-mm-) thick steel sheet.

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.7 FRAME ANCHORS

A. Jamb Anchors:

1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.8 STOPS AND MOLDINGS

A. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch (16 mm) high unless otherwise indicated.

B. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch (0.8 mm) thick, fabricated from same material as frames in which they are installed.

2.9 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117 and ANSI/NAAMM-HMMA 861.

C. Hollow Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
2. Astragals: Provide overlapping astragal on one leaf of pairs of doors. Extend minimum 3/4 inch (19 mm) beyond edge of door on which astragal is mounted.

D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
5. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

        1) Three anchors per jamb up to 60 inches (1524 mm) high.
        2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
        3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
        4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
        5) Two anchors per head for frames above 42 inches (1066 mm) wide and mounted in metal-stud partitions.

    b. Postinstalled Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.

6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8 and ANSI/NAAMM-HMMA 861.
2. Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

G. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
2. Provide fixed frame moldings on outside of exterior frames.
3. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.10 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and HMMA 840.

1. 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. At fire-protection-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections because of 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.
    c. Install frames with removable glazing stops located on secure side of opening.
    d. Install door silencers in frames before grouting.
    e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

    a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
5. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

    a. Jambs and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
    b. Between Edges of Pairs of Doors: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).
    c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).
    d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors according to NFPA 105.

D. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (50 mm) o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

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. Solid-core doors with wood-veneer faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

1.3 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction and trim for openings.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire-protection ratings for fire-rated doors.

C. Samples for Initial Selection: For factory-finished doors.

D. Samples for Verification:
1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish.

E. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Source Limitations: Obtain flush wood doors from single manufacturer.

C. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated" and WDMA I.S.1-A, "Architectural Wood Flush Doors."

D. Fire-Rated Wood Doors: Doors 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.

1. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Warping (bow, cup, or twist) more than 1/4 inch (6.4 mm) in a 42-by-84-inch (1067-by-2134-mm) section.
b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch (0.25 mm in a 76.2-mm) span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Algoma Hardwoods, Inc. (Basis of Design)
2. Ampco, Inc.
3. Buell Door Company Inc.
4. Chappell Door Co.
5. Eagle Plywood & Door Manufacturing, Inc.
6. Eggers Industries.
7. Graham; an Assa Abloy Group company.
8. Haley Brothers, Inc.
9. Ideal Architectural Doors & Plywood.
10. Ipik Door Company.
11. Lambton Doors.
12. Marlite.
13. Marshfield Door Systems, Inc.
14. Mohawk Flush Doors, Inc.; a Masonite company.
15. Oshkosh Architectural Door Company.
16. Poncraft Door Company.
17. Vancouver Door Company.
18. VT Industries Inc.

2.2 DOOR CONSTRUCTION, GENERAL

A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

B. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.

C. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as follows:

a. 5-inch (125-mm) top-rail blocking.
b. 5-inch (125-mm) bottom-rail blocking, in doors indicated to have protection plates.
c. 5-inch (125-mm) midrail blocking, in doors indicated to have armor plates.
d. 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.

3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

D. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-2, made with binder containing no urea-formaldehyde.
2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.
3. Provide doors with glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors (Match Doors in adjacent existing Building):

1. Grade: Premium, with Grade A faces.
2. Species: Birch
3. Cut: Rotary Cut
4. Color: To be selected from manufacturers full range
5. Match between Veneer Leaves: Book match.
6. Assembly of Veneer Leaves on Door Faces: Balance match.
7. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
8. Exposed Vertical Edges: Same species as faces.
9. Core: Particleboard.
10. Construction: Five plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.
11. Adhesives: Type I per WDMA TM-6.
12. WDMA I.S.1-A Performance Grade: Heavy Duty.

2.4 LIGHT FRAMES AND LOUVERS

A. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

C. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.

1. Wood Species: Same species as door faces.

2. Profile: Manufacturer's standard shape.
3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.

B. Finish doors at factory. Color to match Architects sample.

C. Transparent Finish:

1. Grade: Premium.
2. Finish: Manufacturers standard finish with performance comparable to AWI catalyzed polyurethane or WDMA TR-6 catalyzed polyurethane.
3. Staining: To match Architects sample.
4. Effect: Open-grain finish.
5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Access doors and frames.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples: For each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches (150 by 150 mm) in size.

C. Product Schedule: For access doors and frames. Use same designations indicated on Drawings.

1.3 CLOSEOUT SUBMITTALS

A. Record Documents: For fire-rated doors, list of applicable room name and number in which access door is located.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES

A. Aluminum Flush Removeable Access Doors:

1. Products by the following Manufacturers will be acceptable:
   a. Acudor – Basis of Design is the FD-8060
   b. Best Access Doors
   c. Cendrex
   d. Approved Equal
2. Description: Face of door flush with frame.
3. Optional Features: Removable doors.
4. Locations: Floor
5. Door Size: 30”x30”
6. Aluminum Sheet for Door: Manufacturers Standard material and finish.
7. Frame Material: Same material, thickness, and finish as door.

8. Latch and Lock: Cam latch, screwdriver operated.

2.2 MATERIALS

A. Aluminum Extrusions: ASTM B221 (ASTM B221M), Alloy 6063.

B. Aluminum Sheet: ASTM B209 (ASTM B209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.

C. Frame Anchors: Same material as door face.

D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.

D. Latch and Lock Hardware:

1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
2. Keys: Furnish two keys per lock and key all locks alike.
3. Mortise Cylinder Preparation: Where indicated, prepare door panel to accept cylinder specified in [Section 087100 "Door Hardware."] [Section 087111 "Door Hardware (Descriptive Specification)."]

E. Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

2.4 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 FIELD QUALITY CONTROL

A. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

B. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

3.4 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 083113

SECTION 084113 - ALUMINUM-FRAMED STOREFRONTS AND INTERIOR STOREFRONT DOORS

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. Exterior and interior storefront framing.

B. Related Sections:

1. Division 08 Section "Glazed Aluminum Curtain Walls" for curtain-wall systems that mechanically retain glazing on four sides.
2. Division 08 Section “Door Hardware” for door hardware to be installed under this division for exterior storefront entrance doors.

1.3 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
2. Dimensional tolerances of building frame and other adjacent construction.
3. Failure includes the following:

a. Deflection exceeding specified limits.
b. Thermal stresses transferring to building structure.
c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
d. Glazing-to-glazing contact.

e. Noise or vibration created by wind and by thermal and structural movements.
f. Loosening or weakening of fasteners, attachments, and other components.
g. Sealant failure.
h. Failure of operating units.

B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.

2. Seismic Loads: As indicated on Drawings.

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.

E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.

F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).

G. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

H. Water Penetration under Dynamic Pressure: Provide aluminum-framed systems that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa)].

1. Maximum Water Leakage: According to AAMA 501.1. No uncontrolled water penetrating aluminum-framed systems or water appearing on systems' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to exterior and water that cannot damage adjacent materials or finishes.

I. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).
b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).

3. Interior Ambient-Air Temperature: 75 deg F (24 deg C).

J. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.

K. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.57 Btu/sq. ft. x h x deg F (3.23 W/sq. m x K) when tested according to AAMA 1503.

L. Sound Transmission: Provide aluminum-framed systems with fixed glazing and framing areas having the following sound-transmission characteristics:

1. Sound Transmission Class (STC): Minimum 30 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
2. Outdoor-Indoor Transmission Class (OITC): Minimum 30 OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

F. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

C. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

D. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

E. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

F. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration caused by thermal movements.
c. Deterioration of metals, metal finishes and other materials beyond normal weathering.
d. Adhesive or cohesive sealant failures.
e. Water leakage through fixed glazing and framing areas.
f. Failure of operating components.

2. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes do not comply with requirements or that fail in materials or workmanship within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 10 years from date of Substantial Completion.

1.9 MAINTENANCE SERVICE

A. Entrance Door Hardware:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

2.2 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, for EXTERIOR aluminum storefront systems provide EFCO System 403 2"x4 ½" Thermal Storefront Framing or comparable product by one of the following:

1. Arcadia, Inc.
2. Arch Aluminum & Glass Co., Inc.
3. CMI Architectural
4. Commercial Architectural Products, Inc.
5. EFCO Corporation.
6. Kawneer North America; an Alcoa company.
7. Leed Himmel Industries, Inc.
8. Pittco Architectural Metals, Inc.
9. TRACO.
10. Tubelite.
11. United States Aluminum.
12. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.
13. YKK AP America Inc.

2.3 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

2.4 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Nonthermal for interior and Thermally broken for exterior.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Center.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.

2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

D. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

E. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.5 GLAZING SYSTEMS

A. Glazing: As specified in Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

2.6 EXTERIOR ENTRANCE DOOR SYSTEMS

A. Interior Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 2-to 2-1/4-inch (50.8- to 57.2-mm) overall thickness, with minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

2. Door Design: Wide stile; 5-inch nominal width.

a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches (255 mm) above floor or ground plane.

3. Glazing Stops and Gaskets: Square snap-on, extruded-aluminum stops and preformed gaskets.

a. Provide nonremovable glazing stops on outside of door.

2.7 ENTRANCE DOOR HARDWARE

A. General: Provide entrance door hardware for each entrance door to comply with requirements in this Section.

1. All Hardware for storefront openings is to be installed by door supplier.

2. Opening-Force Requirements:

a. Accessible Interior Doors: Not more than 5 lbf (22.2 N) to fully open door.

B. Designations: Products are identified by using entrance door hardware designations as follows:

1. References to BHMA Standards: Provide products complying with these standards and requirements for description, quality, and function.

C. Opening-Force Requirements:

1. Latches and Exit Devices: Not more than 15 lbf (67 N) required to release latch.

D. Pivot Hinges: As specified in Division 08 Section "Door Hardware."

E. Mortise Auxiliary Locks: As specified in Division 08 Section "Door Hardware."

F. Manual Flush Bolts: As specified in Division 08 Section "Door Hardware."

G. Automatic and Self-Latching Flush Bolts: As specified in Division 08 Section "Door Hardware."

H. Panic Exit Devices: As specified in Division 08 Section "Door Hardware."

I. Cylinders: As specified in Division 08 Section "Door Hardware."

J. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.

K. Operating Trim: As specified in Division 08 Section "Door Hardware."

L. Closers: As specified in Division 08 Section "Door Hardware."

M. Door Stops: As specified in Division 08 Section "Door Hardware."

N. Silencers: BHMA A156.16, Grade 1.

2.8 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."

B. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil (0.762-mm) thickness per coat.

2.9 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from exterior.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Storefront Framing: Fabricate components for assembly using head-and-sill-receptor system with shear blocks at intermediate horizontal members.

F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. Provide compression weather stripping at fixed stops.

G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. Provide weather sweeps applied to door bottoms.

H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.10 ALUMINUM FINISHES

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: Custom Color selected by the Architect

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Set continuous sill members and flashing in full sealant bed as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

F. Install glazing as specified in Division 08 Section "Glazing."

G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

H. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

3.3 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet (3 mm in 3.7 m); 1/4 inch (6 mm) over total length.
2. Alignment:

a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch (1.5 mm).
b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch (0.8 mm).

B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch (3 mm).

3.4 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.

1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches (75 mm) from the latch, measured to the leading door edge.

END OF SECTION 084113

SECTION 084413 - GLAZED ALUMINUM CURTAIN WALLS AND EXTERIOR STOREFRONT ENTRANCE DOORS

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. Conventionally glazed aluminum curtain walls installed as stick assemblies.
2. Exterior Storefront Entrance Doors

B. Related Sections:

1. Division 07 Section "Joint Sealants" for installation of joint sealants installed with glazed aluminum curtain walls.
2. Division 08 Section “Door Hardware” for door hardware to be installed under this division for exterior storefront entrance doors.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of glazed aluminum curtain walls representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Glazed aluminum curtain walls shall withstand movements of supporting structure indicated on Drawings.
2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.
e. Failure of operating units.

B. Delegated Design: Design glazed aluminum curtain walls, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Structural Loads:

1. Wind Loads: As indicated on Drawings.

D. Structural-Test Performance: Test according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding L/175 of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.
3. Cantilever Deflection: Where framing members overhang an anchor point, limit deflection to two times the length of cantilevered member, divided by 175.

F. Seismic Performance: Glazed aluminum curtain walls shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. Component Importance Factor as indicated on drawings.

G. Water Penetration under Static Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft. (480 Pa).

H. Water Penetration under Dynamic Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to AAMA 501.1 at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 10 lbf/sq. ft. (480 Pa).

1. Maximum Water Leakage: According to AAMA 501.1. No uncontrolled water penetrating assemblies or water appearing on assemblies' normally exposed interior surfaces from sources other than condensation. Water leakage does not include water controlled by flashing and gutters that is drained to exterior.

I. Thermal Movements: Allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures:

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
2. Test Interior Ambient-Air Temperature: 75 deg F (24 deg C).

3. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

J. Energy Performance: Glazed aluminum curtain walls shall have certified and labeled energy performance ratings in accordance with NFRC.

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.57 Btu/sq. ft. x h x deg F (3.23 W/sq. m x K) as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.40 as determined according to NFRC 200.
3. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.30 cfm/sq. ft. (1.50 L/s per sq. m) of fixed wall area as determined according to ASTM E 283 at a minimum static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa) / 6.24 lbf/sq. ft. (300 Pa).
4. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC- certified condensation resistance rating of no less than 45 as determined according to NFRC 500.

K. Sound Transmission: Provide glazed aluminum curtain walls with fixed glazing and framing areas having the following sound-transmission characteristics:

1. Outdoor-Indoor Transmission Class: Minimum 30 when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For glazed aluminum curtain walls. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each vertical-to-horizontal intersection of glazed aluminum curtain walls, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.

3. Include laboratory mockup Shop Drawings, prepared by a qualified preconstruction testing agency, showing details of laboratory mockup.

a. Resubmit Shop Drawings with changes made to glazed aluminum curtain walls to successfully complete preconstruction testing.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Maintenance Data: For glazed aluminum curtain walls to include in maintenance manuals.

F. Warranties: Sample of special warranties.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating glazed aluminum curtain walls that meet or exceed energy performance requirements indicated and of documenting this performance by certification, labeling, and inclusion in lists.

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

E. Energy Performance Standards: Comply with NFRC for minimum standards of energy performance, materials, components, accessories, and fabrication. Comply with more stringent requirements if indicated.

1. Provide NFRC-certified glazed aluminum curtain walls with an attached label.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for glazed aluminum curtain walls by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 WARRANTY

A. Special Assembly Warranty: Standard form in which manufacturer agrees to repair or replace components of glazed aluminum curtain walls that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

    a. Structural failures including, but not limited to, excessive deflection.
    b. Noise or vibration created by wind and thermal and structural movements.
    c. Deterioration of metals, metal finishes and other materials beyond normal weathering.
    d. Water penetration through fixed glazing and framing areas.
    e. Failure of operating components.

2. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

    a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
    b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
    c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

2.2 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, for exterior glazed aluminum curtain-wall systems provide EFCO System 5600 2 1/4” x 6” or comparable product by one of the following:
    1. EFCO Corporation.
    2. Kawneer North America; an Alcoa company.
    3. United States Aluminum.
    4. Vistawall Architectural Products; The Vistawall Group; a Bluescope Steel company.

2.3 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Structural Profiles: ASTM B 308/B 308M.
5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

2.4 FRAMING

A. Framing Members: Manufacturer's standard extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally improved.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Front.

B. Pressure Caps: Manufacturer's standard aluminum components that mechanically retain glazing.

1. Include snap-on aluminum trim that conceals fasteners.
2. Provide Custom and non-standard caps in shapes and sizes indicated on Drawings.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.

E. Use exposed fasteners with countersunk Phillips screw heads, 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

F. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

G. Framing Sealants: Manufacturer's standard sealants.

2.5 GLAZING

A. Glazing: Comply with Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

2.6 EXTERIOR STOREFRONT ENTRANCE DOORS

A. Storefront Entrance Doors: Provide manufacturer's heavy duty 2-inch to 2-1/4 inch thick glazed door with minimum 3/16 inch thick by 3 1/2 inch wide, extruded tubular rail and stile members with 6-1/2 inch high bottom rail and 3-1/2 inch top rail. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie-rods.

1. Doors capable of receiving the following:
   a. Concealed Vertical Rod Exit Device with Request-To-Exit Function and Electric Latch and Rod Retraction.
   b. All door hardware indicated in the Door Hardware Schedule under Section 087100 Door Hardware indicated to be installed on these doors.
   c. All Electric Hardware Components and Wiring associated with the Intrusion Detection and Access Control Systems indicated to be provided on this project.
   d. All hardware indicated under this specification section.
2. Provide one of the following or approved equals that are approved by the Architect before bidding. Submit product data for substitutions at least 10 days prior to bid date. Only products accepted by the Architect and added to this specification by addendum may be provided.

   a. Kawneer 350 Heavy Wall Entrance Doors
   b. Vista Wall Rugged Entrance Systems
   c. EFCO – D300 Series

3. Glazing Stops and Gaskets: Provide manufacturer's standard snap-on extruded aluminum glazing stops and preformed gaskets.
4. Stile Design: Medium stile; three and a half inches wide with six and one half inch maximum high bottom rail.

2.4 DOOR HARDWARE

A. General: Provide heavy-duty units in sizes and types recommended by entrance system and hardware manufacturers for entrances and uses indicated.

1. All hardware for storefront openings are to be installed by door supplier.

2. Opening-Force Requirements:

   a. Egress Doors: Not more than 30 lbf (133 N) required to set door in motion and not more than 15 lbf (67 N) required to open door to minimum required width.
   b. Accessible Interior Doors: Not more than 5 lbf (22.2 N).

B. Pivot Hinges: As specified in Division 8 Section "Door Hardware."

C. Locking Devices: As specified in Division 8 Section "Door Hardware."

D. Mortise Auxiliary Locks: As specified in Division 8 Section "Door Hardware."

E. Manual Flush Bolts: As specified in Division 8 Section "Door Hardware."

F. Automatic and Self-Latching Flush Bolts: As specified in Division 8 Section "Door Hardware."

G. Pull Handles: As specified in Division 8 Section "Door Hardware."

H. Integrated Panic Exit Devices: As specified in Division 8 Section "Door Hardware."

I. Cylinders: As specified in Division 8 Section "Door Hardware."

J. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.

K. Operating Trim: As specified in Division 8 Section "Door Hardware."

L. Closers: As specified in Division 8 Section "Door Hardware."

M. Surface-Mounted Holders: As specified in Division 8 Section "Door Hardware."

N. Door Stops: As specified in Division 8 Section "Door Hardware."

O. Weather Stripping: Manufacturer's standard replaceable components.

1. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
2. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.

P. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.

Q. Silencers: BHMA A156.16, Grade 1.

R. Thresholds: Raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch (13 mm).

1. Standard: BHMA A156.21.

2.7 ACCESSORY MATERIALS

A. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

2.8 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from exterior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
7. Components curved to indicated radii.

D. Fabricate components that, when assembled, have the following characteristics:

1. Internal guttering system or other means to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.
2. Pressure-equalized system or double barrier design with primary air and vapor barrier at interior side of glazed aluminum curtain wall and secondary seal weeped and vented to exterior.

E. Factory-Assembled Frame Units:

1. Rigidly secure nonmovement joints.
2. Seal joints watertight unless otherwise indicated.
3. Install glazing to comply with requirements in Division 08 Section "Glazing."

F. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

G. Storefront Entrance Doors and Frames: Fabricate door framing in profiles indicated. Reinforce as required to support imposed loads. Factory assembled door and frame units and factory install hardware to greatest extent possible. Reinforce door and frame units as required for installing hardware indicated. Cut, drill and tap for factory-installed hardware before finishing components.

1. Exterior Doors: Provide compression weather stripping at fixed stops. At other locations, provide sliding weather stripping retained in adjustable strip mortised into door edge.
2. Prepare doors and frames to accept hardware indicated under Section 08710 - Door Hardware. Acquire templates as necessary from hardware to assure proper installation.

2.9 ALUMINUM FINISHES

A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply

coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: Custom Color selected by the Architect

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Weld components in concealed locations to minimize distortion or discoloration of finish. Protect glazing surfaces from welding.
7. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within glazed aluminum curtain wall to exterior.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Division 08 Section "Glazing."

G. Install Entrance Doors and Frames plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturer's written instructions.

1. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.
2. Products installed but not furnished in this section include:

a. All hardware provide under Division 8, Section "Door Hardware".

3.3 ERECTION TOLERANCES

A. Erection Tolerances: Install glazed aluminum curtain walls to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6 mm in 12 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6 mm in 12 m).
3. Alignment:

a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).

4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.7 m); 1/2 inch (12.7 mm) over total length.

B. Glazed aluminum curtain walls will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 084413

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes items known commercially as finish or door hardware that are required for swing doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed. All door hardware must be in compliance with ADA and ANSI A117.1.

B. This Section includes the following:

1. Hinges.
2. Key control system.
3. Lock cylinders and keys.
4. Lock and latch sets.
5. Bolts.
6. Exit devices.
7. Push/pull units.
8. Closers.
9. Overhead holders.
10. Miscellaneous door control devices.
11. Door trim units.
12. Kick plates.
13. Weatherstripping for exterior doors.
14. Sweeps.
15. Sound stripping for interior doors.
16. Astragals or meeting seals on pairs of doors.
17. Thresholds.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. **Division 1 Section “Allowances” Door Hardware is to be supplied and installed under allowance.**
2. Division 8 Section "Hollow Metal Frames and Doors" for silencers integral with hollow metal frames.
3. Division 8 Section "Flush Wood Doors" for factory prefitting and factory premachining of doors for door hardware.

D. Products furnished but not installed under this Section include:

1. Hardware for Storefront Entrance Doors.

1.3 DOOR HARDWARE ALLOWANCE

A. Door Hardware Selection: Furnish and Install door hardware indicated and in quantities indicated in door hardware schedule. Door hardware schedule is to be accomplished by hardware supplier and is to be submitted for architect's review and approval.

B. Allowance: Award purchase order to supplier selected to furnish and install hardware.

C. Allowance Adjustment: A change order will be issued to adjust difference between door hardware allowance and purchase order to door hardware supplier.

1.4 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification sections.

B. Product data including manufacturers' technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.

C. Final hardware schedule coordinated with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Final Hardware Schedule Content: Based on hardware indicated, organize schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:

   a. Type, style, function, size, and finish of each hardware item.
   b. Name and manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of each hardware set cross-referenced to indications on Drawings both on floor plans and in door and frame schedule.
   e. Explanation of all abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for hardware.
   g. Door and frame sizes and materials.
   h. Keying information.

2. Submittal Sequence: Submit final schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work that is critical in the Project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by door hardware, and other information essential to the coordinated review of schedule.

D. Templates for doors, frames, and other work specified to be factory prepared for the installation of door hardware. Check shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

1.5 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer.

B. Supplier Qualifications: An architectural door hardware supplier, with warehousing facilities in South Carolina, that can supply door hardware similar in quantity, type, and quality to that indicated for this Project and that employs an architectural hardware consultant (AHC) with a minimum of five years experience who is available to Owner, Architect, and Contractor, at reasonable times during the course of the Work, for consultation.

2. Require supplier to meet with Owner to finalize keying requirements and to obtain final instructions in writing.

D. Americans with Disabilities Act (ADA): Provide and install finish hardware in accordance with requirements of Americans with Disabilities Act (ADA). Specifically, comply with ADA sections relating to accessibility and usability.

Notification of Architect: Before installation of finish hardware, notify Architect of any Contract Document requirements that are suspected to be in noncompliance with ADA.

ANSI Standards for Physically Handicapped: Finish Hardware shall comply with: "American National Standard for Buildings and Facilities – Providing Accessibility and Usability for Physically Handicapped People" (ANSI A117.1-1986) 1986 edition, by American National Standards Institute, Inc.; New York, New York. Before installation of finish hardware, Notify Architect of any Contract Document requirements that are suspected to be in noncompliance with ANSI A117.1-1986. In addition, before installation of finish hardware, notify Architect of conflicting requirements of ADA and ANSI A117.1-1986.

1.6 PRODUCT HANDLING

A. Tag each item or package separately with identification related to final hardware schedule.

B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.

C. Inventory door hardware jointly with representatives of hardware supplier and hardware installer until each is satisfied that count is correct.

D. Deliver individually packaged door hardware items promptly to place of installation (shop or Project site).

E. Provide secure lock-up for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.7 MAINTENANCE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance

instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

1.8 SUBMITTALS:

A. Product Data: Submit manufacturers technical product data for each item of hardware in accordance with Division-1 section "Submittals". Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finish.

B. Vertical Hardware Schedule: Submit final hardware schedule in manner indicated below. Coordinate hardware with doors, frames, and related work to ensure proper size, thickness, hand, function and finish of hardware.

1. Final Hardware Schedule Content: Based on finish hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:
   a. Type, style, function, size and finish of each hardware item.
   b. Name and manufacturer of each item.
   c. Fastening and other pertinent information.
   d. Location of hardware set cross-referenced to indications on Drawings both on floor plans and in door schedule.
   e. Explanation of all abbreviations, symbols, codes, etc. contained in schedule.
   f. Door and frame sizes and materials.
   g. Keying information.

C. Submittal Sequence: Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) which is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by finish hardware, and other information essential to the coordination review of hardware schedule.

D. Templates: Furnish hardware templates to each fabricator of doors, frames, and other work being factory-prepared for the installation of hardware. Upon request, check shop drawings of other such others work to confirm that adequate provisions are made for proper location and installation of hardware.

E. Wiring Diagrams: Furnish wiring diagrams, include elevation drawings and operation narrative.

F. Operations and Maintenance Data: After installation, representative templates, instructions sheets and installation details shall be provided to the owner when building is accepted. Include one copy of each hardware schedule, keying and wiring diagrams.

PART 2 - PRODUCTS

2.1 SCHEDULED HARDWARE

A. Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of finish hardware are indicated in the "Hardware Schedule" at the end of this Section.

1. ANSI/BHMA designations used elsewhere in this Section or in schedules to describe hardware items or to define quality or function are derived from the following standards. Provide products complying with these standards and requirements specified elsewhere in this Section.

    a. Butts and Hinges: ANSI/BHMA A156.1.
    b. Bored and Preassembled Locks and Latches: ANSI/BHMA A156.2.
    c. Exit Devices: ANSI/BHMA A156.3.
    d. Door Controls - Closers: ANSI/BHMA A156.4.
    e. Auxiliary Locks and Associated Products: ANSI/BHMA A156.5.
    f. Architectural Door Trim: ANSI/BHMA A156.6.
    g. Template Hinge Dimensions: ANSI/BHMA A156.7.
    h. Door Controls - Overhead Holders: ANSI/BHMA A156.8.
    i. Interconnected Locks and Latches: ANSI/BHMA A156.12.
    j. Mortise Locks and Latches: ANSI/BHMA A156.13.
    k. Auxiliary Hardware: ANSI/BHMA A156.16.
    l. Self-Closing Hinges and Pivots: ANSI/BHMA A156.17.
    m. Materials and Finishes: ANSI/BHMA A156.18.

2.4 MATERIALS AND FABRICATION

A. Base Metals: Produce hardware units of basic metal and forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units by applicable ANSI/BHMA A156 series standards for each type of hardware item and with ANSI/BHMA A156.18 for finish designations indicated. Do not furnish "optional" materials or forming methods, except as otherwise specified.

B. Fasteners: Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation. Do not provide hardware that has been prepared for self-tapping sheet metal screws, except as specifically indicated.

C. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match hardware finish or, if exposed in surfaces of other work, to match finish of this other work as closely as possible including "prepared for paint" surfaces to receive painted finish.

2.4 LOCK CYLINDERS AND KEYING

A. General: Supplier will meet with Owner to finalize keying requirements and to obtain final instructions in writing.

B. Comply with Owner's instructions for Master Key System and, except as otherwise indicated, provide individual change key for each lock that is not designated to be keyed alike with a group of related locks. Key system is to be compatible with the existing campus key system.

1. Permanently inscribe each key with number of lock that identifies cylinder manufacturer's key symbol, and notation, "DO NOT DUPLICATE."

C. Key Material: Provide keys of nickel silver only.

D. Key Quantity: Furnish 3 change keys for each lock.

2. Deliver permanent keys to Owner’s representatives.
3. Factory construction key project.

2.5 KEY CONTROL SYSTEM

A. Provide a key control system including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150 percent of the number of locks required for the Project.

1. Provide complete cross index system set up by key control manufacturer, and place keys on markers and hooks in the cabinet as determined by the final key schedule.
2. Provide hinged-panel type cabinet for wall mounting, lockable.

B. Provide a surface mounted stainless steel key lock box for fire department use (see drawings for location and mounting height).

PART 3 - EXECUTION

3.1 INSTALLATION

A. Hardware installer is to provide the installation of all items identified in the Hardware Schedule except where indicated to be installed by other subcontractors.

B. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations and except as otherwise directed by Architect.

C. Install each hardware item in compliance with the manufacturer's instructions and recommendations. Where cutting and fitting is required to install hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation or application of surface protection with finishing work specified in the Division 9 Sections. Do not install surface-mounted items until finishes have been completed on the substrates involved.

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 that are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

F. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant.

G. Weather-stripping and Seals: Comply with manufacturer's instructions and recommendations to the extent installation requirements are not otherwise indicated.

H. Products furnished but not installed under this specification included:

1. Hardware for Storefront Entrance Doors.

3.2 ADJUSTING, CLEANING, AND DEMONSTRATING

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made at no expense to the Owner.

B. Clean adjacent surfaces soiled by hardware installation.

C. Instruct Owner's personnel in the proper adjustment and maintenance of door hardware and hardware finishes.

3.3 HARDWARE SCHEDULE

A. General: Provide hardware for each door to comply with requirements of this specification and the Hardware Set Numbers indicated in the “Hardware Schedule”. Door hardware schedule is to be accomplished by hardware supplier and is to be submitted for architect’s review and approval.

1. Hardware sets indicate quantity, item, product designation, size, finish and color, and manufacturer as applicable.

a. Finish is to be Satin Chrome US26D/626-652

B. Division 26 contractor will be responsible for providing wiring, conduit, boxes and final connection of power for all electronic hardware in the following schedule. The Division 8 hardware contractor/supplier will furnish and install all hardware as scheduled in the following hardware schedule except as noted otherwise.

END OF SECTION 087100

SECTION 088000 - GLAZING

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. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Doors.
2. Glazed curtain walls.
3. Glazed entrances.
4. Exterior Storefront framing.
5. Fire-Protective Rated Glass
6. Fire Resistive Rated Glass

1.3 DEFINITIONS

A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

E. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Glass Design: Glass thickness designations indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites in the thickness designations indicated for various size openings, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

a. Specified Design Wind Loads: As indicated on drawings, but not less than wind loads applicable to Project as required by ASCE 7 "Minimum Design Loads for Buildings and Other Structures": Section 6.0 "Wind Loads."
b. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.

1) Load Duration: 60 seconds or less.

c. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch (25 mm), whichever is less.

1) For monolithic-glass lites heat treated to resist wind loads.
2) For insulating glass.
3) For laminated-glass lites.

d. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.

C. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

D. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites ¼-inch thick.

2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
3. Center-of-Glass Values: Based on using LBL-44789 WINDOW 5.0 computer program for the following methodologies:

    a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F (W/sq. m x K).
    b. Solar Heat Gain Coefficient: NFRC 200.
    c. Solar Optical Properties: NFRC 300.

1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Warranties: Special warranties specified in this Section.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass.

C. Source Limitations for Glass Sputter-Coated with Solar-Control Low-E Coatings: Where solar-control low-e coatings of a primary glass manufacturer that has established a certified fabricator program is specified, obtain sputter-coated solar-control low-e-coated glass in fabricated units from a manufacturer that is certified by coated-glass manufacturer.

D. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

E. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.

1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

F. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

G. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:

1. Insulating Glass Certification Council.
2. Associated Laboratories, Inc.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

1.9 WARRANTY

A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Basis-of-Design Product: The design for Low E Insulated Glass product is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified. Equal products to be approved by architect prior to bidding, submit products for substitution approval 10 days prior to bid date.

2.2 GLASS PRODUCTS

A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class 1 Clear and condition indicated.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
2. For uncoated glass, comply with requirements for Condition A.
3. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
4. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.

C. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
2. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.
3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.

4. Sealing System: Dual seal, with primary and secondary sealants as follows:

    a. Manufacturer's standard sealants.

5. Spacer Specifications: Manufacturer's standard spacer material and construction.

D. Coated Spandrel Float Glass: Float glass complying with other requirements specified and with the following:

1. Fallout Resistance: Provide spandrel units identical to those passing the fallout-resistance test for spandrel glass specified in ASTM C 1048.
2. Factory apply manufacturer's standard opacifier of the following material to coated second surface of lites, with resulting products complying with Specification No. 89-1-6 in GANA Tempering Division's "Engineering Standards Manual."

    a. Manufacturer's standard opacifier material.
    b. Polyester film laminated to glass with solvent-based adhesive.

2.3 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:

1. Neoprene, ASTM C 864.
2. EPDM, ASTM C 864.
3. Silicone, ASTM C 1115.
4. Thermoplastic polyolefin rubber, ASTM C 1115.
5. Any material indicated above.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:

1. Neoprene.
2. EPDM.
3. Silicone.
4. Thermoplastic polyolefin rubber.
5. Any material indicated above.

C. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock-strips, complying with ASTM C 542, black.

2.4 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; packaged on rolls with release liner protecting adhesive; and complying with AAMA 800 for the following types:

1. Type 1, for glazing applications in which tape acts as the primary sealant.
2. Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.5 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.6 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with outdoor and indoor faces.

C. Grind smooth and polish exposed glass edges and corners.

D. Confirm with storefront and curtain wall manufacturer that glazing thicknesses indicated can be accommodated and will be accepted by the systems used on this project.

2.7 MONOLITHIC FLOAT-GLASS UNITS

A. Uncoated Clear Float-Glass Units (G1 and G1S): Class 1 (clear)

1. Thickness:

a. (G1) -1 inch Insulated Assembly Unit (25.0 mm) – 1/4-inch Glass
b. (G1S) 1 inch Insulated Assembly Unit (25.0 mm) – 1/4-inch Glass

B. Uncoated Clear Float-Glass Units (G1T, G2T and G4-T)): Class 1 (clear) or Kind FT (fully tempered) float glass.

1. Thickness:
   a. (G1T) - 1 inch Insulated Assembly Unit Tempered (25.0 mm) – 1/4-inch Glass.
   a. (G2T) – 5/8 inch Insulated Assembly Unit Tempered (25.0 mm) – 3/16-inch Glass
   b. (G4-T) – 1/4-inch (6.0 mm) Clear fully tempered float glass, 6.0mm, polished edges

2.8 INSULATING-GLASS UNITS

A. Passive Solar Low-E Insulating-Glass Units (G1) (G1T) (G2T):

1. Basis of Design: PPG Solarban 60 Low-E Glass. Provide basis of design or equal product by one of the following manufacturers. Products subject to compliance with requirements. Submit equal products for substitution at least 10 days prior to bid date. Products that may be substituted included only those approved by architect and added by addendum.

   a. AFG Industries Inc.
   b. Pilkington Building Products
   c. Viracon
   d. Visteon

2. Minimum Characteristics for 1-inch insulated glass system:

   a. Winter Nightime U-Value .29 min
   b. Summer Daytime U-Value .27 min
   c. Shading Coefficient .44 min
   d. Visible Light .70 min
   e. Solar Heat Gain Coefficient .38 min
   f. Ultra Violet % .19 min

3. Overall Unit Thickness and Thickness of Each Lite:

   a. (G1) (G1T) - 1 inch and 1/4-inch each lite
   b. (G2T) – 5/8 inch and 1/4 inch each lite.

4. Interspace Content: Air or Argon as required to meet minimum characteristics, 1/2 –inch space. (1/4-inch for G2T)

5. Class 1 (clear) float glass:

   a. Annealed and Kind FT (fully tempered) where indicated – (G1T)

6. Low-E Coating: Pyrolytic or sputtered on second surface of all units.

2.9 INSULATED FIRE-RESISTANCE-RATED GLAZING (G3F)

A. General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-resistance ratings indicated, based on testing in accordance with ASTM E119 or UL 263.

B. Fire-Resistance-Rated Glazing Labeling: Permanently mark fire-resistance-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, that glazing is approved for use in walls, and fire-resistance rating in minutes.

C. Fire-Resistance-Rated Laminated Glass with Intumescent Interlayers: Laminated glass made from multiple plies of uncoated, clear or low iron float glass; with intumescent interlayers; complying with 16 CFR 1201, Category II.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Safti First; SuperLite C/P. (Basis of Design is Superlite II-XL 60)
b. Schott North America, Inc.
c. Vetrotech Saint-Gobain; SGG Keralite FR-R.

2. Overall Unit Thickness and Thickness of Each Lite:

a. (G3F) - 1 3/8 inch – 3/8” Fire Resistive Safety Glazing, 5/8” Semi-Rigid Intumescent Layer, 3/8” Fire Resistive Safety Glazing.

2.10 INSULATED FIRE-PROTECTION-RATED GLAZING (G5F)

A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies and NFPA 257 for window assemblies.

B. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name; test standard; whether glazing is permitted to be used in doors or openings; if permitted in openings, whether glazing has passed hose-stream test; whether glazing meets 450 deg F (250 deg C) temperature-rise limitation; and fire-resistance rating in minutes.

A. **G5F Fire Protective Rated Glass for 45 Minute and G5F for 60 Minute Doors (D-H-45) and (D-H-60 w/ 100 square inches max)**; 3/4-inch thick fire-protection-rated tempered glass complying with 16 CFR 1201, Category II.

1. Basis of Design Products: SAFTIFirst SuperLite X-45 and X-60 Fire Protective Glazing

2. Subject to compliance with requirements and glazing sizes indicated on drawings provide a Product from one of the following Manufactures:

a. AGC Glass Company North America

b. SAFTI FIRST Fire Rated Glazing (Basis of Design)
c. Schott North America, Inc.
d. Technical Glass Products
e. Vetrotech Saint-Gobain

3. Glass Types Fire Protective Ratings:

a. G4F – 45 Minute Fire Rated - SAFTIFirst SuperLite X-45
b. G5F – 60 Minute Fire Rated - SAFTIFirst SuperLite X-60

4. Fire-Rated Glass Assembly Requirements per IBC 2021 Requirements, Table 716.1(2):

a. D – Meets fire door assembly criteria. NFPA 252 or UL 10B or UL 10C
b. H – Meets fire door assembly hose test. NFPA 252 or UL 10B or UL 10C.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing glazing, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or

other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm) as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.6 LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer's written instructions. Provide supplementary wet seal and weep system, unless otherwise indicated.

3.7 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations, including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

SECTION 092116.23 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

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: Gypsum board shaft wall assemblies.

1.3 ACTION SUBMITTALS

A. Product Data: For each component of gypsum board shaft wall assembly.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or with gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

A. Fire-Resistance Rating: As indicated.

B. Studs: Manufacturer's standard profile for repetitive members, corner and end members, and fire-resistance-rated assembly indicated.

1. Depth: As indicated on the Drawings.
2. Minimum Base-Metal Thickness: 0.018 inch or as indicated on the Drawings.

C. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches long and matching studs in depth.

1. Minimum Base-Metal Thickness: Matching steel studs.

D. Firestop Tracks: Provide firestop track at head of shaft wall on each floor level.

E. Finishes: As indicated on Drawings.

F. Insulation: Sound attenuation blankets.

2.3 PANEL PRODUCTS

A. Regional Materials: Gypsum panel products shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

B. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

C. Gypsum Shaftliner Board, Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with paper faces.

1. Products: Subject to compliance with requirements, provide product most suitable for conditions. Available products that may be incorporated into the Work include, but are not limited to, the following manufacturers:
   a. American Gypsum (Basis of Design).
   b. CertainTeed Corp.

c. USG Corporation.
d. Georgia-Pacific Gypsum LLC.
e. National Gypsum Company.

2. Thickness: 1 inch (25.4 mm).
3. Long Edges: Double bevel.

D. Gypsum Board: As specified in Section 092900 "Gypsum Board."

2.4 NON-LOAD-BEARING STEEL FRAMING

A. Steel Framing Members: Comply with ASTM C 645 requirements for metal unless otherwise indicated.

1. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40 (Z120) unless otherwise indicated.

B. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Products: Subject to compliance with requirements, provide product most suitable for conditions. Available products that may be incorporated into the Work include, but are not limited to, the following manufacturers:
   a. Blazeframe Industries
   b. Fire Trak Corp
   c. Grace Construction Products.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with manufacturer's written recommendations.

B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in Section 092900 "Gypsum Board" that comply with gypsum board shaft wall assembly manufacturer's written recommendations for application indicated.

C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

1. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing according to ASTM E 488 conducted by a qualified testing agency.
2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing according to ASTM E 1190 conducted by a qualified testing agency.

E. Sound Attenuation Blankets: As specified in Section 072100 under “Mineral Wool Blanket Insulation”

F. Acoustical Sealant: As specified in Section 079200 " Joint Sealants".

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board shaft wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Sprayed Fire-Resistive Materials: Coordinate with gypsum board shaft wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive materials removed or damaged during installation of shaft wall assemblies to comply with requirements specified in Section 078100 "Applied Fireproofing."

B. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of gypsum board shaft wall assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION

A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and ASTM C 754 other than stud-spacing requirements.

B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.

C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.

D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.

F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

G. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect while maintaining fire-resistance rating of gypsum board shaft wall assemblies.

H. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.4 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092116.23

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

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. Non-load-bearing steel framing systems for interior gypsum board assemblies.
2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

B. Related Requirements:

1. Section 054000 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATION SUBMITTALS

A. Evaluation Reports: For firestop tracks, from ICC-ES.

PART 2 - PRODUCTS

2.1 DESCRIPTION

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: hot-dip galvanized, unless otherwise indicated.

B. Studs and Runners: ASTM C 645.

1. Steel Studs and Runners:

a. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).
b. Depth: As indicated on Drawings.
c. Provide deeper runner track as needed in location which are to receive SFRM in order to facilitate installation of studs.

C. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.

D. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of **studs.**

1. Products: Subject to compliance with requirements, provide one of the following:

a. Fire Trak Corp.; Fire Trak System attached to studs with Fire Trak Posi Klip.
b. Grace Construction Products; FlameSafe FlowTrak System.
c. Metal-Lite, Inc.; The System.

E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm)

F. Cold-Rolled Channel Bridging: Steel, 0.053-inch (1.34-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.

G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.018 inch (0.45 mm).

2. Depth: As indicated on Drawings.

H. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.

1. Configuration: Asymmetrical.

I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.018 inch, and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

B. Hanger Attachments to Concrete:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.

2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.

D. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Armstrong World Industries, Inc.; Drywall Grid Systems.
b. Chicago Metallic Corporation; Drywall Grid System.
c. USG Corporation; Drywall Suspension System.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (610 mm) o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

1. Space studs as follows:

    a. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
    b. Multilayer Application: 16 inches o.c. unless otherwise indicated.
    c. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

    a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Curved Partitions:

    a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
    b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches (150 mm) o.c.

D. Z-Furring Members:

1. Erect insulation (specified in Section 072100 "Thermal Insulation") vertically and hold in place with Z-furring members spaced 24 inches o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (305 mm) from corner and cut insulation to fit.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

    a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

    a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.

6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

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. Interior gypsum board.

B. Related Requirements:

1. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.3 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide one of the following:

1. American Gypsum.
2. Georgia-Pacific Gypsum LLC.
3. Lafarge North America Inc.
4. National Gypsum Company.
5. PABCO Gypsum.
6. Temple-Inland.
7. USG Corporation.

B. Gypsum Wallboard: ASTM C 1396/C 1396M.

1. Thickness: 1/2 inch (12.7 mm).
2. Long Edges: Tapered

C. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered

D. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Thickness: 1/2 inch (12.7 mm).
2. Long Edges: Tapered.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
2. Shapes:

a. Cornerbead.
b. Bullnose bead.
c. LC-Bead: J-shaped; exposed long flange receives joint compound.
d. L-Bead: L-shaped; exposed long flange receives joint compound.
e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
f. Expansion (control) joint.
g. Curved-Edge Cornerbead: With notched or flexible flanges.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Thermal and Sound Attenuation Insulation: As specified in Division 07 Section “Thermal Insulation”.

D. Acoustical Joint Sealant As specified in Division 07 Section “Joint Sealant”.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Type X: As indicated on Drawings.
2. Moisture- and Mold-Resistant Type: As indicated on Drawings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or

furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.4 APPLYING TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.

B. Water-Resistant Backing Board: Install where indicated with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.

C. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at locations indicated on Drawings and according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.
3. U-Bead: Use at exposed panel edges and where indicated.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. 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 substrate for tile and are concealed at fire ratings.
3. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.

    a. Primer and its application to surfaces are specified in other Section 099123 "Interior Painting."

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

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. Resilient base (Rubber Base).
2. Resilient molding accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches (300 mm) long.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products 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 (13 deg C) or more than 95 deg F (35 deg C).

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE (RB-1)

A. Manufacturers: Subject to compliance with performance, provide product indicated on Drawings or comparable product by one of the following:
1. Johnsonite; A Tarkett Company. (Basis of Design)
2. Mannington
3. Roppe Corporation, USA.

B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).

1. Style:
   a. Style A, Straight: (RB-2) Straight, Tight Locket.
   b. Style B, Cove: (RB-1), Cove.

C. Thickness: 0.125 inch (3.2 mm).

D. Height: 4 Inches (RB-1, RB-2).

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Preformed.

G. Inside Corners: Job formed.

H. Colors: As indicated on Drawings.

2.2 RUBBER MOLDING ACCESSORY

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Roppe Corporation, USA (Basis of Design)
2. Johnsonite; A Tarkett Company.
3. Armstrong World Industries

B. Description: Rubber carpet edge for glue-down applications, reducer strip for resilient flooring, joiner for tile and carpet, and transition strips.

C. Profile and Dimensions: As indicated on Drawings.

D. Locations: As indicated on Drawings.

E. Colors and Patterns: As indicated on Drawings to match Cove base.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less.

C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:

    a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
    b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products 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 products and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before applying liquid floor polish.

1. Apply one coat.

E. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096516 - RESILIENT SHEET FLOORING

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. Vinyl sheet flooring with backing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of resilient sheet flooring.

   1. Include sheet flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
   2. Show details of special patterns.

C. Samples: For each exposed product and for each color, texture, and pattern specified, in manufacturer's standard size, but not less than 6-by-9-inch (150-by-230-mm) sections.

D. Samples for Initial Selection: For each type of resilient sheet flooring indicated.

E. Samples for Verification: For each type of resilient sheet flooring, in manufacturer's standard size, but not less than 6-by-9-inch (150-by-230-mm) sections of each color, texture, and pattern required.

F. Product Schedule: For resilient sheet flooring. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of resilient sheet flooring to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for resilient sheet flooring installation and seaming method indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store resilient sheet flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C). Store rolls upright.

1.8 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 85 deg F (29 deg C) in spaces to receive resilient sheet flooring during the following 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 (13 deg C) or more than 95 deg F (35 deg C).

C. Close spaces to traffic during resilient sheet flooring installation.

D. Close spaces to traffic for 48 hours after resilient sheet flooring installation.

E. Install resilient sheet flooring after other finishing operations, including painting, have been completed.

1.9 WARRANTY

A. Manufacturer warrants that flooring products are free from manufacturing defects. Refer to product-specific warranty document for additional detail and warranty period.

1. Material warranty must be direct from the product manufacturer.

2. Material warranties from separate or third-party insurance providers are not valid.

3. Material warranties from private label distributors are not valid.

4. Failures include the following:

a. Material manufacturing defects.

5. Warranty Period:

a. For materials: 10 years from date of Substantial Completion

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient sheet flooring, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.

2.2 VINYL SHEET FLOORING WITH BACKING (SV-1)

A. Basis of Design Product is Premium Comfort by Gerflor. Other equal manufacturers and products may be considered.

B. Product Standard: ASTM F1303.
1. Wear-Layer Thickness: 40mil.
2. Overall Thickness: 3mm (0.12)
3. Interlayer Material: Manufacturers standard.
4. Backing Class: Class C (foamed plastic).

C. Wearing Surface: Smooth.

D. Sheet Width: As standard with manufacturer

E. Seamless-Installation Method: Heat welded.

F. Colors and Patterns: Refer to Drawings for color and pattern.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient sheet flooring manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit resilient sheet flooring and substrate conditions indicated.

C. Seamless-Installation Accessories:

1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.

a. Colors: As selected by Architect from manufacturer's full range to contrast with flooring.

2. Chemical-Bonding Compound: Manufacturer's product for chemically bonding seams.

D. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient sheet flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient sheet flooring.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to resilient sheet flooring manufacturer's written instructions to ensure adhesion of resilient sheet flooring.

B. Concrete Substrates: Prepare according to ASTM F710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient sheet flooring manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by resilient sheet flooring manufacturer.

    a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of [3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m)] <Insert rate> in 24 hours.
    b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum [75] <Insert number> percent relative humidity level measurement.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient sheet flooring until materials are the same temperature as space where they are to be installed.

1. At least 48 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient sheet flooring.

3.3 RESILIENT SHEET FLOORING INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient sheet flooring.

B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.

C. Lay out resilient sheet flooring as follows:

1. Maintain uniformity of flooring direction.
2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches (152 mm) away from parallel joints in flooring substrates.
3. Match edges of flooring for color shading at seams.
4. Avoid cross seams.

D. Scribe and cut resilient sheet flooring to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install resilient sheet flooring on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.

H. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.

B. Perform the following operations immediately after completing resilient sheet flooring installation:

1. Remove adhesive and other blemishes from surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient sheet flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from flooring surfaces before applying liquid floor polish.

1. Apply the number of coats recommended by the manufacturer.

E. Cover and protect resilient sheet flooring until Substantial Completion.

END OF SECTION 096516

SECTION 099113 - EXTERIOR PAINTING

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. This Section includes surface preparation and the application of paint systems on the following exterior substrates:
   1. Galvanized metal.
   2. Steel.
   3. Concrete

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each type of paint system and each color and gloss of topcoat indicated.

   1. Submit Samples on rigid backing, 8 inches (200 mm) square.
   2. Step coats on Samples to show each coat required for system.

1.4 QUALITY ASSURANCE

A. MPI Standards:

   1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
   2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

   1. Final approval of color selections will be based on benchmark samples.

      a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Benjamin Moore & Co.
2. Duron, Inc.
3. ICI Paints.
4. Miller Paint.
5. Porter Paints.
6. PPG Architectural Finishes, Inc.
7. Rose Talbert
8. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: Match exterior prefinished material as identified on Exterior Finish Notes on A4.1 and as approved by architect.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust and loose mill scale. Clean using methods recommended in writing by paint manufacturer.

F. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:

1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance of paint materials with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-

paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Galvanized-Metal Substrates:

1. Water-Based Light Industrial Coating System:

   a. Prime Coat: Primer, galvanized, water based**, MPI #134**.
   b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
   c. Topcoat: Light industrial coating, exterior, water based (Gloss Level 3)**, MPI #161**.

B. Steel Substrates:

1. Alkyd System:
   a. Prime Coat: Shop primer specified in Section where substrate is specified.
   b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
   c. Topcoat: Alkyd, exterior, semi-gloss (Gloss Level 5)**, MPI #94**.

C. Concrete Substrates, Nontraffic Surfaces:

1. Water-Based Light Industrial Coating System **MPI EXT 3.1C**:
   a. Prime Coat: Primer, alkali resistant, water based**, MPI #3**.
   b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
   c. Semigloss Topcoat: Light industrial coating, exterior, water based, semigloss (MPI Gloss Level 5)**, MPI #163**.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

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 surface preparation and the application of paint systems on the following interior substrates:
   1. Steel.
   2. Wood / MDF
   3. Gypsum board.
   4. Concrete

1.3 DEFINITIONS

A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
   1. Submit Samples on rigid backing, 8 inches 200 mm square.
   2. Step coats on Samples to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:
   1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
   2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
   3. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Paint: 5 percent, but not less than 1 gal.3.8 L of each material and color applied.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F7 deg C.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F10 and 35 deg C.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F 3 deg C above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Benjamin Moore & Co.
   2. PPG Architectural Finishes, Inc.
   3. Sherwin-Williams Company (The).

B. Products: Subject to compliance with requirements, provide product listed in other Part 2 articles for the paint category indicated.

C. Refer to Finish Schedule located on the Drawings.

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:
   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   1. Flat Paints and Coatings: 50 g/L.
   2. Nonflat Paints and Coatings: 150 g/L.

3. Dry-Fog Coatings: 400 g/L.
4. Primers, Sealers, and Undercoaters: 200 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Floor Coatings: 100 g/L.
9. Shellacs, Clear: 730 g/L.
10. Shellacs, Pigmented: 550 g/L.

D. Colors: As indicated on the Drawings.

2.3 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Concrete: 12 percent.
2. Wood: 15 percent.
3. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Steel Substrates (Not Shop Primed): Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer[.] [but not less than the following:]
   1. SSPC-SP 2, "Hand Tool Cleaning."

E. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Wood Substrates:
   1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
   2. Sand surfaces that will be exposed to view, and dust off.
   3. Prime edges, ends, faces, undersides, and backsides of wood.
   4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
   1. Use applicators and techniques suited for paint and substrate indicated.
   2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
   3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
   4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
   5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
   1. Paint the following work where exposed in equipment rooms:
      a. Equipment, including panelboards and switch gear.
      b. Uninsulated metal piping.
      c. Uninsulated plastic piping.
      d. Pipe hangers and supports.
      e. Metal conduit.
      f. Plastic conduit.
      g. Tanks that do not have factory-applied final finishes.
      h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
   2. Paint the following work where exposed in occupied spaces:
      a. Equipment, including panelboards.
      b. Uninsulated metal piping.
      c. Uninsulated plastic piping.
      d. Pipe hangers and supports.
      e. Metal conduit.
      f. Plastic conduit.
      g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
      h. Other items as directed by Architect.
   3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
   1. Contractor shall touch up and restore painted surfaces damaged by testing.
   2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Steel Substrates:
1. Institutional Low-Odor/VOC Latex System:
a. Prime Coat: Primer, rust-inhibitive, water based MPI #107.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 3), MPI #145.

B. Galvanized-Metal Substrates:
1. Institutional Low-Odor/VOC Latex System:
a. Prime Coat: Primer, galvanized, water based, MPI #134.
b. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.

C. Wood / MDF Substrates: Including wood trim and architectural woodwork.
1. Institutional Low-Odor/VOC Latex System:
a. Prime Coat: Primer, latex, for interior wood, MPI #39.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.

D. Gypsum Board Plaster Substrates:
1. Institutional Low-Odor/VOC Latex System:
a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), MPI #147.

E. Concrete Substrates, Traffic Surfaces:

1. Solvent-Based Concrete Floor Sealer System**, MPI INT 3.2F**:

a. First Coat: Sealer, solvent based, for concrete floors, matching topcoat.
b. Topcoat: Sealer, solvent based, for concrete floors**, MPI #104**.

END OF SECTION

SECTION 099300 - STAINING AND TRANSPARENT FINISHING

1.1 SUMMARY

A. Section Includes:

1. Primers
2. Wood stains.
3. Transparent finishes.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.
2. Include preparation requirements and application instructions.
3. Indicate VOC content.

B. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of exposed finish.

C. Samples for Verification: Sample for each type of finish system and in each color and gloss of finish required on representative samples of actual wood substrates.

1. Size: **8 inches (200 mm) square**
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.3 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials[**, from the same product run,**] that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Stains and Transparent Finishes: **5** percent, but not less than **1 gal. (3.8 L)** of each material and color applied.

1.4 MOCKUPS

A. Apply mockups of each finish system indicated and each color selected **to verify preliminary selections made under Sample submittals, to demonstrate aesthetic effects and to set quality standards for materials and execution**.

1. Architect will select one surface to represent surfaces and conditions for application of each type of finish system and substrate.

    a. Other Items: Architect will designate items or areas required.

2. Final approval of stain color selections will be based on mockups.

    a. If preliminary stain color selections are not approved, apply additional mockups of additional stain colors selected by Architect at no added cost to Owner.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply finishes when relative humidity exceeds 85 percent, at temperatures of less than 5 deg F (3 deg C) above the dew point, or to damp or wet surfaces.

C. Do not apply exterior finishes in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Benjamin Moore & Co.
2. PPG Architectural Finishes, Inc.
3. Sherwin-Williams Company (The).

B. Products: Subject to compliance with requirements, provide product listed in other Part 2 articles for the paint category indicated.

C. Refer to Finish Schedule located on the Drawings.

2.2 SOURCE LIMITATIONS

A. Source Limitations: Obtain each coating product from single source from single manufacturer.

2.3 MATERIALS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

B. Stain Colors: **As selected by Architect from manufacturer's full range**.

2.4 WOOD STAINS

A. Stain, Exterior, Solvent Based, Solid Hide: Solvent-based, oil or oil/alkyd, pigmented stain for new, or previously stained, wood surfaces.

B. Stain, Exterior, Water Based, Solid Hide: Water-based, solid-hide, emulsion-type, pigmented stain for primed or previously painted exterior wood surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Exterior Wood Substrates: 15 percent, when measured with an electronic moisture meter.

C. Maximum Moisture Content of Interior Wood Substrates: **13** percent, when measured with an electronic moisture meter.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with finish application only after unsatisfactory conditions have been corrected.

1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.

1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

B. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each substrate condition and as specified.

1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.

C. Exterior Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Prime edges, ends, faces, undersides, and backsides of wood.

    a. For solid hide stained wood, stain edges and ends after priming.
    b. For varnish-coated stained wood, stain edges and ends and prime with varnish. Prime undersides and backsides with varnish.

3. Countersink steel nails, if used, and fill with putty or plastic wood filler tinted to final color. Sand smooth when dried.

3.3 APPLICATION

A. Apply finishes according to manufacturer's written instructions.

1. Use applicators and techniques suited for finish and substrate indicated.
2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

3.5 EXTERIOR WOOD-FINISH-SYSTEM SCHEDULE

A. Wood Substrates, Exposed Framing:

1. Solid-Color, Water-Based Stain System

a. Prime Coat: Primer, alkyd for exterior wood.
b. Intermediate Coat: Stain, exterior, water based, solid hide, matching topcoat.
c. Topcoat: Stain, exterior, water based, solid hide.

END OF SECTION 099300

SECTION 099600 - HIGH-PERFORMANCE COATINGS

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 surface preparation and the application of high-performance coating systems on surfaces indicated in the Drawings.

1. Exterior Substrates:
   a. Steel.
   b. Galvanized Metal.

1.3 DEFINITIONS

A. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

B. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

C. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Verification: For each type of coating system and each color and gloss of topcoat indicated.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

C. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials**, from the same product run,** that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Coatings: **5** percent, but not less than **1 gal.** of each material and color applied.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each coating system.
   a. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

   a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated are at levels recommended by the paint manufacturer.

B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. <Double click here to find, evaluate, and insert list of manufacturers and products.>

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."

B. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
3. Products shall be of same manufacturer for each coat in a coating system.

C. Colors: **As selected by Architect from manufacturer's full range**.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Wood: 15 percent.

C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and coating systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

D. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer**.**
1. SSPC-SP 6/NACE No. 3.

E. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied coatings.

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for coating and substrate indicated.
2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.

1. Contractor shall touch up and restore coated surfaces damaged by testing.
2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

A. Steel Substrates:

1. Epoxy System **MPI EXT 5.1F**:
   a. Prime Coat: Primer, epoxy, anti-corrosive, for metal**, MPI #101**.
   b. Intermediate Coat: Epoxy, high build, low gloss**, MPI #108**.
   c. Topcoat: Epoxy, gloss**, MPI #77**.

B. Galvanized-Metal Substrates:

1. Epoxy System **MPI EXT 5.3C**:

   a. Prime Coat: Primer, epoxy, anti-corrosive, for metal**, MPI #101**.
   b. Intermediate Coat: Epoxy, matching topcoat.
   c. Topcoat: Epoxy, gloss**, MPI #77**.

END OF SECTION 099600

SECTION 101400 - SIGNAGE

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 SUMMARY

A. This Section includes the following:
   1. Panel signs as required by code for Certificate of Occupancy.
   2. Building Identification Sign

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.

B. Shop Drawings: Include plans, elevations, and large-scale sections of typical members and other components. Show mounting methods, grounds, mounting heights, layout, spacing, reinforcement, accessories, and installation details.

   1. Provide message list for each sign, including large-scale details of wording, lettering and Braille layout.

C. Maintenance Data: For signage cleaning and maintenance requirements to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative of signage manufacturer for installation and maintenance of units required for this Project.

B. Source Limitations: Obtain each sign type through one source from a single manufacturer.

C. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

   1. Interior Code Signage: Provide signage as required by accessibility regulations and requirements of authorities having jurisdiction. These include, but are not limited to, the following (Refer to AX1.1 AND AX1.3 for signage list):

1.5 PROJECT CONDITIONS

A. Field Measurements: Where sizes of signs are determined by dimensions of surfaces on which they are installed, verify dimensions by field measurement before fabrication and indicate measurements on Shop Drawings.

1.6 COORDINATION

A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.

1. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers:
1. ASI Sign Systems, Inc.
2. Innerface Sign Systems, Inc.
3. Mohawk Sign Systems.
4. Avalis Wayfinding Solutions, Inc

B. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to comply with the following requirements:

1. Edge Condition: Square cut.
2. Corner Condition: Square rounded to ½ inch radius.

C. Graphic Content and Style: Provide sign copy that complies with requirements indicated in the Sign Schedule for size, style, spacing, content, mounting height and location, material, finishes, and colors of signage.

D. Tactile and Braille Copy: Manufacturer's standard process for producing copy complying with ADA Accessibility Guidelines and ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square cut edges free from burrs and cut marks.

1. Raised-Copy Thickness: Not less than 1/32 inch (0.8 mm).

2.2 PANEL SIGNS

A. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.

1. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch (1.5 mm) measured diagonally.

B. Framed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to comply with the following requirements:

1. Edge Condition: Square cut.
2. Top and Bottom Metal Band: 1” wide.

C. Graphic Content and Style: Provide sign copy that complies with requirements indicated in the Sign Schedule for size, style, spacing, content, mounting height and location, material, finishes, and colors of signage.

D. Changeable Message Inserts: Fabricate signs to allow insertion of changeable messages in the form of transparent covers with paper inserts provided and printed by Owner.

E. Tactile and Braille Copy: Manufacturer's standard process for producing copy complying with ADA Accessibility Guidelines and ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square cut edges free from burrs and cut marks.

1. Raised-Copy Thickness: Not less than 1/32 inch (0.8 mm).

2.3 PANEL SIGN TYPES

A. General Signage

1. Material: Plastic laminate.
2. Perimeter: Unframed.
3. Copy: 1/32” raised text, Braille and glyph.
4. Character Style: Arial.
5. Text: See Signage Schedule.
6. Message: Fixed.
7. Sizes:

a. Sign: Refer to AX1.1 and AX1.3

2.4 ACCESSORIES

A. Mounting Methods for interior signage: Use double-sided vinyl tape fabricated from materials that are not corrosive to sign material and mounting surface.

B. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or

lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.5 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying 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 range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.

1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches (75 mm) of sign without encountering protruding objects or standing within swing of door.

B. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:

1. Vinyl-Tape Mounting: Use double-sided foam tape to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

3.4. PANEL SIGN SCHEDULE: See AX1.1 and AX1.3 for signage locations and design.

END OF SECTION 101400

SECTION 104413 - FIRE EXTINGUISHER CABINETS

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. Fire protection cabinets for the following:

a. Portable Fire Extinguishers and Hose Valves

B. Related Sections:

1. Division 10 Section "Fire Extinguishers."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.

1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

B. Transparent Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), 3mm thick, with Finish 1 (smooth or polished).

2.2 FIRE PROTECTION CABINET

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Basis of Design: Alta 7000 Series by Potter Roemer.

B. Equivalent substitute products by other manufacturers listed below will be considered but must be submitted at least ten days prior to bids and must receive written approval from the architect by means of addendum.

1. JL Industries, Inc.
2. Larsen's Manufacturing Company.
3. Modern Metal Products; Div. of Technico.
4. Potter Roemer; Div. of Smith Industries, Inc.
5. Sampson Products, Inc.

C. Cabinet Type: Suitable for fire extinguisher or Hose Valve as indicated on Drawings

D. Cabinet Construction: Non-rated and 1-hour fire-rated. See Drawings for locations.

E. Cabinet Material: Painted steel sheet.

F. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.
2. Rolled-Edge Trim: 2-1/2-inch backbend depth.

G. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.

H. Cabinet Trim Material: Painted steel sheet.

I. Door Material: Painted steel sheet.

J. Door Style: Narrow vertical glazed lite in steel door panel with frame.

K. Door Glazing: 1/8” clear acrylic.

L. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

1. Provide projecting door pull and friction latch.
2. Provide manufacturer's standard hinge permitting door to open 180 degrees.

M. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Door Lock: Cam lock/keyed cylinder that allows door to be opened during emergency by pulling sharply on door handle.
3. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."

1) Location: Applied to cabinet glazing.
2) Application Process: Silk-screened.
3) Lettering Color: Black.
4) Orientation: Vertical.

N. Finishes:

1. Polyester Painted: Color to be selected by Architect from manufacturer’s standard colors.

2.3 FABRICATION

A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.
3. Prepare doors and frames to receive locks.
4. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
2. Fabricate door frames of one-piece construction with edges flanged.
3. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 STEEL FINISHES

A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with **SSPC-SP 5/**NACE No. 1, "White Metal Blast Cleaning" After cleaning, apply a conversion coating suited to the organic coating to be applied over it.

B. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where semi-recessed cabinets will be installed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for semi-recessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

A. General: Install fire protection cabinets in locations and at mounting heights indicated.

B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semi-recessed fire protection cabinets.
2. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.

E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

SECTION 104416 - FIRE EXTINGUISHERS

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 portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

B. Related Sections:

1. Division 10 Section "Fire Extinguisher Cabinets."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

B. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

1.4 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FMG.

1.5 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following.

a. Amerex Corporation.
b. Ansul Incorporated; Tyco International Ltd.
c. Badger Fire Protection; a Kidde company.
d. Buckeye Fire Equipment Company.
e. Fire End & Croker Corporation.
f. J. L. Industries, Inc.; a division of Activar Construction Products Group.
g. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
h. Larsen's Manufacturing Company.
i. Moon-American.
j. Pem All Fire Extinguisher Corp.; a division of PEM Systems, Inc.
k. Potter Roemer LLC.
l. Pyro-Chem; Tyco Safety Products.

2. Valves: Manufacturer's standard
3. Handles and Levers: Manufacturer's standard
4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

B. Regular Dry-Chemical Type in Steel Container: UL-rated 60-B:C, 10-lb (4.5-kg) nominal capacity, with sodium bicarbonate-based dry chemical in enameled-steel container.

1. Provide at bracket locations at Electrical Rooms and Mechanical Rooms where indicated on drawings.

C. Multipurpose Dry-Chemical Type in Steel Container: UL-rated 2-A:10-B:C, 5-lb (2.3-kg) nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

1. Provide at all fire extinguisher cabinets.

2.2 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or black baked-enamel finish.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Amerex Corporation.
b. Ansul Incorporated; Tyco International Ltd.
c. Badger Fire Protection; a Kidde company.
d. Buckeye Fire Equipment Company.
e. Fire End & Croker Corporation.
f. J. L. Industries, Inc.; a division of Activar Construction Products Group.
g. Larsen's Manufacturing Company.
h. Potter Roemer LLC.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

1. Mounting Brackets: 48 inches (1372 mm) above finished floor to top of fire extinguisher.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

SECTION 107313 – PRE-ENGINEERED METAL CANOPIES

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. Cantilevered pre-engineered metal canopies

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include styles, material descriptions, construction details, fabrication details, dimensions of individual components and profiles, hardware, fittings, mounting accessories, features, and finishes for canopies.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. Include plans, elevations, sections, mounting heights, and attachment details.
2. Detail fabrication and assembly of canopies.
3. Show locations for blocking, reinforcement, and supplementary structural support.

C. Samples: For each exposed product and for each color and texture specified.

D. Engineering calculations stamped by a an engineered licensed in the state the product will be installed.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For canopies to include in operation and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Installer Qualifications: Fabricator of products.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

1.7 WARRANTY

A. Special Warranty: Manufacturer and fabricator agree to repair or replace components of canopies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including framework.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CANTILEVERED PRE-ENGINERED METAL CANOPY

A. Basis of Design are canopies provided by Mapes. The basis of design is the Mapes Cantilever. Equal products will be considered by other manufacturers.

B. Materials
1. Sun shading elements shall consist of extruded aluminum louver blades. (minimum .110 thickness)
2. Intermediate framing members shall be extruded aluminum, alloy 6063-T6, in profile and thickness shown in Drawings.
3. Cantilever support brackets shall be design engineered per application.
4. Cantilever support brackets will have standard available finishes.
5. Fascia shall be standard extruded 8" J style.

C. Fabrication

1. All connections shall be mechanically assembled utilizing 3/16 fasteners with a minimum shear stress of 350 lb. Pre-welded or factory-welded connections are not acceptable.

2. Louver blades shall be all extruded aluminum set on a nominal 45 degree back slant.

D. Finish

1. Color: As selected by Architect from manufacturer's full range including premium finishes.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for supporting members, blocking, inserts, installation tolerances, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install canopies at locations and in position indicated, securely connected to supports, free of rack, and in proper relation to adjacent construction. Use mounting methods of types described and in compliance with Shop Drawings and fabricator's written instructions.

B. Install canopies after other finishing operations, including joint sealing and painting, have been completed.

C. Slip fit frame connections accurately together to form hairline joints, and tighten to secure.

D. Weld frame connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.

1. Field Welding: Comply with the following requirements:

a. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
b. Obtain fusion without undercut or overlap.
c. Remove welding flux immediately.
d. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

E. Anchoring to In-Place Construction: Use anchors, fasteners, fittings, hardware, and installation accessories where necessary for securing canopies to structural support and for properly transferring load to in-place construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come in contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

G. Coordinate canopy installation with flashing and joint-sealant installation so these materials are installed in sequence and in a manner that prevents exterior moisture from passing through completed exterior wall and roof assemblies.

3.3 CLEANING AND PROTECTION

A. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION 107313

SECTION 142123.16 - MACHINE ROOM-LESS ELECTRIC TRACTION PASSENGER ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Machine-room-less electric traction elevators.

B. Related Requirements:

1. Section 011000 "Summary" for purchase contract for elevators negotiated by Owner and assigned to Contractor.
2. Section 015000 "Temporary Facilities and Controls" for temporary use of elevators for construction purposes.
3. Section 033000 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
4. Section 051200 "Structural Steel Framing" for the following:

    a. Attachment plates, angle brackets, and other preparation of structural steel for fastening guide-rail brackets.
    b. Hoist beams.
    c. Structural-steel shapes for subsills.

5. Section 055000 "Metal Fabrications" for the following:

    a. Attachment plates and angle brackets for supporting guide-rail brackets.
    b. Hoist beams.
    c. Structural-steel shapes for subsills.
    d. Pit ladders.

6. Section 096516 "Resilient Sheet Flooring"

7. Section 260000 “Electrical”

8. Section 265110 "Interior Lighting" for elevator pit to illumination level equal or greater than ASME A17.1/CSA B44 200, or applicable version.

9. Section 283100 “Fire Detection and Alarm”

1.2 DEFINITIONS

A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.

B. Service Elevator: A passenger elevator that is also used to carry freight.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Machine-room-less electric traction elevators.

B. Product Data Submittals: For each product.

1. Include capacities, sizes, performances, operations, safety features, finishes, and similar information.
2. Include Product Data for car enclosures, hoistway entrances, and operation, control, and signal systems.

C. Shop Drawings:

1. Include plans, elevations, sections, and large-scale details indicating service at each landing, coordination with building structure, relationships with other construction, and locations of equipment.

D. Samples for Initial Selection: For finishes involving color selection.

E. Samples for Verification: For exposed car, hoistway door and frame, and signal equipment finishes; 3-inch- (75-mm-) square Samples of sheet materials; and 4-inch (100-mm) lengths of running trim members.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Seismic Qualification Certificates: For elevator equipment, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

C. Manufacturer Certificates: Signed by elevator manufacturer certifying that hoistway and pit layout and dimensions, as indicated on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.

D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.

1. Submit manufacturer's or Installer's standard operation and maintenance manual, in accordance with ASME A17.1/CSA B44.

B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Elevator manufacturer or an authorized representative who is trained and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle materials, components, and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.

1.8 COORDINATION

A. Coordinate installation of inserts, sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, inserts, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.

B. Coordinate locations and dimensions of work specified in other Sections that relates to electric traction elevators including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways and pits.

1.9 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
2. Warranty Period: 1 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.

B. Accessibility Requirements: Comply with requirements for accessible elevators in the United States Access Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.

C. Seismic Performance: Elevator system shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7 and shall comply with elevator seismic requirements in ASME A17.1/CSA B44.

1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified[and the system will be fully operational after the seismic event]."
2. Project Seismic Design Category: C.
3. Elevator Component Importance Factor: 1.5.

2.2 ELEVATORS

A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturer's standard components shall be used, as included in standard elevator systems and as required for complete system.

B. Elevator Description:
1. Rated Load: 3500 lb

2. Rated Speed: 100 fpm
3. Auxiliary Operations:
   a. Battery-powered automatic evacuation.
   b. Earthquake Emergency Operation: Comply with requirements in ASME A17.1/CSA B44.
   c. Automatic dispatching of loaded car.
   d. Nuisance-call cancel.
4. Car Enclosures:

   a. Inside Width: Not less than 80 inches
   b. Inside Depth: Not less than 66 inches
   c. Inside Height: Not less than 89 inches
   d. Front Walls (Return Panels): Satin stainless steel, ASTM A480/A480M, No. 4 finish
   e. Car Fixtures: Satin stainless steel, ASTM A480/A480M, No. 4 finish
   f. Side and Rear Wall Panels: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
   g. Reveals: Satin stainless steel, ASTM A480/A480M, No. 4 finish
   h. Door Faces (Interior): Satin stainless steel, ASTM A480/A480M, No. 4 finish
   i. Door Sills: Nickel silver.

j. Ceiling: Polished stainless steel, ASTM A480/A480M, No. 8 finish
k. Handrails: 1-1/2 inches (38 mm) round rear of car.
l. Floor prepared to receive resilient flooring (specified in Section 096516 "Resilient Sheet Flooring").

5. Hoistway Entrances:

a. Width: 42 inches.
b. Height: 84 inches.
c. Type: Single-speed side sliding.
d. Frames: Satin stainless steel, ASTM A480/A480M, No. 4 finish
e. Doors and Transoms: Satin stainless steel, ASTM A480/A480M, No. 4 finish.
f. Sills: Nickel silver.

6. Hall Fixtures: Satin stainless steel, ASTM A480/A480M, No. 4 finish
7. Additional Requirements:

a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, ASTM A480/A480M, No. 4 finish
b. Provide hooks for protective pads and one complete set(s) of full-height protective pads.

2.3 MACHINE ROOM-LESS ELECTRIC TRACTION ELEVATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one the following:
1. Otis Elevator
2. Schindler Elevator Corp – 3100 MRL as the Basis of Design.
3. Kone

B. Source Limitations: Obtain elevators from single manufacturer.

1. Major elevator components, including driving machines, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

2.4 TRACTION SYSTEMS

A. Elevator Machines: Permanent magnet, variable-voltage, variable-frequency, ac-type hoisting machines and solid-state power converters.

1. Provide regenerative system.
2. Provide regenerative system that complies with the IgCC.
3. Limit total harmonic distortion of regenerated power to 5 percent in accordance with IEEE 519.
4. Provide means for absorbing regenerated power when elevator system is operating on standby power.
5. Provide line filters or chokes to prevent electrical peaks or spikes from feeding back into building power system.

B. Inserts: Furnish required concrete and masonry inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.

C. Machine Beams: Provide steel framing to support elevator hoisting machine and deflector sheaves from the building structure. Comply with Section 055000 "Metal Fabrications" for materials and fabrication.

D. Car Frame and Platform: Bolted- or welded-steel units.

E. Guides: Roller guides or polymer-coated, nonlubricated sliding guides. Provide guides at top and bottom of car and counterweight frames.

2.5 OPERATION SYSTEMS

A. Provide manufacturer's standard microprocessor operation systems as required to provide type of operation indicated.

B. Auxiliary Operations:
1. Single-Car Battery-Powered Automatic Evacuation: If power fails and car is at a floor, it remains at that floor, opens its doors, and shuts down. If car is between floors, it moves to the next floor above or below, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.
2. Automatic Dispatching of Loaded Car: When car load exceeds 80 percent of rated capacity, doors begin closing.
3. Nuisance-Call Cancel: When car calls exceed a preset number while car load is less than a predetermined weight, all car calls are canceled. Preset number of calls and predetermined weight can be adjusted.
4. Automatic Operation of Lights and Fan: When elevator is stopped and unoccupied with doors closed, lighting, ventilation fan, and cab displays are de-energized after five minutes and are re-energized before car doors open.

2.6 DOOR REOPENING DEVICES

A. Infrared Array: Provide door reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams causes doors to stop and reopen.

B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door reopening device, a loud buzzer sounds and doors begins to close at reduced kinetic energy.

2.7 CAR ENCLOSURES

A. Provide steel-framed car enclosures with nonremovable wall panels, with non-removable car roof, access doors, power door operators, and ventilation.

1. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.

B. Materials and Finishes: Manufacturer's standards, but not less than the following:

1. Subfloor:

a. Exterior, underlayment grade plywood, not less than 5/8-inch (15.9-mm) nominal thickness.

2. Floor Finish:
   a. Specified in Section 096516 "Resilient Sheet Flooring".
3. Stainless Steel Wall Panels: Flush, formed-metal construction; fabricated from stainless steel sheet.
4. Fabricate car with recesses and cutouts for signal equipment.
5. Fabricate car door frame integrally with front wall of car.
6. Stainless Steel Doors: Flush, hollow-metal construction; fabricated from stainless steel sheet.
7. Sight Guards: Provide sight guards on car doors.
8. Sills: Extruded or machined metal, with grooved surface, 1/4 inch (6.4 mm) thick.
9. Ceiling: Metal flush panels, with four low-voltage downlights in each panel. Align ceiling panel joints with joints between wall panels.
10. Ventilation Fan Efficiency: Not less than 3.0 cfm/W (1.4 L/s per W).

2.8 HOISTWAY ENTRANCES

A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile to accommodate hoistway wall construction.

1. Where gypsum board wall construction is indicated, frames to be self-supporting with reinforced head sections.

B. Materials and Fabrication: Manufacturer's standards, but not less than the following:
1. Stainless Steel Frames: Formed from stainless steel sheet.
2. Stainless Steel Doors and Transoms: Flush, hollow-metal construction; fabricated from stainless steel sheetting stainless steel sheet
3. Sight Guards: Provide sight guards on doors matching door edges.
4. Sills: Extruded or machined metal, with grooved surface, 1/4 inch (6.4 mm) thick.
5. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M.

2.9 SIGNAL EQUIPMENT

A. Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Provide buttons and lighted elements illuminated with LEDs.

B. Car-Control Stations: Provide manufacturer's standard recessed car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.

1. Mark buttons and switches for required use or function. Use both tactile symbols and Braille.
2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

C. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.

1. Emergency two-way elevator communication systems to be designed to accommodate the deaf, hard of hearing and speech impaired in accordance with section 3001.2 of the 2021 IBC. The system shall provide the visible text and audible modes that meet all of the following requirements:

a. When operating in each mode, include a live interactive system that allows back and forth conversation between the elevator occupants and emergency personnel.
b. Is operational when the elevator is operational.

D. Allows elevator occupants to select the text-based or audible mode depending on their communication needs to interact with emergency personnel.

E. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car-control station. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows if not provided in car-control station.

F. Hall Push-Button Stations: Provide one hall push-button station at each landing

1. Provide manufacturer's standard wall-mounted units.
2. Equip units with buttons for calling elevator and for indicating desired direction of travel.

G. Hall Lanterns: Units with illuminated arrows; but provide single arrow at terminal landings. Provide the following:

1. Manufacturer's standard wall-mounted units, for mounting above entrance frames.

H. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.

1. At manufacturer's option, audible signals may be placed on cars.

I. Standby Power Elevator Selector Switches: Provide switches, as required by ASME A17.1/CSA B44, where indicated. Adjacent to switches, provide illuminated signal that indicates when normal power supply has failed.

J. Emergency Pictorial Signs: Fabricate from materials matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire, elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station unless otherwise indicated.

2.10 FINISH MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, commercial steel, Type B, exposed, matte finish.

B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, commercial steel, Type B, pickled.

C. Stainless Steel Sheet: ASTM A240/A240M, Type 304.

D. Stainless Steel Bars: ASTM A276/A276M, Type 304.

E. Stainless Steel Tubing: ASTM A554, Grade MT 304.

F. Nickel Silver Extrusions: ASTM B151/B151M, Alloy UNS No. C74500 or UNS No. C77600.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Examine hoistways, hoistway openings, and pits as constructed; verify critical dimensions; and examine supporting structure and other conditions under which elevator work is to be installed.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF MACHINE ROOM-LESS ELECTRIC TRACTION ELEVATORS

A. Comply with manufacturer's written instructions.

B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualifications of welding operators.

C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.

D. Lubricate operating parts of systems, including ropes, as recommended by manufacturers.

E. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.

F. Leveling Tolerance: 1/8 inch (3 mm), up or down, regardless of load and travel direction.

G. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

H. Locate hall signal equipment for elevators as follows unless otherwise indicated:

1. For groups of elevators, locate hall push-button stations between two elevators at center of group or at location most convenient for approaching passengers.
2. Place hall lanterns either above or beside each hoistway entrance.
3. Mount hall lanterns at a minimum of 72 inches (1829 mm) above finished floor.

3.3 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.

B. Operating Test: Load elevator to rated capacity and operate continuously for 30 minutes over full travel distance, stopping at each level and proceeding immediately to the next. Record temperature rise of elevator machine during 30-minute test period. Record failure to perform as required.

C. Advise Owner, Architect, and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 PROTECTION

A. Temporary Use: Comply with the following requirements for elevator used for construction purposes:

1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
2. Provide strippable protective film on entrance and car doors and frames.
3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
5. Do not load elevators beyond their rated weight capacity.
6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate, elevator(s).

B. Check operation of elevator with Owner's personnel present before date of Substantial Completion and again not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

3.6 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service to include 12 months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation at rated speed and capacity. Parts and supplies to be manufacturer's authorized replacement parts and supplies.

1. Perform maintenance during normal working hours.
2. Perform emergency callback service during normal working hours with response time of two hours or less.
3. Include 24-hour-per-day, 7-day-per-week emergency callback service with response time of two hours or less.

END OF SECTION 142123.16

SECTION 210010 - GENERAL PROVISIONS – FIRE PROTECTION

PART 1 - GENERAL

1.1 SCOPE:

A. Bids of work covered by each section of these specifications shall be based on the "Fire Protection Sprinkler System Specification Sheet". Because of small scale of drawings, it is not possible to indicate all offsets, fittings, and accessories, which may be required. Contractor shall carefully investigate structural and finish conditions affecting his work and shall arrange such work accordingly as may be required to meet such conditions. Where locations make it necessary or desirable from Contractor's standpoint to make changes in arrangements or details shown on drawings, he may present suggestions for such changes and obtain Engineer's approval prior to making such changes.

1.2 CODES:

A. All work under this division shall be in strict compliance with the International Building Code – 2021 Edition with SC modifications, the International Fire Code – 2021 Edition with SC modifications, NFPA 13 – 2019 Edition, and all applicable Codes and Regulations of the Authority Having Jurisdiction.

1.3 MATERIAL AND SHOP DRAWINGS:

A. Use only new materials and the standard product of a single manufacturer for each article of its type unless specifically mentioned otherwise. Materials and workmanship in the case of assembled items shall conform to the latest applicable requirements of NFPA, NEC, ASTM, and ANSI.

B. Schedule submittals to expedite work. Unless otherwise indicated in this Section, submittals shall be submitted within 30 days of date of Notice to Proceed. Provide electronic copies of submittals for review and approval. All submittals shall be emailed in a single volume. Partial lists will not be considered and will be returned to the Contractor. Identify Project, Contractor, subcontractor, supplier, manufacturer, pertinent drawing sheet and detail numbers, and associated specification section numbers. Identify variations from requirements of Contract Documents. Any submittal that exceeds 10 MB shall be transferred using Dropbox or other similar file sharing service.

C. Contractor responsibilities:

1. Review submittals prior to transmittal. Verify compatibility with field conditions and dimensions, product selections and designations, quantities, and conformance of submittal with requirements of Contract Documents. Return non-conforming submittals to preparer for revision rather than submitting to Engineer. Coordinate submittals to avoid conflicts between various items of work. Failure of Contractor to review submittals prior to transmittal to Engineer shall be cause for rejection. Incomplete, improperly packaged, and submittals from sources other than

Contractor will not be accepted. Submittals not stamped APPROVED and signed by the Contractor will be returned to the Contractor.

2. Prepare drawings illustrating portion of work for use in fabricating, interfacing with other work, and installing products. All equipment submitted shall be of adequate size and physical arrangement to allow unobstructed access when installed, for routine maintenance and other similar operations. Contract Drawings shall not be reproduced and submitted as shop drawings. Title each drawing with Project name and reference the sheet the drawing corresponds to. Drawings shall be in compliance with the requirements of NFPA 13 - 27.1.

3. Provide product data such as manufacturer's brochures, catalog pages, illustrations, diagrams, tables, performance charts, and other material which describe appearance, size, attributes, code and standard compliance, ratings, and other product characteristics. Provide all critical information such as reference standards, performance characteristics, capacities, power requirements, wiring and piping diagrams, controls, component parts, finishes, dimensions, and required clearances. Submit only data which are pertinent. Mark each copy of manufacturer's standard printed data to identify products, models, options, and other data pertinent to project.

4. Engineer will review and return submittals with comments. Do not fabricate products or begin work which requires submittals until return of submittal with Engineer acceptance. Promptly report any inability to comply with provisions. Revise and resubmit submittals as required within 15 days of return from Engineer. Make re-submittals under procedures specified for initial submittals. Identify all changes made since previous submittal.

D. Engineer Review:

1. Detailed drawings, including proposed head layouts, shall be prepared by the Fire Protection Contractor. These drawings shall be submitted to the Engineer for their approval. Upon approval by the engineer, it shall be the responsibility of this contractor to submit the approved shop drawings to the Office of the State Fire Marshal for their approval. All approvals shall be received prior to starting work. Upon receipt of the approval from the Office of the State Fire Marshal, this contractor shall provide one set of approved shop drawings to the authority having jurisdiction for their records.

E. Items Requiring Submittal are as Follows:

1. All items listed in MANUFACTURERS: Section of 210010

1.4 ASBESTOS:

A. At any time, the Contractor encounters asbestos, he shall immediately stop work in the immediate area and suspend any further work until asbestos is removed. Contractor shall, upon discovery of asbestos, notify owner, or owner's representative, who shall be responsible for the removal of the asbestos, all in accordance with NESHAP (National

Emission Standard for Hazardous Air Pollutants). Any form of asbestos removal or demolition shall be by owner. Engineer is not an "Owner or Operator" as defined under NESHAP.

B. Contractor is responsible for and shall be aware of all state and federal laws pertaining to asbestos as well as NESHAP requirements.

1.5 PERMITS AND FEES:

A. Obtain permits, licenses, pay fees, etc. as required for performance of Contract. Arrange for necessary inspections required by governing authority and deliver certificates of approval to Architects or their representatives. File plans required by governing body.

1.6 DEFINITIONS:

A. In this division of the specifications and accompanying drawings, the following definitions apply:

1. Provide/Install: To purchase, pay for, transport to the job site, unpack, and connect completely and ready for operation; to include all permits, inspections, equipment, material, labor, hardware, and operations required for completion and operation.

2. Furnish: To purchase, pay for, and deliver to the job site for installation by others.

3. The Fire Sprinkler Contractor is cautioned that "furnish" requires coordination with others. Such coordination costs shall be included as part of this contractor's bid.

1.7 CUTTING AND PATCHING:

A. Cutting of walls, floors, roofs, partitions, and ceiling, required for proper installation of the systems shall be performed under this contract.

B. Cutting shall be done in a neat, workmanlike manner. No joist, beams, girders, columns, or other structural members may be cut without written permission from the Engineer. When possible, holes shall be saw-cut or core drilled neatly to minimize patching.

C. Re-routing of existing pipes, insulation, etc. as required for installation of new system is included in this work. All work shall be done in accordance with specifications for new work of the particular type involved.

D. Patching shall be performed to match existing structures, exterior walls and roofs, and shall form a watertight installation.

1.8 VERIFICATION OF DIMENSIONS, ETC.:

A. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work, working conditions, verify all dimensions in the field, advise the Engineer of any discrepancy, and submit shop drawings of any changes he proposes to make for

approval before starting the work. Contractor shall install all equipment in a manner to avoid building interference.

1.9 COORDINATION WITH OTHER TRADES:

A. Coordinate all work of each section with work of other sections to avoid interference. Bidders are cautioned to check their equipment against space available as indicated on drawings and shall make sure that proposed equipment can be accommodated. Before beginning work under each section, inspect installed work of other trades and verify that such work is complete to the point where the installation may properly begin.

1.10 PROTECTION OF ADJACENT WORK:

A. Protect work and adjacent work at all times with suitable covering. All damage to work in place caused by Contractor shall be repaired and restored to original good and acceptable condition using same quality and kinds of materials as required to match and finish with adjacent work.

1.11 EXISTING EQUIPMENT AND MATERIALS:

A. All items of equipment removed under this section of the specifications shall become the property of this Contractor shall be promptly removed from this site.

1.12 FIRESTOPPING:

A. Provide firestopping for all mechanical penetrations through fire resistant walls and shaft enclosures, and floor, ceiling, and roof elements of fire resistant assemblies. Firestopping shall provide rating comparable to rating of structure it protects.

B. Firestopping materials currently classified with UL as "Through Penetration Firestop Systems".

C. Firestopping materials shall have been tested in accordance with UL 1479 "Fire Tests of Through Penetration Firestops".

1.13 CLEAN-UP:

A. At the completion of the contract work, all areas where work has been performed shall be left clean. All trash shall be removed from the site by the Contractor.

1.14 APPROVALS AND SUBSTITUTIONS:

A. Notwithstanding any reference in the specifications to any article, device, product, material, fixture, form, or type of construction by name, make or catalog number, such references shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; and the Contractor, in such cases, may at his option use any article, device, product, material, fixture, or type of construction which, in the judgment of the Engineer, expressed in writing, is equal to that specified.

B. Requests for written approval to substitute materials or equipment considered by the Contractor as equal to those specified, shall be submitted for approval to the Engineer ten (10) days prior to bid date. Requests shall be accompanied by samples, descriptive literature and engineering information as necessary to fully identify and evaluate the product. No increase in the contract sum will be considered when requests are not approved.

1.15 AS-BUILT DRAWINGS:

A. The Contractor shall keep a record set of drawings on the job; and as construction progresses shall show the actual installed location of all items, material, and equipment on these job drawings. Indicate approved changes in red ink.

B. At the time of final completion, a corrected set of As-Built drawings shall be delivered to the Engineer. A final set of reproducible drawings with job information that reflects the actual installation shall be prepared by the fire sprinkler contractor and given to the Owner along with a set of approved fire sprinkler shop drawings.

1.16 WARRANTY:

A. The Contractor for each section of the work under this division will furnish to the Owner a written warranty for the installation as installed of all equipment covered under each section of the specifications, to perform in a satisfactory manner with no more than normal service.

B. Each warranty shall extend for a period of one year following substantial completion and acceptance of construction. They shall be endorsed by the Contractor.

1.17 MANUFACTURERS:

A. In order to define requirements for quality and function of manufactured products, and requirements such as size, gauges, grade selection, color selections and like specifications requirements, the specifications as written hereinafter are based upon products of those manufacturers who are named hereinafter under various specifications for materials.

B. In addition to products of manufacturers named hereinafter in the specifications, equivalent products of the following named manufacturers will be acceptable under the base bid:

1. Pipe Hangers:

a) Cooper B-Line, Fee and Mason Manufacturing Company, Anvilstar International, Erico Caddy, Tolco a Division of Nibco

2. Fire Protection Valves, Fire Department Connections, etc.:

a) Potter-Roemer, Inc., Fire End & Croker Corporation, Guardian Fire Equipment, Inc.

3. Sprinklers:

   a) Viking Group, Reliable Automatic Sprinkler Company, Tyco Fire Products

4. Backflow Preventers:

   a) Watts Industries, Ames Fire & Waterworks, Zurn Wilkins

5. Identification Items

   a) Seton Name Plate Company, W.H. Brady Company, Handley Industries, Inc.

PART 2 - PRODUCTS

2.1 VALVES:

A. All valves provided under each section shall be of a single manufacturer unless otherwise specified.

2.2 FIRESTOPPING MATERIALS:

A. The material used to fill the annular space shall prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E 119 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inches of water at the location of the test specimen for the time period equivalent to the fire resistance rating of the construction penetrated. Material shall be capable of curing in the presence of atmospheric moisture to produce durable and flexible seal and will form airtight and watertight bonds with most common building materials in any combination including cement, masonry, steel, and aluminum.

2.3 SLEEVES AND OPENINGS:

A. Provide UL certified fire stop sleeving system for all pipe penetrations through fire rated walls, floors, partitions, ceilings, floor-ceiling assemblies, and roofs as tested under ASTM E814 "Standard Method of Fire Tests of Through Penetration Fire Stops".

2.4 SEISMIC RESTRAINTS:

A. Complete installation of fire protection system shall meet the seismic requirements including longitudinal bracing, sway bracing, and four way bracing as required by NFPA 13 – 2019 Edition.

PART 3 - EXECUTION

3.1 PIPE FITTINGS:

A. General: Provide complete systems of piping and fittings for all services as indicated. All pipe, valves, and fittings shall comply with American National Standards Institute, Inc. Code and/or local codes and ordinances. Cut pipe accurately to measurements established at building or site, and work into place without springing or forcing, properly clearing all windows, doors, and other openings or obstructions.

B. Excessive cutting or other weakening of building to facilitate piping installation will not be permitted. Piping shall line up flanges and fittings freely. Test all piping prior to concealing.

3.2 PIPE:

A. All piping material shall be as specified in other sections of this division.

3.3 SLEEVES:

A. Provide all sleeves in floors, beams, wall, roof, etc. as required for installing work of this division unless otherwise specified hereinafter. Sleeves thru fire-rated assemblies shall be firestopped as specified herein and insulation shall not pass thru sleeve unless material complies with firestopping specified.

3.4 PIPE HANGERS, SUPPORTS AND INSERTS:

A. Pipe hangers, supports and inserts shall comply with the requirements of NFPA.

B. Hanger or Support Spacing (unless specified different hereinafter):

C. Hanger or support maximum spacing shall be as required by NFPA.

3.5 CLEANING:

A. All surfaces on metal, pipe, and other equipment furnished and installed under this division of the specifications shall be thoroughly cleaned of grease, scale, dirt and other foreign material.

3.6 TESTING (PIPING):

A. Upon completion of each system of work under this division, and at a designated time, all piping shall be pressure tested for leaks in the presence of the owner or third party inspecting agency. Owner or testing agency shall be notified five days before testing is to be conducted and all tests shall be conducted in their presence. All equipment required for test shall be furnished by contractor at his expense. All tests shall be performed as specified hereinafter. If inspection or tests show defects, such defective work or material shall be replaced, and inspection and tests repeated at no additional cost to owner. Make tight any

leaks. Repeat tests until system is proven tight. Caulking of leaks will not be permitted. All equipment not capable of withstanding the test pressure shall be valved off during the test.

B. All sprinkler piping shall be tested hydrostatically at not less than 200 pounds per square inch pressure for two hours and shall meet all requirements of Underwriters.

3.7 OPERATION AND MAINTENANCE INSTRUCTIONS, AND MAINTENANCE MANUAL:

A. Upon completion of work, and at a time designated by the engineer, a competent employee of the contractor shall be provided to instruct a representative of the owner in the operation and maintenance of the system.

B. Minimum instruction period shall be:

1. Fire Protection System - 1/2 day

C. Maintenance Manuals: The contractor shall compile and bind five (5) sets of all manufacturer's instructions and descriptive literature on all items of equipment furnished under this work. These instructions shall be delivered through the general contractor to the engineer for approval prior to final inspection.

D. Instructions shall include:

1. Warranty letter signed by the Fire Protection Contractor.
2. Index for each section with each section properly identified.
3. Complete equipment list with model and serial numbers.
4. Copy of one complete, approved submittal for each equipment section.
5. Description of each system, including manufacturer's literature for all items.
6. Start-up and shut-down description for each system.
7. Suggested operating and maintenance instructions with frequency of maintenance indicated.
8. Parts list for all items of equipment.
9. Copy of NFPA 25 “Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems”.

E. Manuals shall be 8-1/2 x 11 inch text pages in digital PDF format. Prepare binder covers with printed subject title of manual, title of project, date, and volume number when multiple binders are required. Provide a table of contents for each volume. Internally subdivide the binder contents with bookmarks providing a link to each section. Provide directory listing as appropriate with names addresses, and telephone numbers of design consultant, Contractor, subcontractors, equipment suppliers, and nearest service representatives.

End of Section 210010

SECTION 210500 - FIRE PROTECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This section of the specifications describes requirements pertaining to Fire Protection. All work shall comply with Section 210010 - General Provisions Fire Protection, the International Fire Code – 2021 Edition with SC modifications, the International Building Code – 2021 Edition with SC modifications, the South Carolina Fire Protection Sprinkler Act, and NFPA 13 – 2019 Edition.

1.2 SCOPE

A. This section of these specifications is intended to describe furnishing labor, material, and equipment for the installation of an automatic wet pipe sprinkler system.

B. In all areas, equipment and piping shall be installed so it will not interfere with the air conditioning, heating, ventilating, and electrical systems that must occupy the same general areas.

C. Contractor shall design an automatic wet system for the entire building as indicated on the project documents and “Fire Protection Sprinkler System Specification Sheet”. All piping shall be sized based on hydraulic calculations using 52 PSIG static and 50 PSIG residual at 1090 GPM taken at hydrant H1619B253 located at 150 Oregon Avenue. See civil drawings for new fire service.

1.3 COMPLIANCE WITH CODES

A. The complete installation for the building shall be in accordance with code requirements of City of Greenwood Fire Department, the Office of the State Fire Marshal, State Elevator Code (Title 41, Chapter 16), International Building Code – 2021 Edition with SC modifications, International Fire Code – 2021 Edition with SC modifications, South Carolina Fire Protection Sprinkler Systems Act (Title 40, Chapter 10), and NFPA 13 – 2019 Edition.

1.4 SHOP DRAWINGS

A. Detailed drawings, including proposed sprinkler layouts, shall be prepared by the Fire Protection Contractor. These drawings shall be submitted to the Engineer for their approval. Upon approval by the engineer, it shall be the responsibility of this contractor to submit the approved shop drawings to the Office of the State Fire Marshal for their approval. All approvals shall be received prior to starting work.

B. Upon completion of the indicated work, one (1) additional set of approved reproducible drawings showing the entire installation "as built" shall be furnished to the Owner for his files.

1.5 SEISMIC REQUIREMENTS

A. Complete installation of fire protection system shall meet the seismic and restraint requirements including longitudinal bracing, sway bracing, end of branch line restraints, and four way bracing as required.

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Sprinklers shall be spray type, having 1/2" discharge orifice, with temperature ratings in accordance with Underwriter's specifications unless otherwise noted. Sprinklers shall be horizontal sidewall, upright, or semi-recessed pendant, decorative/glass bulb type as manufactured by the Reliable Automatic Sprinkler Company, or equal as listed in 210010. All sprinklers shall have a chrome finish except upright sprinklers in areas with no ceiling which shall have a brass finish. Sprinklers shall be of temperature rating as required by the application per NFPA including using intermediate temperature rating when located within 30” of the edge of any HVAC diffuser in the ceiling. No oversized escutcheons shall be utilized if the suspended ceiling requires a 1” clearance around the vertical penetrations as required by ASCE7-05. Flexible sprinkler drops with braided hose design shall be used in lieu of any required oversized escutcheons and shall be installed per the manufacturers published instructions. Corrugated, or non-braided, flexible drops will not be allowed.

B. The Contractor shall provide a cabinet with extra sprinklers and one (1) sprinkler wrench for each type of sprinkler provided in the building per NFPA 13-16.2.7. Sprinklers shall be properly apportioned as to temperature rating and types of sprinklers used as required by NFPA 13 with no fewer than two sprinklers of each type and temperature rating, and shall include a list that shall be in an envelope in the cabinet. Mount the cabinet on the wall adjacent to fire riser.

C. Waterflow Detector: Provide vane-type waterflow detector. The detector shall have a sensitivity in the range of 4 to 10 gpm and static pressure rating of 450 psi. The detector shall respond to waterflow in a specified direction after a preset adjustable time delay.

D. Alarm Bell: Provide alarms of the approved weatherproof and guarded type, to sound locally on the flow of water as detected by the waterflow detector in each sprinkler system to which it is connected. Mount alarms on the outside of the outer walls of the building at the maximum height of the riser room. Alarm bell shall have underdome strikers and operating mechanisms. Bells shall be suitable for outdoor surface mounting utilizing weatherproof parts. Bells shall be System Sensor, or equal, SSM24-6 series with 24 volt input from the fire alarm panel (with battery back-up) and 6” diameter with WBB weatherproof electrical box. Coordinate all work with fire alarm system installer prior to rough-in.

E. Inspector's Test Connection: Provide test connections about six feet above the floor for each sprinkler system or portion of each sprinkler system equipped with an alarm device and locate at the hydraulically most remote part of each system. Provide test connection

piping to a location where the discharge will be readily visible and where water may be discharged without damage.

F. System and Auxiliary Drains: All drain locations shall be approved by the A/E team. Exterior drain locations shall be provided with a concrete splash block if not discharging on concrete and shall not be located within 10' of any public doorway. All discharge points shall be within 20' of a catch basin, yard inlet, or other such type receptor. All interior drain locations shall be approved by the A/E team and shall meet the requirements of NFPA 13-16.10.5.

G. Backflow Preventer: Provide an Ames, or equal, Series C200 double check valve assembly. Assembly shall consist of two independent Tri-Link check modules within a single housing, sleeve access port, four test cocks and two drip tight shut off valves. Tri-Link checks shall be removable and serviceable, with the use of special tools. The housing shall be constructed of 304 stainless steel pipe with groove end connections. Tri-link checks shall have reversible elastomer discs and in operation shall produce drip tight closure again the reverse flow of liquid. The maximum working pressure shall be 175 psi.

H. Automatic Air Vent: On wet pipe sprinkler systems utilizing metallic piping, install a Potter Electric Signal Company, or equal, Model PAV automatic air vent located at the high point of the system and off of the top of the piping to allow air to be removed from the system. Provide and install a ball valve and nipple prior to the automatic air vent for maintenance purposes.

I. All wet pipe sprinkler piping shall be UL listed metallic pipe and materials in accordance with NFPA 13 – 2019 Edition. Piping 2-1/2" and larger shall be Schedule 10 black steel with rolled-grooved fittings and all piping 2" and smaller shall be schedule 40 black steel piping with rolled-grooved fittings or threaded or threaded fittings.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. Equipment, materials, installation, and workmanship shall be in accordance with NFPA 13 – 2019 Edition, and the International Fire Code – 2021 Edition with SC modifications.

3.2 FIELD TESTING AND FLUSHING:

A. Preliminary Tests: Hydrostatically test each system at 200 psig for a period of two hours. Flush piping in accordance with NFPA 13. Piping above suspended ceilings shall be tested, inspected, and approved before installation of ceilings. Test the alarms and other devices. Test the water flow alarms by flowing water through the inspector's test connection. When tests have been completed and corrections made, submit a signed and dated certificate, similar to that specified in NFPA 13, with a request for a formal inspection and tests.

3.3 KEY PLAN:

A. Provide a key plan of each level with zones indicated. Plans shall be an 11" x 17" permanent copy, framed under glass and mounted on the wall adjacent to the main riser.

End of Section 210500

Fire Sprinkler System Specification Sheet

(Per §40-10-250)

Project Data

Project name: Oregon Station

Location in South Carolina:	Address (street # & name): 150 Oregon Avenue		State Project: ☐ Yes ■ No
	City: Greenwood	County: Greenwood	State Project #: N/A

Water Supply Information

(Flow test data must be less than 1 year old per §40-10-250(A)(1))

Date test conducted: 01 / 18 / 2024	Static pressure (psi): 52	Residual pressure (psi): 50	Flow (gpm): 1090
Distances of test gauges relative to the base of the riser:	Horizontal (ft): 240'	Vertical (elevation difference in ft): -2'	
Source of water supply:	☐ Municipal dead-end ■ Municipal circulation ☐ existing fire pump ☐ Other:		Pipe Size (in.): 12"
Test data by/from:	Name: Russell Holley	Title: Not Provided	
	Organization: Greenwood Commissioners of Public Works		Phone: 864-942-8199
Fire pump: ☐ New ☐ Existing ■ No Pump	Rated Pressure (psi): N/A	Churn Pressure (psi): N/A	
	Rated Capacity (gpm): N/A	Pressure @ 150% flow (psi): N/A	
On-site water storage:	☐ Yes ■ No ☐ New ☐ Existing	☐ Tank ☐ Other: N/A	Capacity (gal): N/A

NFPA Hazard Classification

(Attach continuation page when necessary)

Area #	Hazard Class or Code Reference	Description of Hazard Protected (including occupancy use group, and details of storage arrangement as applicable (including commodity class, rack arrangement/type, ceiling and storage height.))
1	Ordinary Hazard - Gr. I	Shell Space for future upfits

Design Parameters

(Attach continuation page when necessary)

Area #	System Type	Density(gpm/ft²)/Area(ft²), or Other (Reference code sections)	Inside Hose (gpm)	Outside Hose (gpm)
1	Wet	0.15/1500	0	250

Seismic Design Data:	S_s= 0.306	**Site Classification**= D	**Seismic Design Category**= C

Codes and Standards

(Attach continuation page when necessary)

Applicable Codes, Standards, & Editions (i.e. 2018 IBC, 2016 NFPA 13, etc.) **for the Scope of Work on the Fire Sprinkler System**

2021International Building Code with SC modifications, 2021 International Fire Code with SC modifications, NFPA 13 - 2019 Edition

Scope of work (i.e. sprinkler system A.G. from 1'-0" A.F.F., U.G. from tap to 5'-0" outside, etc.) and **notes** (attach continuation page when necessary):

Aboveground fire sprinkler system from 5'-0" outside of the building wall.

Specifier's Information

Name: Todd F. Swygert, P.E.

Engineering services provided through a firm: ■ Yes ☐ No

Firm name: Swygert & Associates, Ltd.

Address: Post Office Box 11686

City: Columbia

State: South Carolina Zip: 29211

Phone: 803-791-9300 ext 102 Fax: 803-791-0830

E-mail: Todd@swygert-associates.com

Certificate of Authorization

Professional Engineer's Seal

Revision No.: 0

Signature: Todd F. Swygert

Date: 2/21/24

Form Version: July 1, 2021

SECTION 220010 - GENERAL PROVISIONS - PLUMBING

PART 1 - GENERAL

1.1 SCOPE:

A. Bids of work covered by each section of these specifications shall be based on the layout and equipment as shown and specified with only such approved substitutions as are allowed. Drawings show general arrangement of piping. Because of the small scale of drawings, it is not possible to indicate all offsets, fittings, and accessories, which may be required. The contractor shall carefully investigate structural and finish conditions affecting his work and shall arrange such work accordingly, furnishing such fittings, traps, valves, and accessories as may be required to meet such conditions. Where locations make it necessary or desirable from the Contractor's standpoint to make changes in arrangements or details shown on drawings, he may present suggestions for such changes and obtain Engineer's approval prior to making such changes.

1.2 CODES:

A. All work under this division shall be in strict compliance with the International Building Code – 2021 Edition with SC modifications, the International Plumbing Code – 2021 Edition with SC modifications, and all applicable Codes and Regulations of the Authority Having Jurisdiction.

1.3 MATERIAL AND SHOP DRAWINGS:

A. Use only new materials and the standard product of a single manufacturer for each article of its type unless specifically mentioned otherwise. Materials and workmanship in the case of assembled items shall conform to the latest applicable requirements of ASME, NEC, ASTM, AWWA, NEMA, and ANSI.

B. Schedule submittals to expedite work. Unless otherwise indicated in this Section, submittals shall be submitted within 30 days of the date of Notice to Proceed. Provide electronic copies of submittals for review and approval. All submittals shall be emailed in a single volume. Partial lists will not be considered and will be returned to the Contractor. Identify Project, Contractor, subcontractor, supplier, manufacturer, pertinent drawing sheet and detail numbers, and associated specification section numbers. Identify variations from requirements of Contract Documents. Any submittal that exceeds 10 MB shall be transferred using Dropbox or other similar file sharing service.

C. Contractor responsibilities:

1. Review submittals prior to transmittal. Verify compatibility with field conditions and dimensions, product selections and designations, quantities, and conformance of submittal with requirements of Contract Documents. Return non-conforming submittals to the preparer for revision rather than submitting them to Engineer. Coordinate submittals to avoid conflicts between various items of work. Failure of Contractor to review submittals prior to transmittal to Engineer shall be cause

for rejection. Incomplete, improperly packaged, and submittals from sources other than Contractor will not be accepted. Submittals not stamped APPROVED and signed by the Contractor will be returned to the Contractor.

2. Provide product data such as manufacturer's brochures, catalog pages, illustrations, diagrams, tables, performance charts, and other material which describe appearance, size, attributes, code and standard compliance, ratings, and other product characteristics. Provide all critical information such as reference standards, performance characteristics, capacities, power requirements, wiring and piping diagrams, controls, component parts, finishes, dimensions, and required clearances. Submit only data which are pertinent. Mark each copy of manufacturer's standard printed data to identify products, models, options, and other data pertinent to project.

3. Engineer will review and return submittals with comments. Do not fabricate products or begin work which requires submittals until return of submittal with Engineer acceptance. Promptly report any inability to comply with provisions. Revise and resubmit submittals as required within 15 days of return from Engineer. Make re-submittals under procedures specified for initial submittals. Identify all changes made since previous submittal.

D. Engineer Review:

1. Engineer will review submittals for sole purpose of verifying general conformance with design concept and general compliance with Contract Documents. Approval of submittal by Engineer does not relieve Contractor of responsibility for correcting errors which may exist in submittal or from meeting requirements of Contract Documents. After review, Engineer will return submittals marked as follows to indicate action taken:

2. No Exception: Part of work covered by submittal may proceed provided it complies with requirements of Contract Documents. Final acceptance will depend upon that compliance. The term "approved" shall only indicate that there is no exception taken to the submittal.

3. No Exception As Corrected: Part of work covered by submittal may proceed provided it complies with notations and corrections on submittal and requirements of Contract documents. Final acceptance will depend upon that compliance.

4. Revise And Resubmit: Do not proceed with part of work covered by submittal including purchasing, fabricating, and delivering. Revise or prepare new submittal in accordance with notations and resubmit.

E. Items Requiring Submittal are as Follows:

1. Insulation
2. Piping Materials
3. All items listed in MANUFACTURERS: Section of 220010

1.4 ASBESTOS:

A. At any time, the Contractor encounters asbestos, he shall immediately stop work in the immediate area and suspend any further work until the asbestos is removed. The contractor shall, upon discovery of asbestos, notify the owner, or owner's representative, who shall be responsible for the removal of the asbestos, all in accordance with NESHAP (National Emission Standard for Hazardous Air Pollutants). Any form of asbestos removal or demolition shall be by the owner. Engineer is not an "Owner or Operator" as defined under NESHAP.

B. The contractor is responsible for, and shall be aware of all state and federal laws pertaining to asbestos as well as NESHAP requirements.

1.5 LEAD FREE:

A. All solder, flux and pipes used in water system must be lead free. Lead free is defined as less than 0.2 percent lead in solder and flux and less than 8.0 percent lead in pipes and fittings.

1.6 AMERICANS WITH DISABILITIES ACT:

A. All items or work under this division of the specifications shall comply with guidelines as set forth in the Americans with Disabilities Act.

1.7 PERMITS AND FEES:

A. Obtain permits, licenses, pay fees, etc. as required for performance of Contract. Arrange for necessary inspections required by governing authority and deliver certificates of approval to Architects or their representatives. File plans required by governing body.

1.8 DEFINITIONS:

A. In this division of the specifications and accompanying drawings, the following definitions apply:

B. Provide/Install: To purchase, pay for, transport to the job site, unpack, and connect completely and ready for operation; to include all permits, inspections, equipment, material, labor, hardware, and operations required for completion and operation.

C. Furnish: To purchase, pay for, and deliver to the job site for installation by others.

D. The Plumbing Contractor is cautioned that "furnish" requires coordination with others. Such coordination costs shall be included as part of Plumbing Contractor's bid.

1.9 CUTTING AND PATCHING:

A. Cutting of walls, floors, roofs, partitions, and ceiling, required for proper installation of the systems shall be performed under this contract.

B. Cutting shall be done in a neat, workmanlike manner. No joist, beams, girders, columns, or other structural members may be cut without written permission from the Engineer. When possible, holes shall be saw-cut or core drilled neat to minimize patching.

C. Re-routing of existing pipes, insulation, etc. as required for installation of new system is included in this work. All work shall be done in accordance with specifications for new work of the particular type involved.

D. Patching shall be performed to match existing structures, exterior walls, and roofs, and shall form watertight installation.

1.10 VERIFICATION OF DIMENSIONS, ETC.:

A. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work, working conditions, verify all dimensions in the field, advise the Engineer of any discrepancy, and submit shop drawings of any changes he proposes to make in quadruplicate for approval before starting the work. The contractor shall install all equipment in a manner to avoid building interference.

1.11 COORDINATION WITH OTHER TRADES:

A. Coordinate all work of each section with work of other sections to avoid interference. Bidders are cautioned to check their equipment against space available as indicated on drawings, and shall make sure that proposed equipment can be accommodated. Before beginning work under each section, inspect installed work of other trades and verify that such work is complete to the point where the installation may properly begin.

1.12 PROTECTION OF ADJACENT WORK:

A. Protect work and adjacent work at all times with suitable covering. All damage to work in place caused by Contractor shall be repaired and restored to original good and acceptable condition using same quality and kinds of materials as required matching and finishing with adjacent work.

1.13 EXISTING EQUIPMENT AND MATERIALS:

A. All items of equipment removed under this section of the specifications shall become the property of this Contractor and shall be promptly removed from this site.

1.14 FIRESTOPPING:

A. Provide firestopping for all mechanical penetrations through fire resistant walls and shaft enclosures, and floor, ceiling, and roof elements of fire resistant assemblies. Firestopping shall provide rating comparable to rating of structure it protects.

B. Firestopping materials currently classified with UL as "Through Penetration Firestop Systems".

C. Firestopping materials shall have been tested in accordance with UL 1479 "Fire Tests of Through Penetration Firestops".

1.15 CLEAN-UP:

A. At the completion of the contract work, all areas where work has been performed shall be left clean. All trash shall be removed from the site by the Contractor.

1.16 APPROVALS AND SUBSTITUTIONS:

A. Notwithstanding any reference in the specifications to any article, device, product, material, fixture, form, or type of construction by name, make or catalog number, such references shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; and the Contractor, in such cases, may at his option use any article, device, product, material, fixture, or type of construction which, in the judgment of the Engineer, expressed in writing, is equal to that specified.

B. Requests for written approval to substitute materials or equipment considered by the Contractor as equal to those specified, shall be submitted for approval to the Engineer ten (10) days prior to bid date. Requests shall be accompanied by samples, descriptive literature and engineering information as necessary to fully identify and evaluate the product. No increase in the contract sum will be considered when requests are not approved.

1.17 AS-BUILT DRAWINGS:

A. The Contractor shall keep a record set of drawings on the job; and as construction progresses shall show the actual installed location of all items, material, and equipment on these job drawings. Indicate approved changes in red ink.

B. At the time of final completion, a corrected set of As-Built drawings shall be delivered to the Engineer. A final set of reproducible drawings with job information that reflects the actual installation shall be prepared by the contractor and given to the Owner.

1.18 WARRANTY:

A. The Contractor for each section of the work under this division will furnish to the Owner a written warranty for the installation as installed, to perform in a quiet, efficient, and satisfactory manner with no more than normal service.

B. Each warranty shall extend for a period of one year following substantial completion and acceptance of construction. They shall be endorsed by the Contractor.

1.19 MANUFACTURERS:

A. In order to define requirements for quality and function of manufactured products, and requirements such as size, gauges, grade selection, color selections and like specifications requirements, the specifications as written hereinafter are based upon products of those manufacturers who are named hereinafter under various specifications for materials.

B. In addition to products of manufacturers named hereinafter in the specifications, equivalent products of the following named manufacturers will be acceptable under the base bid:

1. Insulation:

   a) Owens Corning, Johns Manville, CertainTeed Corporation, Knauf Insulation

2. Valves:

   a) Crane Company, Grinnell Company, O.I.C. Valve Co., Chase Brass & Copper Company, Rockwell Manufacturing Company, Consolidated Brass Company, Hammond, Nibco.

3. Pipe Hangers:

   a) Cooper B-Line, Fee and Mason Manufacturing Company, Anvil International, Erico Caddy, Tolco a Division of Nibco

4. Plumbing Fixtures:

   a) Stern Williams, Fiat, Zurn Industries

5. Floor Drains, Roof Drains, Cleanouts, etc.:

   a) Wade, Inc., Zurn Industries, Inc., Josam Manufacturing Company, Jay R. Smith

6. Dielectric Fittings:

   a) Capitol Manufacturing Company, Dresser Manufacturing Company, Epco Sales, Inc.

7. Water Heating Equipment:

   a) Rheem Manufacturing Company, Ruud, State Industries, Lochinvar, A.O. Smith

8. Plumbing Trim:

   a) Delta Commercial Faucet Company, Chicago Faucets, Speakman, T & S Brass and Bronze Works, Inc., Zurn Industries, Symmons Engineering Company

9. Sump Pumps:

   a) Bell & Gossett Company, Weil, Weinman, Barnes, Liberty Pumps

10. Identification Items:

    a) Seton Name Plate Company, W.H. Brady Company, Handley Industries, Inc.

PART 2 - PRODUCTS

2.1 PAINTING:

A. Furnish touch up paint supplied by equipment manufacturer.

B. Coat ferrous metal surfaces that do not have factory painting or galvanizing with one coat of Sherwin Williams high heat aluminum paint.

2.2 VALVES:

A. All valves provided under each section shall be of a single manufacturer unless otherwise specified. All valves shall be of listed manufacturer as scheduled hereinafter in other sections of Division 22.

2.3 FIRESTOPPING MATERIALS:

A. The material used to fill the annular space shall prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E 119 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inches of water at the location of the test specimen for the time period equivalent to the fire resistance rating of the construction penetrated. Material shall be capable of curing in the presence of atmospheric moisture to produce durable and flexible seal, and will form airtight and watertight bonds with most common building materials in any combination including cement, masonry, steel, and aluminum.

2.4 SLEEVES AND OPENINGS:

A. Provide UL certified fire stop sleeving system for all pipe penetrations through fire rated walls, floors, partitions, ceilings, floor-ceiling assemblies, and roofs as tested under ASTM E814-13a "Standard Method of Fire Tests of Through Penetration Fire Stops".

2.5 SEISMIC RESTRAINTS:

A. Seismic restraints shall be provided per International Building Code Chapter 16 for Seismic Design Category C Buildings.

PART 3 - EXECUTION

3.1 EXCAVATION, TRENCHING AND BACKFILLING:

A. To accommodate mechanical work, execute all excavation, trenching, shoring and backfilling in excess of that required for structures. Coordinate this work with that required for structures, and schedule such work to be consistent with other construction work. All work shall be in compliance with OSHA safety standards.

B. Perform all excavations of every description and whatever substances encountered, to depths indicated, or as otherwise specified. During excavation, material suitable for backfilling shall be piled a sufficient distance from banks of trench in an orderly manner. Avoid overloading to prevent slides or cave-ins. All excavated materials not required or suitable for backfill shall be removed and wasted as indicated on drawings or as directed. Execute such grading as may be necessary to prevent surface water from flowing into trenches or other excavations. Any water accumulating therein by surface flow, seepage or otherwise, shall be removed by pumping or by other approved method. Such sheeting, bracing, and shoring shall be done as may be necessary for protection of work and for safety of personnel. Unless otherwise indicated, excavation shall be by open cut. Short section of a trench may be tunneled if, in the opinion of the Engineer, the pipe can be safely and properly installed and backfill can be properly tamped in such tunnel sections. Excavation shall be considered as unclassified and shall be executed complete.

C. Width of trenches at any point below top of pipe shall not be greater than outside diameter of pipe plus 16" for pipes measuring up to thirty inches, to permit satisfactory jointing and thorough tamping of bedding material under and around pipe. Care shall be taken not to over-excavate. Correct over-excavation by means of backfilling with concrete, or tamped and compacted suitable backfill material as approved for other backfilling work.

D. Remove rock in either ledge or boulder formation and replace with selected materials in such manner as to provide a compacted earth cushion having a thickness between unremoved rock and pipe of at least eight inches, or 1/2 inch for each foot of fill over top of pipe, whichever is greater, but not more than three-fourths nominal diameter of pipe. Where bell-and-spigot pipe is used, maintain cushion under bell as well as under straight portion of pipe.

E. Whenever wet or otherwise unstable soil that is incapable of adequately supporting pipe is encountered in trench bottoms, remove such material to depth required and replace to the proper grade with selected material compacted as hereinafter specified for backfilling of pipe.

F. Bedding surface for pipe shall provide a firm foundation of uniform density throughout entire length of pipe. Carefully bed pipe in a soil foundation that has been accurately shaped and rounded to conform to lowest one-fourth of outside portion of circular piped, or lower curved position of pipe arch for entire length of pipe or arch. When necessary, tamp bedding firmly. Bell holes and depressions for joints shall be only of such length, depth, and width as required for properly making particular type joint.

G. Existing utility lines that are shown on drawings, or locations of which are made known to Contractor prior to excavation, and that are to be retained, as well as utility lines constructed during excavation operation shall be protected from damage during excavation and backfilling and, if damaged, shall be repaired by Contractor at his expense. In event that Contractor damages any existing utility lines that are not shown on drawings or locations of which are not know to Contractor, report thereof shall be made immediately. If it is determined that repairs shall be made by Contractor, such repairs will be ordered under terms of "Changes in the Work" as set forth in the General Conditions.

H. After bedding has been prepared and pipe installed, selected material from excavation or burrow, at a moisture content that will facilitate compaction shall be placed along both sides of pipe in layers not exceeding six inches in compacted depth. Bring backfill up evenly on both sides of pipe for its full length. Care shall be taken to ensure thorough compaction of fill under tampers and rammers. Continue this method of filling and compacting until fill has reached an elevation of at least 12 inches above top of pipe. Backfill and compact remainder of trench by spreading and rolling, or compact by mechanical rammers or tampers in layers not exceeding eight inches.

I. In compacting by rolling or operating heavy equipment parallel with pipe, displacement of or injury to pipe shall be avoided. Movement of construction machinery over previously installed work at any stage on construction shall be at Contractor's risk. Any pipe damaged thereby shall be repaired or replaced at the option of Engineer and expense of Contractor.

J. Wet down all fill and backfill work, and each layer thereof to obtain optimum moisture content. Compaction shall then be executed to density of 95 percent of that obtainable in laboratory by Procter Method, or by AASHO Method T99.

K. When fill or backfill is required to be compacted to any specified density factor, tests shall be executed by an approved laboratory to ascertain compliance with requirements. One test shall be made for each 50 linear feet of open trench. Repeat tests for any specific area which fails to meet requirements until conformance is obtained. Cost of laboratory services shall be borne by Contractor as part of costs for this section of work.

L. Remove from site all excess earth, rock and other debris resultant from excavation and backfilling work.

M. When piping penetrates exterior foundation walls, pipe shall be water sealed with foundation using Link Seal, or equal, modular seal elements.

3.2 PIPE FITTINGS:

A. General: Provide complete systems of piping and fittings for all services as indicated. All pipe, valves, and fittings shall comply with American National Standards Institute, Inc. Code and/or local codes and ordinances. All fittings shall be domestically produced from domestic forgings. Cut pipe accurately to measurements established at building or site, and work into place without springing or forcing, properly clearing all windows, doors, and other openings or obstructions.

B. Excessive cutting or other weakening of the building to facilitate piping installation will not be permitted. Piping shall line up flanges and fittings freely and shall have adequate unions and flanges so that all equipment can be disassembled for repairs. Test all piping prior to insulation or concealing.

3.3 PIPE:

A. All piping material shall be as specified in other sections of this division.

B. Fittings and Connections: All turns and connections shall be made with long radius fittings as scheduled hereinafter.

C. Pipe joints shall be made in accordance with the following applicable specifications:

D. Make all solder joints with non-corrosive type flux 95 Percent tin and 5 percent antimony alloy solder.

E. (OPTION) Make all solder joints with copper and copper alloy press fittings where applicable. Sealing elements for press fittings shall be EPDM.

F. Plastic Pipe: Joints for polyvinyl chloride pipe and fittings shall be made using solvent cement. Threaded joints shall be used only where required for disconnection and inspection.

3.4 SLEEVES:

A. Provide all sleeves in floors, beams, wall, roof, etc. as required for installing work of this division unless otherwise specified hereinafter. Size sleeves for insulated pipe to accommodate both pipe and insulation. Construct vertical sleeves in connection with concealed piping of 22 gauge galvanized iron. Sleeves thru fire-rated assemblies shall be firestopped as specified herein and insulation shall not pass thru sleeve unless material complies with firestopping specified.

3.5 PIPE HANGERS, SUPPORTS AND INSERTS:

A. Pipe hangers, supports and inserts shall comply with Table 308.5 of the 2021 International Plumbing Code and be provided as follows:

B. All piping shall be supported by forged steel hangers or brackets suitably fastened to structural portion. Wall brackets shall be Fee & Mason Fig. No. 151. Provide lock nuts on all adjustable hanger assemblies.

PIPE SIZE - INCHES

	1/2 – 2	2-1/2 – 4	6 – Up	Wall Plate Hanger
Grinnell	104	260	171	139
Fee & Mason	199	239	170	302
Elcen	92	12	15	---

C. Hanger or Support Spacing (unless specified different hereinafter):

1. Copper Pipe:

Nominal Pipe Size – Inches	Maximum Span - Feet
1-1/4" and under	6'
1-1/2" and above	10'

2. Plastic Pipe:

4'- 0" intervals

D. Size hangers on insulated piping to permit insulation and saddles to pass full size through hanger.

E. Bases of Stacks:

1. If not buried in earth, to be supported on concrete, brick in cement mortar, metal brackets permanently attached to the building structure, or by other approved methods.

F. Trapeze Hangers:

1. May be used for groups of pipes close together and parallel. Trapeze hangers may be constructed from structural channel or angle irons or from pre-formed channel shapes. All pipe lines must be held on specific centers by U bolts, clips, or clamps.

G. Inserts:

1. For each hanger on horizontal pipes, installed before concrete is poured. Inserts shall permit horizontal adjustment of the nut.

H. Special and Additional Supports:

1. Special supports will be required where hangers cannot be used. Horizontal pipes shall be secured to prevent vibration or excessive sway. Where pipes must be laid on fill, they shall be supported at each joint by brick or concrete supports carried down into solid, natural earth. Where required, provide additional hangers to secure required level, slope, or drainage, and also to prevent sagging. Provide a hanger within one foot of each elbow. Provide all miscellaneous steel required for pipe supports, anchors, etc.

3.6 INSULATION SHIELDS:

A. Provide all insulated piping with 10-inch long (16 gauge) protective galvanized sheet metal shields extending 120 degrees around bottom of insulated pipe at all hangers.

3.7 FLOOR, WALL, AND CEILING PLATES:

A. Where pipes pass through floors, finished walls, or ceilings, fit with chromium plate cast brass plates or chromium plated steel plates as specified hereinafter. Plates shall be large enough to completely close holes around pipes, and shall be square, octagonal, or round, with least dimension not less than 1-1/2 times larger than diameter of pipe. Secure plates in an approved manner. Plates shall be Beaton-Caldwell No. 3A for floors and No. 40 for walls and ceilings.

3.8 SWING CONNECTIONS:

A. Swing connections shall be provided at all points of expansion. Install all connections to equipment, etc. in a manner to allow for normal pipe movement due to thermal expansion without causing undue stresses to be exerted on said equipment.

3.9 REDUCING FITTINGS:

A. Where pipe lines reduce in size, provide reducing fittings wherever possible. Provide eccentric fittings or reducers where horizontal runs of supply lines reduce in size, and install so that there will be no air trapped in hot or cold water systems. In screwed work, no bushings shall be used unless there is a difference of two standard pipe sizes between inner and outer threads.

3.10 DIELECTRIC CONNECTIONS:

A. Wherever any connection is made between dissimilar metals, provide dielectric pipe couplings or unions.

3.11 CLEANING:

A. All surfaces on metal, pipe, insulation covered surfaces, and other equipment furnished and installed under this division of the specifications shall be thoroughly cleaned of grease, scale, dirt, and other foreign material.

3.12 TESTING (PIPING):

A. Upon completion of each system of work under this division, and at a designated time, all piping shall be pressure tested for leaks in the presence of the owner. The owner shall be notified five days before testing is to be conducted and all tests shall be conducted in the presence of the owner. All equipment required for the test shall be furnished by the contractor at his expense. All tests shall be performed as specified hereinafter. If inspection or tests show defects, such defective work or material shall be replaced, and inspection and tests repeated at no additional cost to owner. Make tight any leaks. Repeat tests until system is proven tight. Caulking of leaks will not be permitted. All equipment not capable of withstanding the test pressure shall be valved off during the test.

B. Drainage System: Drainage and venting system shall be tested in such a manner that cast iron soil pipe will not be subjected to excessive pressure. Testing of any portion of this system shall be executed by plugging all necessary openings of that portion of system being

tested and filling with water to a height of not less than ten feet above highest floor, or a pump may be used to maintain an equivalent pressure. Test pressure shall be maintained to thirty minutes when using pump method. When using water column method, test period shall also be thirty minutes, and water level shall not drop. Hot poured joints shall not be tested with more than eighty feet head of water. No tests shall be made during freezing weather and all tests shall be made prior to backfilling.

C. Hot and Cold Water Piping: Upon completion of rough-in and before setting fixtures, entire hot and cold water systems shall be tested at a hydrostatic pressure of 1-1/2 times operating pressure, but not less than 150 psig, and be proved tight at this pressure. Where a portion of the water system is to be concealed before completion, this portion shall be tested separately in a manner described for the entire system. Water used for testing shall be from a potable source of supply.

D. Gas Piping: Gas piping shall be tested at not less than 1-1/2 times working pressure, and be proved tight at this pressure for a minimum of ½ hour per 500 cfh. (Minimum test pressure 10 psig at 4 hours.)

E. Storm drainage piping shall be tested in a manner as specified hereinbefore for drainage system.

3.13 OPERATION AND MAINTENANCE INSTRUCTIONS, AND MAINTENANCE MANUAL:

A. Upon completion of work, and at a time designated by the engineer, a competent employee of the contractor shall be provided to instruct a representative of the owner in the operation and maintenance of the system.

1. Minimum instruction period shall be:

a) Plumbing System - 1/2 day

B. Maintenance Manuals: The contractor shall compile and bind five (5) sets of all the manufacturer’s instructions and descriptive literature on all items of equipment furnished under this work. These instructions shall be delivered through the general contractor to the engineer for approval prior to final inspection.

1. Instructions shall include:

a) Warranty letter signed by the Mechanical Contractor.
b) Index for each section with each section properly identified.
c) Copy of sterilization report.
d) Copy of backflow preventer test.
e) Complete equipment list with model and serial numbers.
f) Copy of one complete, approved submittal for each equipment section.
g) Description of each system, including manufacturer's literature for all items.
h) Start-up and shut-down description for each system.
i) Suggested operating and maintenance instructions with frequency of maintenance indicated.

j) Parts list for all items of equipment.

k) Name, address, and telephone number of nearest sales and service organization for all items of equipment.

C. Manuals shall be 8-1/2 x 11 inch text pages in digital PDF format. Prepare binder covers with printed subject title of manual, title of project, date, and volume number when multiple binders are required. Provide a table of contents for each volume. Internally subdivide the binder contents with bookmarks providing a link to each section. Provide directory listing as appropriate with names addresses, and telephone numbers of design consultant, Contractor, subcontractors, equipment suppliers, and nearest service representatives.

End of Section 220010

SECTION 220500 - PLUMBING

PART 1 - GENERAL

1.1 WORK INCLUDED:

A. General Requirements: This Section of the Specifications and related drawings describe requirements pertaining to plumbing work including applicable insulation in separate Section 220700. All work shall conform to Section 220010, General Provisions - Plumbing. Work includes, but is not necessarily limited to:

1. All fixtures noted or specified.

2. Cold water and hot water systems.

3. Gas piping system.

4. Storm drainage system.

5. Soil, waste, and vent piping system.

6. Other plumbing indicated on drawings, specified herein, or required for complete and proper installation in accordance with applicable codes and regulations.

7. Insulation.

B. Upon completion of work, all fixtures, devices, etc. for use by persons with disabilities shall meet all requirements as set forth by the Americans with Disabilities Act (ADA).

PART 2 - PRODUCTS

2.1 SOIL, WASTE, DRAIN AND VENT PIPING AND FITTINGS:

A. Materials shall conform to the following specifications requirements:

B. Construct all building sewers and building drain lines underground and/or under floor slabs to a point 5'-0" outside of building walls, unless indicated otherwise on the drawings, with Schedule 40 solid wall PVC pipe and fittings by Charlotte, or approved equal. Pipe and fittings shall be manufactured from rigid polyvinyl chloride vinyl compounds with a cell class of 12454 as identified in ASTM D 1784. Piping shall conform to ASTM D1785 and ASTM D 2665. Pipe and fittings shall conform to NSF International Standard 14. Co-ex or foam core piping will not be permitted.

C. Construct all soil, drain, and waste piping, that is installed above floor slabs with Schedule 40 solid wall PVC pipe and fittings by Charlotte, or approved equal. Pipe and fittings shall be manufactured from rigid polyvinyl chloride vinyl compounds with a cell class of 12454 as identified in ASTM D 1784. Piping shall conform to ASTM D1785 and ASTM D 2665.

Pipe and fittings shall conform to NSF International Standard 14. Co-ex or foam core piping will not be permitted. PVC piping shall be protected by a steel strike plate of no less than 0.0575 inches when the piping is located within 1-1/4" of the structural members. Strike plate shall extend no less than 2" above and below the structural member.

D. Plumbing Contractor will connect up soil pipe at a point five feet outside the building.

E. Construct vent piping with Schedule 40 solid wall PVC pipe and fittings by Charlotte, or approved equal. Pipe and fittings shall be manufactured from rigid polyvinyl chloride vinyl compounds with a cell class of 12454 as identified in ASTM D 1784. Piping shall conform to ASTM D1785 and ASTM D 2665. Pipe and fittings shall conform to NSF International Standard 14. Co-ex or foam core piping will not be permitted. PVC piping shall be protected by a steel strike plate of no less than 0.0575 inches when the piping is located within 1-1/4" of the structural members. Strike plate shall extend no less than 2" above and below the structural member.

2.2 SUPPLY PIPING AND FITTINGS:

A. Materials for supply piping and fittings shall conform to the following specification requirements:

B. All domestic water piping aboveground shall be seamless hard drawn type L copper tubing, ASTM B 88, with wrought copper ASA B16.22, fittings, Class No. 150. Type L copper piping shall be protected by a steel strike plate of no less than 0.0575 inches when the piping is located within 1-1/4" of the structural members. Strike plate shall extend no less than 2" above and below the structural member.

C. (OPTION) All water piping aboveground may be Viega, or equal, ProPress G fittings installed in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting on the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged in the fitting. The joints shall be pressed using the tool approved by the manufacturer. Piping shall be protected by a steel strike plate of no less than 0.0575 inches when the piping is located within 1-1/4" of the structural members. Strike plate shall extend no less than 2" above and below the structural member.

D. Gas piping located underground shall be encased in a vented conduit of approved material as indicated by the International Fuel Gas Code – 2021 Edition with SC modifications. Piping inside of vented conduit shall be CSST (corrugated stainless steel tubing) by TracPipe PSII, or equal. The tubing shall be 300 type stainless steel CSST with an integral polyethylene sleeve. The sleeve shall have internal vent channels running lengthwise to direct any leakage along the pipe to the end fitting. Fittings shall be made of yellow brass and be tested and listed by CSA International for concealed use. Joints shall be a metal-to-metal seal with no gaskets. Male adapter fitting with vent shall be used at termination points where exposed to the atmosphere.

E. Valves: Materials for valves shall conform to the following specification requirements:

1. Ball:

a) Ball valves 3" and smaller shall be two-piece bronze body, full port, chrome ball, RTFE seats, with adjustable packing, rated for 600 psig minimum working pressure, meeting WWV-35 and MSS-SP110.

2. Check:

a) Valves 2 inches and smaller shall be of swing check, solder end type suitable for a minimum working pressure of 300 psig.

3. Gas Valves:

a) Valves shall be semi-steel body, bolted cover type, screwed or flanged ends suitable for 175 pound, WOG.

F. Wall hydrants shall be Woodford Manufacturing Co., Jay R. Smith, Zurn Industries, or equal, Style 67.

G. Temperature and pressure relief valves shall be type N 40 XL as manufactured by Watts Regulator Company, Cash Acme, Conbraco, or equal.

2.3 CLEANOUTS:

A. Provide cleanouts as follows:

1. Unfinished areas and chases - Z-1450-7 C.I. cleanout ferrule with counter-sunk lead seal plug.

2. Finished walls - ZN-1440-4 C.I. wall cleanout ferrule with raised head lead seal plug and Nikaloy square scoriated frame and cover.

3. General use in Finished Floor - ZN-1400-4 C.I. floor cleanout with seriated cut-off ferrule lead seal plug adjustable Nikaloy square scoriated frame and cover.

4. All cleanouts shall be as manufactured by Zurn Industries, Inc., Jay R. Smith, Josam, or equal.

2.4 DRAINS:

A. Provide floor and area drains of manufacturer's standard size at locations indicated on drawings. Construct drains of cast iron with polished brass strainer. Floor drains shall be as indicated on the drawings. Drains shall be manufactured by Zurn Industries, Inc., Jay R. Smith, Josam, or equal.

2.5 WATER HEATER:

A. Provide water heater complete, including all piping, specialties and connections as indicated on the drawings. All water heaters shall meet the minimum energy factor required by the U.S. Federal "National Appliance Energy Conservation Act of 2010".

2.6 FIXTURES AND FIXTURE TRIM:

A. Fixtures and fixture trim shall be as called for in the fixture schedule shown on drawings. All enamel on cast iron fixtures shall be acid resisting. The color of fixtures shall be white.

2.7 STORM DRAINAGE:

A. All pipes shall conform to sizes shown on drawings. All drain piping shall be similar to that specified for waste and soil piping.

2.8 SUMP PUMPS:

A. Sump pumps shall be Bell & Gossett, or approved equal, of high efficiency models indicated on drawings. Package shall consist of a wastewater pump, fiberglass sump pit, completely assembled with valves, piping, guide rails, and lifting cable. Pump shall be for continuous operation when fully submerged and shall be capable of handling solids up to ½" sphere, and include a float switch. See schedule for operating conditions.

2.9 MECHANICAL SEAL AND SLEEVES:

A. All pipes through exterior foundation walls shall have molded non-metaling high density polyethylene sleeves with integral hollow, molded water stop ring four inches larger than the outside diameter of the sleeve. End caps and reinforcing ribs shall be domestically manufactured in an approved ISO-9001 facility. Seals shall be Century Line Sleeve, or equal.

PART 3 - EXECUTION

3.1 EXISTING CONDITIONS:

A. Verify locations and inverts of existing and proposed pipes, location of structural elements, locations and sizes of chases, type, and method of construction of floors, walls, partitions, etc.

B. Drawings do not indicate all offsets, fittings, and specialties. Examine other drawings, investigate conditions to be encountered and arrange work accordingly, furnishing required fittings, valves, specialties, etc. without extra charge. Where conditions necessitate rearrangement, submit for approval sketches showing proposed arrangement.

3.2 INSTALLATION:

A. GENERAL:

1. Protect pipe openings and drains by plugs or caps. Duct tape will not be acceptable. Clean all stoppages.

2. Unless otherwise shown, install piping concealed, straight, without sags or pockets and graded for drainage. Cut pipe ends square and ream. Before assembly, clean dirt, scale, and chips.

3. Provide clearance between pipe and building structure so pipes can expand without damage to building structure.

4. Schedule meetings with other trades before and during installation to avoid conflicts and ensure that pipes and equipment are installed in the best manner, taking into consideration headroom, maintenance, appearance, and replacement.

3.3 PAINTING:

A. Clean damaged factory finishes and coat with matching touch-up paint. Paint all supports and hangers with two coats of high heat aluminum paint.

3.4 SOIL, WASTE, SEWER AND VENT PIPING:

A. Install sewer and water pipes in separate trenches with grades uniform to provide solid bearing. Dig bell holes at hubs. Piping through or under footings shall be provided with a pipe sleeve or relieving arch.

B. Run horizontal pipe, graded uniformly, not less than 1/4" per foot for pipes 2-1/2" and smaller; and 1/8" per foot for larger pipes. Offset as required to pass obstacles.

C. Change size by reducing fittings. Change directions by 45-degree wyes and long-sweep bends. Use short-sweep bends only with written approval. No pipe shall be drilled, tapped, or welded. Saddle hubs and bands, tapped tees, and crosses will not be approved.

D. Upon completion of tests and inspections, backfill with approved material, placed and tamped to prevent settlement.

3.5 HOT AND COLD WATER PIPING:

A. Unless otherwise indicated, run hot and cold water piping concealed, and uniformly pitched to ensure venting and drainage. Install drain valves at low points.

B. Unless otherwise required, branches to small fixtures shall be 1/2" ID for single fixture and 3/4" ID for two fixtures. Pipe size indications are "nominal" sizes.

3.6 GAS PIPING:

A. Gas piping shall be installed and connected to all gas-fired appliances with an individual regulating and shut-off valve at each appliance. Piping shall be installed in accordance with more stringent rules and recommendations of the following:

1. International Fuel Gas Code – 2021 Edition with SC modifications

3.7 STORM DRAINAGE:

A. This work in general consists of drainage lines, roof drains, connections to downspouts, including cast iron boots, and other structures and connections into storm system at locations as indicated on the drawings.

3.8 TRAPS:

A. Provide each fixture with a trap when connection to drainage system is required. Place each trap as near to the fixture as possible. No fixture shall be double trapped.

3.9 FLASHING:

A. Vent pipes and stack vents shall be flashed and made watertight on the roof with 16 ounce, soft, sheet copper or 4-pound sheet lead. Flashings shall extend not less than 8 inches from pipe in all directions. Flashing for pipe shall be extended up the pipe a minimum of 6 inches, at which point threaded standard cast iron or malleable iron recess roof coupling shall be installed to form counterflashing or rain guard.

3.10 CLEANOUTS:

A. Provide an easily accessible cleanout at the foot of each vertical soil or waste stack and where indicated on drawings. Cleanouts shall be of the same nominal size as the pipe in which they are installed, up to 4 inches; and not less than 4 inches for larger sizes. A cleanout shall consist of a long sweep 1/4 bend or one or two 1/8 bends. The maximum spacing of cleanouts shall be one hundred feet.

3.11 DRAINS:

A. Provide floor drains of manufacturer's standard size at locations indicated on drawings. Carefully set drains to grade to provide drainage of surrounding area and trap.

3.12 FIXTURES AND FIXTURE TRIM:

A. Provide lavatories with angle stops. Provide all other plumbing fixtures with either angle or straight stops, integral with faucets, or with concealed type lock shield or loose-key pattern.

B. All fixtures and trimmings shall be designed to prevent backflow of polluted water or waste into the water supply system.

C. Except where noted otherwise, exposed piping fittings and trimmings shall be chromium plated over nickel-plated brass with polished, bright surfaces.

D. Securely support fixtures with approved brackets, chairs, bolts, and metal expansion inserts. Where chases are provided or adjacent space in an undeveloped area, use through-bolts and heavy steel load distributing plate in addition to other means specified.

3.13 STERILIZATION:

A. All water piping installed under this section shall be thoroughly sterilized. The entire sterilization procedure shall be in strict accordance with the requirements of the State Board of Health and, upon completion of the sterilization, the potability of the water in the system shall be checked and approved by the Engineer. All costs for testing shall be paid for by this Contractor.

End of Section 220500

SECTION 220700 – PLUMBING INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED:

A. General Requirements: This section shall include all insulation as required for installation on all items as specified hereinafter and/or as indicated. All insulations shall be installed in a workmanlike manner by qualified workers in the employment of an independent insulation contractor. Costs of insulation shall be included as part of work by contractor as applicable to his section of work. No separate bid is to be included for insulation work.

B. Fire hazard classification for all material shall not exceed flame spread of 25 and smoke development of 50 as classified by Underwriters Laboratories under Test Method ASTM E-84 and acceptable under NFPA Standards. This is to apply to the complete system and be a composite rating of insulation material with jacket or facings, vapor barrier, joint sealing tapes, mastic, and fittings.

C. Prior to commencing any work, submit data sheets for engineer's approval of all material proposed to be used on this project.

PART 2 - PRODUCTS

2.1 ABOVE GROUND INDOOR PIPING:

A. Pipe Insulation:

1. All water piping shall be insulated with heavy density fiberglass with all-service jacket Owens-Corning Double Self-Sealing Lap, ASJ/SSL-II, one piece, to be used on all lines above and below ambient temperature from 0ºF to 850ºF.

2.2 PIPE INSULATION THICKNESS:

A. Piping for the following systems shall be insulated to the thickness listed:

Item	Insulation Thickness (Inches)
Fiberglass K = .24	
Cold Pipes:	
Cold Water (Domestic)	1"
Storm Drainage	1"

Hot Pipes:

Hot Water (Domestic) 1"

PART 3 - EXECUTION

3.1 PIPE INSULATION:

A. All insulation shall be applied to clean, dry surfaces butting all sections firmly together and finishing as specified hereinafter.

B. All vapor barriers shall be sealed, and shall be continuous throughout. No staples shall be used on any vapor barrier jacket unless sealed with vapor barrier coating or vapor barrier tape.

C. Insulation of all insulated lines shall be interpreted as including all pipe, valves, fittings, and specialties comprising the lines.

D. Where sectional insulation is not practical, the proper insulation cement or block insulation shall be utilized by forming it to the applied surface.

E. Pipe Insulation Protection: Direct contact between pipe and hangers shall be avoided. Hanger shall pass outside of a sheet metal protection saddle which shall cover a section of high density insulation (cellular glass or calcium silicate), of sufficient length to support the weight of the pipe without crushing the insulation. The vapor barrier shall be continuous behind the saddle or shall be lapped over the saddle and securely cemented thereto.

F. All pipe covering shall be furnished with self-seal lap and 3" wide butt joint strips. The release paper is pulled from adhesive edge, pipe covering closed tightly around pipe and self-seal lap rubbed hard in place with the blunt edge of an insulation knife. This procedure applied to longitudinal as well as circumferential joints. Staple all longitudinal and circumferential joints with 9/16" staples 6" on center and seal over all staples with Childers CP-30 vapor barrier coating. Care shall be taken to keep jacket clean as it is the finish on all exposed work. All adjoining insulation sections shall be firmly butted together before butt joint strip is applied, and all cold water service lines shall have vapor barrier coating thoroughly coated to pipe at butt joints and at all fittings.

G. Apply fiberglass inserts to all other hot fittings and cold water fittings in conjunction with Proto PVC Fitting Covers. Seal cold applications as recommended by the manufacturer.

End of Section 220700

SECTION 230010 - GENERAL PROVISIONS - HVAC

PART 1 – GENERAL

1.1 SCOPE:

A. Bids of work covered by each section of these specifications shall be based on the layout and equipment as shown and specified with only such approved substitutions as are allowed. Drawings show general arrangement of ductwork and piping. Because of small scale of drawings, it is not possible to indicate all offsets, fittings, and accessories, which may be required. Contractor shall carefully investigate structural and finish conditions affecting his work and shall arrange such work accordingly, furnishing such fittings, traps, valves, and accessories as may be required to meet such conditions. Where locations make it necessary or desirable from Contractor's standpoint to make changes in arrangements or details shown on drawings, he may present suggestions for such changes and obtain Engineer's approval prior to making such changes.

1.2 CODES:

A. All work under this division shall be in strict compliance with "International Codes" and all applicable Codes and Regulations of the Authority Having Jurisdiction.

1.3 MATERIAL AND SHOP DRAWINGS:

A. Use only new materials and the standard product of a single manufacturer for each article of its type unless specifically mentioned otherwise. Materials and workmanship in the case of assembled items shall conform to the latest applicable requirements of NFPA, ASME, NEC, ASTM, AWWA, NEMA, and ANSI.

B. Schedule submittals to expedite work. Unless otherwise indicated in this Section, submittals shall be submitted within 30 days of date of Notice to Proceed. Provide electronic copies of submittals in PDF format for review and approval. All submittals shall be bound in a single volume. Partial lists will not be considered and will be returned to the Contractor. Controls may be submitted separately and shall be submitted no later than 60 days of notice to proceed. Identify Project, Contractor, subcontractor, supplier, manufacturer, pertinent drawing sheet and detail numbers, and associated specification section numbers. A table of contents shall be included in the front of the submittal with tabs indicating each section. Identify variations from requirements of Contract Documents.

C. Contractor responsibilities:

1. Review submittals prior to transmittal. Verify compatibility with field conditions and dimensions, product selections and designations, quantities, and conformance of submittal with requirements of Contract Documents. Return non-conforming submittals to preparer for revision rather than submitting to Engineer. Coordinate submittals to avoid conflicts between various items of work. Failure of Contractor to review submittals prior to transmittal to Engineer shall be cause for rejection. Incomplete, improperly packaged, and submittals from sources other than

Contractor will not be accepted. Submittals not stamped APPROVED and signed by the Contractor will be returned to the Contractor.

2. Where required by specifications or otherwise needed, prepare drawings illustrating portion of work for use in fabricating, interfacing with other work, and installing products. Prepare ¼" per foot scale drawings of all mechanical rooms when substituting items of equipment that are not the basis for design. All equipment submitted shall be of adequate size and physical arrangement to allow unobstructed access when installed, for routine maintenance, coil removal, shaft removal, motor removal and other similar operations. Contract Drawings shall not be reproduced and submitted as shop drawings. Drawings shall be 8-1/2 by 11 inches minimum and 24 by 36 inches maximum. Title each drawing with Project name and reference the sheet the drawing corresponds to.

3. Provide product data such as manufacturer's brochures, catalog pages, illustrations, diagrams, tables, performance charts, and other material which describe appearance, size, attributes, code and standard compliance, ratings, and other product characteristics. Provide all critical information such as reference standards, performance characteristics, capacities, power requirements, wiring and piping diagrams, controls, component parts, finishes, dimensions, and required clearances. Submit only data which are pertinent. Mark each copy of manufacturer's standard printed data to identify products, models, options, and other data pertinent to project.

4. Control diagrams: Show relative positions of each component as a system diagram. Provide points list, wiring diagram and schedule of all products and components used in system.

5. Engineer will review and return submittals with comments. Do not fabricate products or begin work which requires submittals until return of submittal with Engineer acceptance. Promptly report any inability to comply with provisions. Revise and resubmit submittals as required within 15 days of return from Engineer. Make re-submittals under procedures specified for initial submittals. Identify all changes made since previous submittal.

D. Engineer Review:

1. Engineer will review submittals for sole purpose of verifying general conformance with design concept and general compliance with Contract Documents. Approval of submittal by Engineer does not relieve Contractor of responsibility for correcting errors which may exist in submittal or from meeting requirements of Contract Documents. After review, Engineer will return submittals marked as follows to indicate action taken:

2. No Exception: Part of work covered by submittal may proceed provided it complies with requirements of Contract Documents. Final acceptance will depend upon that compliance. The term "approved" shall only indicate that there is no exception taken to the submittal.

3. No Exception As Corrected: Part of work covered by submittal may proceed provided it complies with notations and corrections on submittal and requirements of Contract documents. Final acceptance will depend upon that compliance.

4. Revise And Resubmit: Do not proceed with part of work covered by submittal including purchasing, fabricating, and delivering. Revise or prepare new submittal in accordance with notations and resubmit.

E. Samples:

1. Submit samples to illustrate functional and aesthetic characteristics of products with all integral parts and attachment devices. Include full range of manufacturer's standard finishes, indicating colors, textures, and patterns for A/E selection. Submit the number of samples specified in individual specification sections. One sample will be retained by A/E.

F. Items Requiring Submittal are as Follows:

1. Insulation
2. All items listed in MANUFACTURERS: Section of 230010

1.4 ASBESTOS:

A. At any time the Contractor encounters asbestos, he shall immediately stop work in the immediate area and suspend any further work until asbestos is removed. Contractor shall, upon discovery of asbestos, notify owner, or owner's representative, who shall be responsible for the removal of the asbestos, all in accordance with NESHAP (National Emission Standard for Hazardous Air Pollutants). Any form of asbestos removal or demolition shall be by owner. Engineer is not an "Owner or Operator" as defined under NESHAP.

B. Contractor is responsible for, and shall be aware of all state and federal laws pertaining to asbestos as well as NESHAP requirements.

1.5 LEAD FREE:

A. All solder, flux and pipe used in water system must be lead free. Lead free is defined as less than 0.2 percent lead in solder and flux and less than 8.0 percent lead in pipes and fittings.

1.6 AMERICANS WITH DISABILITIES ACT:

A. All items or work under this division of the specifications shall comply with guidelines as set forth in the Americans With Disabilities Act.

1.7 PERMITS AND FEES:

A. Obtain permits, licenses, pay fees, etc. as required for performance of Contract. Arrange for necessary inspections required by governing authority and deliver certificates of approval to Architects or their representatives. File plans required by governing body.

1.8 DEFINITIONS:

A. In this division of the specifications and accompanying drawings, the following definitions apply:

B. Provide/Install: To purchase, pay for, transport to the job site, unpack, place or fix (equipment or machinery) in position ready for use, and connect complete and ready for operation; to include all permits, inspections, equipment, material, labor, hardware, and operations required for completion and operation.

C. Furnish: To purchase, pay for, and deliver to the job site for installation by others.

D. The Mechanical Contractor is cautioned that "furnish" requires coordination with others. Such coordination costs shall be included as part of Mechanical Contractor's bid.

1.9 CUTTING AND PATCHING:

A. Cutting of walls, floors, roofs, partitions, and ceiling, required for proper installation of the systems shall be performed under this contract.

B. Cutting shall be done in a neat, workmanlike manner. No joist, beams, girders, columns, or other structural members may be cut without written permission from the Engineer. When possible, holes shall be saw-cut or core drilled neat to minimize patching.

C. Re-routing of existing pipes, insulation, etc. as required for installation of new system is included in this work. All work shall be done in accordance with specifications for new work of the particular type involved.

D. Patching shall be performed to match existing structures, exterior walls and roofs, and shall form watertight installation. Where existing ductwork, pipe or other items are removed, the walls, floors, roofs, partitions or ceilings shall be patched to match existing finishes by this contractor.

1.10 VERIFICATION OF DIMENSIONS, ETC.:

A. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work, working conditions, verify all dimensions in the field, advise the Engineer of any discrepancy, and submit shop drawings of any changes he proposes to make in quadruplicate for approval before starting the work. Contractor shall install all equipment in a manner to avoid building interference.

1.11 COORDINATION WITH OTHER TRADES:

A. Coordinate all work of each section with work of other sections to avoid interference. Bidders are cautioned to check their equipment against space available as indicated on drawings, and shall make sure that proposed equipment can be accommodated. Before beginning work under each section, inspect installed work of other trades and verify that such work is complete to the point where the installation may properly begin.

B. Where equipment supplied by an approved manufacturer is substituted for the specified equipment, the Contractor will be responsible for coordinating any changes required in his work or other trades work, including but not limited to electrical requirements, structural steel requirements and space requirements. Any additional costs required to make changes to other trades work shall be borne by this contractor.

1.12 PROTECTION OF ADJACENT WORK:

A. Protect work and adjacent work at all times with suitable covering. All damage to work in place caused by Contractor shall be repaired and restored to original good and acceptable condition using same quality and kinds of materials as required to match and finish with adjacent work.

1.13 EXISTING EQUIPMENT AND MATERIALS:

A. All items of equipment removed under this section of the specifications shall become the property of this Contractor shall be promptly removed from this site.

1.14 FIRESTOPPING:

A. Provide firestopping for all mechanical penetrations through fire resistant walls and shaft enclosures, and floor, ceiling, and roof elements of fire resistant assemblies. Firestopping shall provide rating comparable to rating of structure it protects.

B. Firestopping materials currently classified with UL as "Through Penetration Firestop Systems".

C. Firestopping materials shall have been tested in accordance with UL 1479 "Fire Tests of Through Penetration Firestops".

1.15 CLEAN-UP:

A. At the completion of the contract work, all areas where work has been performed shall be left clean. All trash shall be removed from the site by the Contractor.

1.16 APPROVALS AND SUBSTITUTIONS:

A. Notwithstanding any reference in the specifications to any article, device, product, material, fixture, form, or type of construction by name, make or catalog number, such references shall be interpreted as establishing a standard of quality and shall not be construed as limiting competition; and the Contractor, in such cases, may at his option use

any article, device, product, material, fixture, or type of construction which, in the judgment of the Engineer, expressed in writing, is equal to that specified.

B. Requests for written approval to substitute materials or equipment considered by the Contractor as equal to those specified, shall be submitted for approval to the Engineer ten (10) days prior to bid date. Requests shall be accompanied by samples, descriptive literature and engineering information as necessary to fully identify and evaluate the product. No increase in the contract sum will be considered when requests are not approved.

C. The Contractor shall bear the burden and cost of coordinating with all trades any changes in work required by substitutions, including but not limited to electrical connections, additional components required, service clearance, etc.

1.17 AS-BUILT DRAWINGS:

A. The Contractor shall keep a record set of drawings on the job; and as construction progresses shall show the actual installed location of all items, material, and equipment on these job drawings. Indicate approved changes in red ink.

B. At the time of final completion, a corrected set of As-Built drawings shall be delivered to the Engineer. A final set of reproducible drawings with job information that reflects the actual installation shall be prepared by the Engineer and given to the Owner.

1.18 WARRANTY:

A. The Contractor for each section of the work under this division will furnish to the Owner a written warranty for the installation as installed, including controls and all other equipment covered under each section of the specifications, to perform in a quiet, efficient, and satisfactory manner with no more than normal service.

B. Each warranty shall extend for a period of one year following substantial completion and acceptance of construction. They shall be endorsed by the Contractor. Refrigeration compressors shall have a five (5) year warranty.

1.19 MANUFACTURERS:

A. In order to define requirements for quality and function of manufactured products, and requirements such as size, gauges, grade selection, color selections and like specifications requirements, the specifications as written hereinafter are based upon products of those manufacturers who are named hereinafter under various specifications for materials.

B. In addition to products of manufacturers named hereinafter in the specifications, equivalent products of the following named manufacturers will be acceptable under the base bid:

1. Ductless Split Heat Pumps:

a) Mitsubishi, Daikin, LG, Lennox, Johnson Controls

2. Electric Unit Heaters:

a) Carrier Air Conditioning Company, The Trane Company, McQuay International, Markel Products Company, Electromode, Berko, Inc., Q-Mark, Raywall, Redd-I, Indeeco

3. Fans:

a) Greenheck Fan Corporation, Loren Cook Company, Breidert/Jenn Fans, Carnes Company, ACME, PennBarry, Twin City Blower, American Coolair/ILG

4. Louvers:

a) Ruskin Manufacturing Company, Greenheck, NCA Manufacturing, Safe Air/Dowco, Inc., Cesco Products, Inc., Leader Industries, Pottorff, Arrow United, Nailor

5. Pipe Hangers:

a) Cooper B-Line, Fee and Mason Manufacturing Company, Anvil International, Erico Caddy, Tolco a Division of Nibco

6. Identification Items:

a) Seton Name Plate Company, W.H. Brady Company, Handley Industries, Inc.

PART 2 - PRODUCTS

2.1 PAINTING:

A. Furnish touch up paint supplied by equipment manufacturer.

B. Coat ferrous metal surfaces that do not have factory painting or galvanizing with one coat of Sherwin Williams high heat aluminum paint.

2.2 NAME PLATES:

A. All equipment provided under this division shall be labeled with a Bakelite nameplate 1" x 3" minimum with 3/8" minimum height lettering as manufactured by Seton Name Plate Company. See filter nameplate requirement below.

2.3 FIRESTOPPING MATERIALS:

A. The material used to fill the annular space shall prevent the passage of flame and hot gases sufficient to ignite cotton waste when subjected to ASTM E 119 time-temperature fire conditions under a minimum positive pressure differential of 0.01 inches of water at the

location of the test specimen for the time period equivalent to the fire resistance rating of the construction penetrated. Material shall be capable of curing in the presence of atmospheric moisture to produce durable and flexible seal, and will form airtight and watertight bonds with most common building materials in any combination including cement, masonry, steel, and aluminum.

2.4 SLEEVES AND OPENINGS:

A. Provide UL certified fire stop sleeving system for all pipe penetrations through fire rated walls, floors, partitions, ceilings, floor-ceiling assemblies and roofs as tested under ASTM E814-13A "Standard Method of Fire Tests of Through Penetration Fire Stops".

PART 3 - EXECUTION

3.1 PIPE:

A. All piping material shall be as specified in other sections of this division.

B. Fittings and Connections: All turns and connections shall be made with long radius fittings as scheduled hereinafter. No miter connections will be permitted in welded work.

C. Pipe joints shall be made in accordance with the following applicable specifications:

1. Make all solder joints with non-corrosive type flux 95 Percent tin and 5 percent antimony alloy solder.

3.2 SLEEVES:

A. Provide all sleeves in floors, beams, wall, roof, etc. as required for installing work of this division unless otherwise specified hereinafter. Size sleeves for insulated pipe to accommodate both pipe and insulation. Construct vertical sleeves in connection with concealed piping of 22 gauge galvanized iron. Sleeves thru fire-rated assemblies shall be firestopped as specified herein and insulation shall not pass thru sleeve unless material complies with firestopping specified.

3.3 PIPE HANGERS, SUPPORTS AND INSERTS:

A. Pipe hangers, supports and inserts shall comply with Table 305.4 of the International Mechanical Code and be provided as follows:

B. All piping shall be supported by forged steel hangers or brackets suitably fastened to structural portion. Wall brackets shall be Fee & Mason Fig. No. 151. Provide lock nuts on all adjustable hanger assemblies.

PIPE SIZE - INCHES

	1/2 – 2	2-1/2 – 4	6 – Up	Wall Plate Hanger
Grinnel	104	260	171	139
Fee & Mason	199	239	170	302
Elcen	92	12	15	---

C. Hanger or Support Spacing (unless specified different hereinafter):

1. Copper Pipe:

Nominal Pipe Size – Inches	Maximum Span - Feet
1-1/4" and under	6' and at each change in direction
1-1/2" and above	10' and at each change in direction

D. Size hangers on insulated piping to permit insulation and saddles to pass full size through hanger.

E. Trapeze Hangers:

1. May be used for groups of pipes close together and parallel. Trapeze hangers may be constructed from structural channel or angle irons or from pre-formed channel shapes. All pipe lines must be held on specific centers by U bolts, clips or clamps.

2. When supported with uni-strut an insulation sleeve under the clamp equal to Armacell Armafix is required.

3.4 ELECTRIC WORK:

A. All motors, and motor starters shall be furnished for items installed under this division of the specifications. All starters shall be magnetic type. All electrically operated equipment shall have readily accessible nameplates summarizing electrical information (i.e., voltage, phase, horsepower, watts, or amperes). Starters shall be as manufactured by General Electric Company, Westinghouse Electric Company, Cutler-Hammer Inc., or Square D Company. A.C. magnetic starters shall be across-the-line type. Starters shall provide overload protection in each phase and shall otherwise conform to all applicable requirements of these specifications. All magnetic starters shall be combination type, Motor Circuit Protector (MCP) type having interrupting rating equal to or greater than the available short circuit current, with "HAND-OFF-AUTO" selector switch, auxiliary contact, and pilot light in cover. Provide laminated plastic nameplates with white center core for each starter.

B. For motors controlled by variable frequency drives, provide shaft grounding on the motor equal to Aegis bearing protection ring.

C. All control conduit and wires and control devices shall be furnished and installed under this division. All contactors shall be of the mechanically held type. All control wiring

within starters shall be installed in a workmanlike manner and neatly laced. All control wiring shall be color coded.

D. All work shall conform with the applicable requirements of the National Electrical Codes. All electrical power characteristics shall be as indicated. All devices, which make and/or break electrical circuits, shall be rated for at least 125 percent of the load.

E. Relays, contactors, and control devices shall open all ungrounded conductors. All fuses shall be current limiting time delay type equal to Bussman "LPN", 250 volt or "LPS", 600 volt.

F. Control voltage shall not exceed 120 volts. Control power shall be taken from line terminals of controllers. Where necessary, control transformers shall be provided and shall conform to NEMA Standards, properly sized, and shall be properly fused. Where control voltage is 120 volts, control conductors shall be color-coded.

G. Electrical power service and connections to all equipment in this division will be made under electrical division of the work.

H. Manual motor starters with overload protection shall be flush mounted type with pilot light. Square D Catalog No. 2510-FS-1P or General Electric, or Westinghouse equivalent.

I. Duct smoke detectors shall be provided under electrical division and installed under this division. This division shall provide interlock wiring required for fan shutdown and smoke damper control. Power wiring and fire alarm communication wiring shall be provided under the electrical division.

3.5 ITEMS OF MECHANICAL EQUIPMENT:

A. All items of mechanical equipment electrically operated shall be in complete accordance with paragraph in this division entitled "Electrical Work". Mechanical equipment, other than individually mounted motors, shall be factory pre-wired to a single-set of line terminals and to a single load terminal strip to match load terminals on equipment. Each step shall have properly sized contactor and overcurrent protection.

B. Mechanical equipment electrical components shall all be bonded together and connected to electrical system ground.

3.6 CLEANING:

A. All surfaces on metal, pipe, insulation covered surfaces, and other equipment furnished and installed under this division of the specifications shall be thoroughly cleaned of grease, scale, dirt and other foreign material.

B. Upon complete installation of ducts, clean entire system of rubbish, plaster, dirt, etc., before installing any outlets. After installation of outlets and connections to fans are made, blow out entire system with all control devices wide open.

3.7 TESTING (PIPING):

A. Upon completion of each system of work under this division, and at a designated time, all piping shall be pressure tested for leaks in the presence of the owner. Owner shall be notified five days before testing is to be conducted and all tests shall be conducted in the presence of the owner. All equipment required for test shall be furnished by contractor at his expense. All tests shall be performed as specified hereinafter. If inspection or tests show defects, such defective work or material shall be replaced and inspection and tests repeated at no additional cost to owner. Make tight any leaks. Repeat tests until system is proven tight. Caulking of leaks will not be permitted. All equipment not capable of withstanding the test pressure shall be valved off during the test.

B. All refrigerant piping and apparatus shall be tested with dry carbon dioxide or nitrogen plus a small amount of refrigerant. All refrigerating equipment shall be tested under vacuum and shall show no evidence of leakage with an absolute pressure of 0.02 inch mercury gauge, sustained for a period of one hour without pumping. Leaks shall be corrected by remaking the joint. Test pressures shall be as follows:

High Side	Low Side
Refrigerant 410A - 400 psi	Refrigerant 410A - 350 psi

3.8 IDENTIFICATION OF EQUIPMENT IN MECHANICAL AREAS:

A. All items of mechanical equipment shall be identified with a black bakelite label with engraved white lettering 1/2” tall. Labels shall be mechanically attached to the equipment with rivets or stainless steel screws. Thermostats and control devices shall be identified with a black bakelite label with engraved white lettering 1/4” tall. Lettering shall correspond with the tags shown in the drawings.

3.9 ADJUSTMENT AND TRIAL RUNS:

A. Upon completion of all work, the contractor shall operate the system in the presence of the owner for the purpose of demonstrating quiet and satisfactory operation, the proper setting of controls, safety and relief valves, and cleanliness of system. Heating and cooling shall be tested separately during periods approaching design conditions and shall fully demonstrate fulfillment of capacity requirements. Test procedures shall be in accordance with applicable portions of ASME, ASHRAE, and other generally recognized test codes as far as field conditions will permit. Any changes or adjustment required shall be made by the contractor without additional expense to owner.

B. Document and submit all operating conditions (startup report) of equipment during trial runs and after test and balance is complete. Include in the report:

1. Ambient air temperature
2. Design operating temperatures and flow rates
3. Entering and leaving air temperatures across each coil or heating device
4. Amp draw of all motors and nameplate amps
5. Voltage at each piece of equipment

6. Refrigerant pressures and temperatures

C. All equipment shall be started and tested for proper operation per the manufacturer's recommended startup procedure. The following items shall be verified and documented in the startup reports.

1. Verify equipment is in accordance with equipment submittal (confirm al components are installed and provided as indicated)
2. Verify unit nameplate voltage with voltage available at jobsite
3. Verify all electrical connections are tight
4. Verify control wiring as required (refer to Controls section of manufacturer's IOM & jobsite specific requirements in accordance with equipment submittal)
5. Verify disconnect and fuses are sized in accordance to unit data plate
6. Verify heater piping or electrical supply in accordance with manufacturer's IOM
7. Verify Gas Heating installed in accordance with manufacturer's IOM
8. Verify drain piping is installed accordance with manufacturer's IOM
9. Verify Economizer operation and proper installation
10. Verify sensors shipped with Economizer as described in installation literature are properly installed and functioning correctly
11. Check supply and exhaust fan belts for proper tension, as applicable and in accordance with manufacturer's IOM
12. Verify proper unit control setup and function (I.e configure features such as single zone VAV and multizone VAV as required by the IOM)
13. Verify unit sequence of operations function in accordance with manufacturer's IOM (heating sequence & cooling sequence)
14. Verify unit clearances are in compliance with manufacturer's IOM

D. Provide a factory startup as indicated in the equipment schedules. Factory startup shall be performed by technicians that are factory trained and certified, and in the employ of the manufacturer's rep.

3.10 OPERATION AND MAINTENANCE INSTRUCTIONS, AND MAINTENANCE MANUAL:

A. Upon completion of work, and at a time designated by the engineer, a competent employee of the contractor shall be provided to instruct a representative of the owner in the operation and maintenance of the system.

B. Minimum instruction period shall be:

1. Air Conditioning System - 1 day

C. Maintenance Manuals: The contractor shall compile and bind all manufacturer's instructions and descriptive literature on all items of equipment furnished under this work. These instructions shall be delivered through the general contractor to the engineer for approval prior to final inspection.

D. Instructions shall include:

1. Warranty letter signed by the Mechanical Contractor.

2. Index for each section with each section properly identified.
3. Complete equipment list with model and serial numbers.
4. Complete equipment list with filter sizes and quantities.
5. Copy of one complete, approved submittal for each equipment section.
6. Description of each system, including manufacturer's literature for all items.
7. Start-up and shut-down description for each system.
8. Suggested operating and maintenance instructions with frequency of maintenance indicated.
9. Parts list for all items of equipment.
10. Name, address, and telephone number of nearest sales and service organization for all items of equipment.
11. Startup reports.
12. Test and Balance Reports

E. Manuals shall be 8-1/2 x 11 inch text pages bound in three ring expansion binders with a hard durable cover with clear plastic pocket on front for title page. Prepare binder covers with printed subject title of manual, title of project, date, and volume number when multiple binders are required. Printing shall be on face and spine. Provide a table of contents for each volume. Internally subdivide the binder contents with divider sheets with typed tab titles under reinforced plastic tabs. Provide directory listing as appropriate with names addresses, and telephone numbers of design consultant, Contractor, subcontractors, equipment suppliers, and nearest service representatives.

F. Manuals shall be 8-1/2 x 11 inch text pages in digital PDF format. Manual shall be submitted as a single PDF file. Prepare file cover with printed subject title of manual, title of project, and date. Provide a table of contents for each volume. Internally subdivide the file contents with bookmarks providing a link to each section. Provide directory listing as appropriate with names addresses, and telephone numbers of design consultant, Contractor, subcontractors, equipment suppliers, and nearest service representatives.

End of Section 230010

SECTION 230500 – HEATING, VENTILATION and AIR CONDITIONING

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS:

A. This Section of the Specifications and related drawings describe requirements pertaining to Air Conditioning, Heating and Ventilation work, including applicable HVAC Insulation in separate Section 230700. All work shall comply with Section 230010 - General Provisions - HVAC.

B. Construct rectangular ductwork to meet all functional criteria defined in Section VII, of the SMACNA "HVAC Duct Construction Standards Metal and Flexible" 2016 Edition. All ductwork must comply with all local, state and federal code requirements.

PART 2 - PRODUCTS

2.1 SUBMITTALS:

A. Ductwork shop drawings must be submitted for approval by Engineer. Any ductwork installed without prior approval by the Engineer shall be replaced at the expense of the contractor.

2.2 QUALITY ASSURANCE:

A. The contractor must comply with this specification in its entirety. At the discretion of the Engineer, sheet metal gauges, and reinforcing may be checked at various times to verify all duct construction is in compliance.

2.3 DUCTS, PLENUM, ETC.:

A. As indicated on drawings, provide a system of metal ducts for supply, return and exhaust air.

B. All sheet metal, ducts, casing, plenums, etc., of sizes indicated, shall be constructed from prime galvanized sheet steel.

2.4 DUCTS THRU WALLS:

A. Provide sheet metal flashing around all duct penetrations.

B. Ducts shall be properly sealed per the fire rating and UL assembly.

2.5 INSTRUMENT TEST HOLES:

A. Install for air handling units instrument test holes in supply, return and outside air duct. Instrument test connections shall be Ventlock Model 699-2, or equal, and shall be located in accessible locations.

2.6 METAL DUCTWALL:

A. All interior ducts shall be constructed of G-90 or better galvanized steel (ASTM A653) LFQ, chem treat. Exterior ductwork or duct exposed to high humidity conditions shall be constructed of G-90 or better galvanized steel LFQ, chem treat. Galvanized metal ducts shall be a minimum thickness of 24 gauge.

B. Low Pressure Exhaust Duct:

1. Ductwork downstream from the VAV box, ductwork on low pressure supply and return systems and restroom exhaust duct shall be fabricated to meet minimum 2" w.g. pressure class in accordance with SMACNA Duct Construction Standard.

2.7 RECTANGULAR DUCT LONGITUDINAL SEAMS:

A. Pittsburgh lock shall be used on all longitudinal seams. All longitudinal seams will be sealed with mastic sealant. Button punch snap lock is not acceptable.

2.8 ROUND DUCT LONGITUDINAL SEAMS:

A. Spiral seam or snap lock seam shall be used on all longitudinal seams for low pressure round duct.

2.9 DUCT JOINTS:

A. Duct joints to meet criteria as defined in SMACNA's 2016 Manual, HVAC Duct Construction Standards, Metal and Flexible.

B. Ductmate or W.D.C.I. proprietary duct connection systems will be accepted as an alternative to SMACNA duct construction standards. Duct constructed using these systems will refer to the manufacturers guidelines for sheet gauge, intermediate reinforcement size and spacing, and joint reinforcements.

C. Ductmate 440 or a Butyl Rubber Gasket which meets Mil-C 18969B, Type II Class B, TT-C-1796A, Type II Class B, and TTS-S-001657 must also pass UL-723. This material, in addition to the above, shall not contain vegetable oils, fish oils, or any other type vehicle that will support fungal and/or bacterial growth associated with dark, damp areas of ductwork. The recommended test procedure for bacterial and fungal growth is found in 21CFR 177, 1210 closures with sealing gaskets for food containers.

2.10 FLEXIBLE DUCT:

A. Flexible duct shall not be used for exhaust duct.

2.11 SEALERS:

A. Duct sealer shall be flexible, water-based, adhesive sealant designed for use in all pressure duct systems. After curing, it shall be resistant to ultraviolet light and shall seal out water, air, and moisture. Sealer shall be UL listed and conform to UL181B and marked 181 B-M. Sealer shall be Childers CP-145A, or equal.

2.12 DUCTWORK HANGER/SUPPORT:

A. Hang and support ductwork as defined by SMACNA, Chapter 5 2016 Manual, First Edition, or as defined within. Hanger spacing for sheet metal duct not to exceed 8'. Hanger spacing for flexible duct shall not exceed 5’.

B. Duct supports on the exterior of the building on grade or on the roof shall be steel with a hot dip galvanized coating.

2.13 TURNING VANES:

A. Turning vanes shall be double wall turning vanes fabricated from the same material as the duct. Tab spacing shall be SMACNA Standard. Rail systems with non-standard tab spacings shall not be accepted. All tabs shall be used, do not skip tabs. Mounting rails shall have friction insert tabs which align the vanes automatically. Vanes shall be subjected to tensile loading and be capable of supporting 250 lbs. when fastened per the manufacturers instructions.

2.14 FIRE DAMPERS:

A. Provide at locations shown on plans, or in accordance with details, schedules or specifications Ruskin fire dampers of appropriate style, or approved equal. Provide fire dampers at all locations as required to comply with National Fire Protection Association Regulations, applicable city requirements, and all local codes or ordinances having jurisdiction. Construct fire dampers as follows:

B. Fire dampers shall be mounted in a U.L. approved integral sleeve or a No. 16 U.S. Gauge welded steel sleeve 12 inches long. Blades shall be hinged on brass trunnions and counter-weighted when necessary to assure closing. Blade thickness and other construction details shall conform to U.L. 555 and bear U.L. label. Dampers shall be held in open position by 165 degrees fusible link and arranged to lock in position on closure.

C. Fire dampers in medium pressure duct applications shall be provided with a fully welded, high free area and air tight transition.

D. Breakaway connections at fire damper sleeves with duct connections shall be made using UL approved "S and Drivemate Connections" or UL approved "Ductmate Breakaway Connections".

2.15 PIPE AND FITTINGS:

A. Schedule of pipe and fittings: Piping and fittings shall conform to requirements as indicated herein.

B. All pipe shall be domestically produced from domestic forgings.

2.16 SCHEDULE OF PIPING

SERVICE	ITEM	PIPING	FITTINGS	FLANGES OR UNIONS
Unitary Condensate Drain	2” and smaller	Type L, Hard drawn copper	Solder type wrought copper	Wrought solder copper to copper

2.17 REFRIGERANT PIPING:

A. General: Execute all refrigerant piping with stamped type "ACR" hard copper and long radius, wrought copper, sweat fittings with tolerance not to exceed 3/1000 of an inch. All joints shall be made with silver solder. Submit equipment manufacturer's suggested piping diagram for approval.

B. After refrigerant piping has been installed and tested, each system shall be evacuated and charged with proper refrigerant of quantity as recommended by manufacturer.

2.18 VENTILATING FANS:

A. See Schedule for characteristics and accessories. Units shall be AMCA or PFMA certified. Use shaded pole, single phase motors under 1/4 HP and split capacitor or polyphase motors 1/4 HP and larger.

B. Fans shall be complete with all accessories required for installation including integral overload protection or motor starter.

2.19 SPLIT HEAT PUMP UNIT

A. General: The outdoor condensing unit is designed specifically for use with matched capacity SkyAir series indoor evaporator units.

1. The outdoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of a Daikin swing compressor, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4 way valve, distribution headers, capillaries, filters, shut off valves, service ports and suction accumulator.
2. Both liquid and suction lines must be individually insulated between the outdoor and indoor units.

3. The outdoor unit can be wired and piped in the front, lateral or downward directions, accessed from the right side of the unit.
4. The sound pressure level standard shall be that value as listed in the Daikin engineering manual for the specified models at 3 feet from the front of the unit.
5. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for re-programming.
6. The outdoor unit shall be modular in design and should allow for side-by-side installation with minimum spacing.
7. The following safety devices shall be included on the condensing unit; high pressure switch, outdoor fan driver overload protector, inverter overload protector, fusible plugs, fuses.
8. Each condensing unit shall utilize an algorithm to automatically adjust the refrigerant suction and condensing temperatures in response to the cooling loads, and in response to the current weather conditions. The VRT control shall be capable of being customized in the following modes and sub modes:
   a) Automatic (factory preset) – The Automatic VRT control shall allow the target evaporator temperature (Te) and target condensing temperature (Tc) to float based on outdoor ambient temperature conditions, and shall incorporate the following sub-modes:
      Powerful
      Quick
      Mild (factory preset)
   b) High Sensible – The High Sensible mode shall allow the system Te and Tc values to be programmed to series of fixed Te and Tc values. The High Sensible mode shall also be capable of incorporating the following sub-modes:
      Eco
   c) Basic – The Basic mode shall disable the VRT control of the outdoor unit and allow the system to operate with constant Te and Tc values.

B. Unit Cabinet:

1. The outdoor unit model RZR__TAVJU shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.
2. The outdoor unit will come furnished with four (4) mounting feet, mounted across the base pan, to allow bolting to a cement pad or optionally supplied mounting bracket.
3. The unit shall include a condenser coil hail guard.

C. Fan:

1. The condensing unit shall consist of one propeller type, direct-drive 200W fan motor that has multiple speed operation via a DC (digitally commutating) inverter.
2. The fan shall be a horizontal discharge configuration with a nominal airflow maximum of 2,682 cfm.
3. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.
4. The fan motor shall be provided with a fan guard to prevent contact with moving parts.

D. Condenser Coil:

1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure highly efficient performance.
3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube.
4. The fins are to be covered with an anti-corrosion acrylic resin and hydrophilic film type E1 rated for up to 1000 hours salt spray.
5. The pipe plates shall be treated with powdered polyester resin for corrosion prevention. The thickness of the coating must be between 2.0 to 3.0 microns.

E. Compressor:

1. The Daikin swing compressor shall be variable speed (PAM inverter) controlled which is capable of changing the speed to follow the variations in total cooling load as determined by the suction gas pressure as measured in the condensing unit. In addition, samplings of evaporator and condenser temperatures shall be made so that the high/low pressures detected are read every 20 seconds and calculated. With each reading, the compressor capacity shall be controlled to eliminate deviation from target value.
2. The inverter driven compressor shall be of highly efficient reluctance DC (digitally commutating), hermetically sealed swing type.
3. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
4. The compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
5. The compressor shall be mounted to avoid the transmission of vibration.

2.20 HEAT PUMP UNITS:

A. Provide complete system of air conditioning units and accessories as scheduled on the drawings. All units shall carry a five (5) year compressor warranty.

PART 3 - EXECUTION

3.1 DUCTWORK, GENERAL:

A. Drawings show general arrangement of duct. Provide all ductwork required to complete installation and avoid interferences. Installation shall conform with applicable portions of Section 230010, General Provisions, HVAC. Fabricate ducts as job progresses, using actual job measurements and referring to architectural, structural, electrical, plumbing and equipment drawings in order to avoid conflicts. Where space limitations preclude use of ducts and fittings as shown, consult Engineer for instructions. All ductwork, offsets, fittings, etc. required to make a complete and efficiently operating installation are included in this contract and shall be fabricated and installed in accordance with SMACNA Standards for the application unless noted otherwise herein.

B. All duct dimensions shown on drawings are "inside clear". The sizes of acoustically lined ducts and dampers in ducts shall be increased accordingly. Ducts shall be smooth on inside.

C. Install double thickness turning vanes in duct fittings having centerline radius less than 1-1/2 times width of duct.

D. Support ducts from building structure with 1 inch wide galvanized steel bands per SMACNA recommendations. Wire hangers and nylon straps will not be acceptable.

E. Seal all joints in supply, return and exhaust ducts with Childers CP-145 Veloseal, or McGill Airseal, DuroDyne or equal water based synthetic duct sealant, or equal.

F. Upon complete installation of ducts, clean entire system of rubbish, plaster, dirt, etc. before installing any outlets. After installation of outlets and connections to fans are made, blow out entire system with all control devices wide open.

3.2 FIRE DAMPERS:

A. Fire dampers shall be securely anchored to floor or wall, and installed by bolting retaining angles to the sleeve on each side of the wall. Wall and floor penetrations shall be fire sealed with an approved UL listed firestop system as manufactured by 3M, Hilti, Metacaulk or equal for the wall or floor type penetrated. A suitable access door shall be provided for each fire damper. In accordance with the requirements of the International Building Code, contractor shall permanently mark any access doors or other openings that serve as a means of access to fire dampers with ½" letters reading "Fire Damper". Label shall be permanently and securely attached.

3.3 PIPING, GENERAL:

A. All piping shall conform with Section 230010 - General Provisions - HVAC.

B. Run pipes parallel to walls and ceilings. Wherever pipes change size, use eccentric fittings. Run piping so as not to obstruct walking or service areas.

C. Pipe and equipment locations shown are approximate. Exact location of equipment, pipes, and chases to be as approved and determined in field to avoid other pipes and maintain structural clearances. Use actual job dimensions and equipment shop drawings for roughing.

D. Piping to comply with best trade practice. Provide clearance between pipe and building structure so pipes can expand without damage to building structure.

E. When soldering refrigerant pipe joints, a dry nitrogen purge shall be required through the inside of the pipe to prevent oxidation.

3.4 CONDENSATE DRAINS:

A. Pipe evaporator condensate drains into nearest floor drain, roof drain, gutter or as indicated. Piping shall be routed to avoid interference with passageways or maintenance.

B. Drains shall be trapped to overcome air handler static pressure.

C. Drain piping shall be sloped 1/8” per foot.

D. Drain piping shall be sized as follows

EQUIPMENT CAPACITY	MINIMUM CONDENSATE PIPE DIAMETER
Up to 20 tons of refrigeration	$^{3}/_{4}$ inch
Over 20 tons to 40 tons of refrigeration	1 inch
Over 40 tons to 90 tons of refrigeration	$1^{1}/_{4}$ inch
Over 90 tons to 125 tons of refrigeration	$1^{1}/_{2}$ inch
Over 125 tons to 250 tons of refrigeration	2 inch

3.5 EQUIPMENT, GENERAL:

A. All equipment specified herein shall be installed in accordance with manufacturer's published installation instructions and these specifications. All items shall have adequate clearances for access and maintenance. Each item of equipment shall be performance tested to verify compliance with specifications. Certified data sheets of successful performance tests shall be included in operating manuals.

3.6 AUTOMATIC TEMPERATURE CONTROL:

A. General: Provide a complete system of temperature controls as described herein. The system shall be installed complete by competent mechanics in the employment of the control manufacturer. All control wiring shall be installed in EMT conduit indoors and rigid conduit outdoors with control and power wiring in separate conduits.

B. Wiring for low voltage circuits (24 volts or less) may be No. 16 up to 50 feet, and above 50 feet shall be of size to limit voltage drop to 5 percent. Interlock wiring shall be as recommended by equipment manufacturer.

C. Provide automatic changeover 7 day programmable thermostat per the equipment schedule.

3.7 SUBMITTALS:

A. Provide submittals as required in Section 230010. At completion of work, submit check-out report of automatic control system. Submit start up reports per Section 230010. Submit test and balance report per 230010. Submit manufacturer's installation, operation, and maintenance instructions.

End of Section 230500

SECTION 230700 – HVAC INSULATION

PART 1 - GENERAL

1.1 WORK INCLUDED:

A. General Requirements: This section shall include all insulation as required for installation on all items as specified hereinafter and/or as indicated. All insulations shall be installed in a workmanlike manner by qualified workers in the employment of an independent insulation contractor. Costs of insulation shall be included as part of work by contractor as applicable to his section of work. No separate bid is to be included for insulation work.

B. Fire hazard classification for all material shall not exceed flame spread of 25 and smoke development of 50 as classified by Underwriters Laboratories under Test Method ASTM E-84 and acceptable under NFPA Standards. This is to apply to the complete system and be a composite rating of insulation material with jacket or facings, vapor barrier, joint sealing tapes, mastic and fittings.

C. Prior to commencing any work, submit data sheets for engineer's approval of all material proposed to be used on this project.

PART 2 - PRODUCTS

2.1 ABOVE GROUND INDOOR PIPING:

A. Refrigerant Pipe Insulation:

1. Insulation material shall be a flexible, closed-cell elastomeric insulation in tubular form equal to AP Armaflex, or Aerocell, or FlexTherm. This product meets the requirements as defined in ASTM C 534, “Specification for preformed elastomeric cellular thermal insulation in tubular form.” Insulation materials shall have a closed-cell structure to prevent moisture from wicking which makes it an efficient insulation. Insulation material shall be manufactured without the use of CFC’s, HFC’s or HCFC’s. It is also formaldehyde free, low VOC’s, fiber free, dust free and resists mold and mildew.

2. Materials shall have a flame spread index of less than 25 and a smoke-developed index of less than 50 when tested in accordance with ASTM E 84, latest revision. In addition, the product, when tested, shall not melt or drip flaming particles, the flame shall not be progressive and all materials shall pass simulated end-use fire tests.

3. Materials shall have a maximum thermal conductivity of 0.27 Btu-in./h-ft2- °F at a 75°F mean temperature when tested in accordance with ASTM C 177 or ASTM C 518, latest revisions. Materials shall have a maximum water vapor transmission of 0.08 perm-inches when tested in accordance with ASTM E 96, Procedure A, latest revision.

4. When supported with uni-strut an insulation sleeve under the clamp is required equal to Armacell Armafix, Aerocell Aerofix, or Cooper B-Line.

B. Condensate Drain Insulation:

1. Use Armacell AP Armaflex, or equal, in a thickness adequate to maintain an insulation surface temperature of 84°F. Miter elbows and seal with adhesive. Coat all joints with Childers CP-30 LO or CP-35 WB Vapor Barrier Coatings, or equal. Use only indoors.

2.2 JACKET FOR OUTDOOR PIPING:

A. All insulation outside (including insulation options) shall be protected with corrugated aluminum jacketing with factory applied moisture barrier. The aluminum jacketing shall be 0.016 thickness and be of 3003 alloy and H-14 temper. Jacketing shall be applied with 2-inch circumferential and 1-1/2 inch longitudinal lap and secured with 3/8 inch wide aluminum bands, 8 inches on center.

B. All elbows shall be covered with 2 piece aluminum insulation covers, manufactured from 110 aluminum alloy in .024" thickness, Childers Aluminum E11-Jacs or equal.

C. On hot service, aluminum elbows may be attached using self-tapping screws. On chilled water service, aluminum elbows shall be glued on pipe insulation.

2.3 PIPE INSULATION THICKNESS:

A. Piping for the following systems shall be insulated to the thickness listed:

Item	Insulation Thickness (Inches)
Armaflex K = 0.25	
Cold Pipes:	
Condensate Drain Piping	1/2"
Refrigerant Suction	3/4"
Refrigerant Liquid (TXV in outdoor unit)	1/2"

PART 3 - EXECUTION

3.1 PIPE INSULATION:

A. All insulation shall be applied to clean, dry surfaces butting all sections firmly together and finishing as specified hereinafter.

B. All vapor barriers shall be sealed, and shall be continuous throughout. No staples shall be used on any vapor barrier jacket unless sealed with vapor barrier coating or vapor barrier tape.

C. Insulation of all insulated lines shall be interpreted as including all pipe, valves, fittings and specialties comprising the lines, except flanged unions and screwed unions on hot piping.

D. Pipe Insulation Protection: Direct contact between pipe and hangers shall be avoided. Hanger shall pass outside of a sheet metal protection saddle which shall cover a section of high density insulation (cellular glass or calcium silicate), of sufficient length to support the weight of the pipe without crushing the insulation. The vapor barrier shall be continuous behind the saddle or shall be lapped over the saddle and securely cemented thereto.

E. Refrigerant Tubing and Condensate Drain Pipe Insulation: Armaflex insulation shall be slip fit over all tubing. Under no circumstances shall insulation be slit to fit over pipe already in place. Sufficient length shall be provided at all bends or turns to prevent the insulation from being pulled too tight and cracking. All seams and butt joints shall be adhered and sealed using Armaflex 520 or 520 BLVAdhesive or equal. Direct contact between pipe and hangers shall be avoided. Hanger shall pass outside of a sheet metal protection saddle which shall cover a section of high density insulation (cellular glass or calcium silicate), of sufficient length to support the weight of the pipe without crushing the insulation. The vapor barrier shall be continuous behind the saddle or shall be lapped over the saddle and securely cemented thereto.

3.2 ALUMINUM JACKET:

A. Jacketing shall be applied with 2-inch circumferential and 1-1/2 inch longitudinal lap and secured with 3/8 inch wide aluminum bands, 8 inches on center and at joints.

End of Section 230700

SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and supervision to construct complete and operable electrical systems as indicated on the drawings and specified herein.

B. All materials and equipment used shall be new, undamaged and free from any defects.

1.2 RELATED DOCUMENTS AND OTHER INFORMATION

A. The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the portions of work specified in each and every Section, individually and collectively.

1.3 PRODUCT WARRANTIES

A. Provide manufacturer's standard printed commitment in reference to a specific product and normal application, stating that certain acts of restitution will be performed for the Purchaser or Owner by the manufacturer, when and if the product fails within certain operational conditions and time limits. Where the warranty requirements of a specific specification section exceeds the manufacturer's standard warranty, the more stringent requirements will apply and modified manufacturer's warranty shall be provided. In no case shall the manufacturer's warranty be less than one (1) year from the date of substantial completion.

1. Where manufacturer's warranty lists a start date of PO or date of ship, contractor shall purchase extended warranty to ensure warranty period extends to a minimum of 1 year after date of substantial completion.

1.4 PRODUCT SUBSTITUTIONS

A. General: Materials specified by manufacturer's name shall be used unless prior approval of an alternate is given by addenda. Requests for substitutions must be received in the office of the Architect at least 10 days prior to opening of bids.

1.5 SUBMITTAL REQUIREMENTS

A. Submit for review by the Engineer Architect a schedule with engineering data of materials and equipment to be incorporated in the work. Submittals shall be supported by descriptive materials, i.e., catalog sheets, product data sheets, diagrams, performance curves and charts published by the manufacturer, warranties, etc., to show conformance to Specifications and Plan requirements; model numbers alone shall not be acceptable. Data submitted for review shall contain all information to indicate compliance with Contract Documents. Complete electrical characteristics shall be provided for all equipment. Submittals for lighting fixtures shall include Photometric Data. The Engineer reserves the right to require samples of any equipment to be submitted for review.

B. The purpose of shop drawing review is to demonstrate to the Architect that the Contractor understands the design concept. The Architect's review of such drawings, schedules, or cuts

shall not relieve the Contractor from responsibility for deviations from the drawings or specifications unless he has, in writing, called the Architect's attention to such deviation at the time of submission, and received written permission from the Architect for such deviations.

C. Where cut sheets include an entire product family, mark all specific items to be utilized for this project on equipment cut sheets. Generic cut sheets with no indication of which items on the cut sheet shall be used will be rejected.

D. Response to Submittals: Shop drawings shall be noted with the following classifications:
   1. "Reviewed": No corrections, no marks. Contractor shall submit copies for distribution.
   2. "Provide as Corrected": A few minor corrections. Items may be ordered as marked up without further resubmission. Submit shall submit copies for distribution. Formally correct prior to submitting O&M manuals.
   3. "Revise and Resubmit": Minor corrections. Items may be ordered at the Contractor's option. Contractor shall resubmit documents with corrections noted.
   4. "Rejected": Major corrections required or not in accordance with the contract documents. Contractor shall correct and resubmit documents.

1.6 ELECTRICAL DRAWINGS

A. Electrical contract drawings are diagrammatic and indicate the general arrangement of electrical equipment. Do not scale electrical plans. Obtain all dimensions from the Architect's dimensioned drawings and field measurements. The Contractor shall review Architectural plans for door swings and built-in equipment; conditions indicated on those plans shall govern for this work.

B. Coordinate installation of electrical equipment with the structural and mechanical equipment and access thereto. Coordinate exterior electrical work with civil and landscaping work.

C. Discrepancies shown on different drawings, between drawings and specifications or between documents and field conditions shall be installed to provide the better quality or greater quantity of work; or, comply with the more stringent requirement; either or both in accordance with the A/E’s interpretation.

1.7 SUBMITTALS – GENERAL ELECTRICAL

A. Electrical coordination drawings shall be provided as described below:
   1. Electrical Rooms: Provide layouts of all electrical rooms using the dimensions of equipment and accessories actually furnished. Locate all ducts and piping entering or crossing these spaces.
   2. Feeders over 100 Amps: The routing of main feeders is not shown on the drawings. Actual routing shall be determined by the contractor in accordance with the specifications and shall be coordinated with work by other trades. For underground lines, show all utility crossings.
   3. Drawings Format: Drawings shall be prepared at a scale of no less than 1/16”=1’-0” for feeder routes and 1/4”=1’-0” for electrical rooms / equipment yards. Drawing shall be titled to define Project Name, Drawing subject and date prepared. Drawings are to be prepared in AutoCAD or compatible software.

B. Firestopping Submittals shall be provided for each proposed system type prior to installation. Submittal shall include the following:
   1. Firestopping Materials
   2. Firestopping Installation Drawings for each conduit penetration, cable in metal sleeve penetration, and blank metal sleeve penetration for each type of wall / floor construction encountered.
   3. Provide fire rated "putty-pads" on all electrical boxes in fire rated partitions.

1.8 SYSTEMS REQUIRING ROUGH-IN

A. Rough-in shall consist of all outlet boxes/raceway systems/supports and sleeves required for the installation of cables/devices by other Divisions and by the Owner. It shall be the responsibility of this Contractor to determine the requirements by reviewing the contract documents and meeting with the Superintendent of the trade involved and Owner's representative to review submittal data, shop drawings, etc.

B. Sealing of all sleeves, to meet the fire rating of the assembly, whether active or not, is work of this Division.

1.9 EXISTING SERVICES AND FACILITIES

A. Damage to Existing Services: Existing services and facilities damaged by the Contractor through negligence or through use of faulty materials or workmanship shall be promptly repaired, replaced, or otherwise restored to previous conditions by the Contractor without additional cost to the Owner.

B. Interruption of Services: Interruptions of services necessary for connection to or modification of existing systems or facilities shall occur only at prearranged times approved by the Owner. Interruptions shall only occur after the provision of all temporary work and the availability of adequate labor and materials will assure that the duration of the interruption will not exceed the time agreed upon.

C. Removed Materials: Existing materials made unnecessary by the new installation shall be stored on site. They shall remain the property of the Owner and shall be stored at a location and in a manner as directed by the Owner. If classified by the Owner's authorized representative as unsuitable for further use, the material shall become the property of the Contractor and shall be removed from the site at no additional cost to the owner.

D. Contractor shall review drawings for all trades for coordination with existing conditions. Contractor shall be responsible for routing of underground raceways and coordinate with GC and other trades for cutting and repair of existing slabs, parking areas, sidewalks, sheetrock and/or plaster walls, etc.

E. Contractor shall be responsible for coordinating with contract documents and other trades for routing of ducts, pipes, cable-tray and other components with existing conditions. Contractor shall be responsible for field verifying source of raceways and cabling that are in conflict regardless of whether they serve devices in the area of work or not. The relocation of these raceways to assist in avoiding these conflicts shall also be included at no additional cost to the owner.

F. Contractor shall protect all existing low-voltage cabling from damage. If conflicts arise, contact architect immediately to determine status of cabling. Existing cabling that is damaged during construction shall be replaced by the contractor.

PART 2 - PRODUCTS

2.1 FIRESTOPPING:

A. A firestop system shall be used to seal penetrations of electrical conduits and cables through fire-rated partitions per NEC 300.21, and NEC 800.26. The firestop system shall be qualified by formal performance testing in accordance with ASTM E-814, or UL 1479.

B. The firestop system shall consist of a fire-rated caulk type substance and a high temperature fiber insulation. It shall be permanently flexible, waterproof, non-toxic, smoke and gas tight and have a high adhesion to all solids so damming is not required. Only metal conduit shall be used in conjunction with this system to penetrate fire rated partitions. Install in strict compliance with manufacturer's recommendations. 3M or approved equal.

C. Comply with TIA/EIA-569-A, Annex A, "Firestopping."

D. Comply with BICSI TDMM, "Firestopping Systems" Article.

PART 3 - EXECUTION

3.1 PRODUCT INSTALLATION, GENERAL

A. Except where more stringent requirements are indicated, comply with the product manufacturer's installation instructions and recommendations, including handling, anchorage, assembly, connections, cleaning and testing, charging, lubrication, startup, test operation and shut-down of operating equipment. Consult with manufacturer's technical experts, for specific instructions on unique product conditions and unforeseen problems.

B. Protection and Identification: Deliver products to project properly identified with names, models numbers, types, grades, compliance labels and similar information needed for distinct identifications; adequately packaged or protected to prevent deterioration during shipment, storage and handling. Store in a dry, well ventilated, indoor space, except where prepared and protected by the manufacturer specifically for exterior storage.

C. Permits and Tests: Provide labor, material and equipment to perform all tests required by the governing agencies and submit a record of all tests to the Owner or his representative. Notify the Architect five days in advance of any testing.

D. Install temporary protective covers over equipment enclosures, outlet boxes and similar items after interiors, conductors, devices, etc. are installed, to prevent the entry of construction debris and to protect the installation during finish work performed by others. Do not install device plates, equipment covers or trims until finish work is complete.

E. Clean all equipment, inside and out, upon completion of the work. Scratched or marred surfaces shall be touched-up with touch-up paint furnished by the equipment manufacturer.

F. Replace all equipment and materials that become damaged.

G. No more than three phase conductors, each of opposite phases for a three phase WYE system, shall be combined in a single raceway unless written approval is granted by the engineer or noted otherwise on the construction documents. 120 volt and 277 volt receptacle and lighting circuits are except from this requirement, but must meet the requirements of the NEC.

H. Shared neutrals shall not be utilized (including, but not limited to homeruns) unless written permission is obtained from the Engineer for a specific application.

3.2 EQUIPMENT PROTECTION

A. Equipment and materials shall be protected during shipment and storage against physical damage, vermin, dirt, corrosive substances, fumes, moisture, cold and rain.

B. Store equipment indoors in clean dry space with uniform temperature to prevent condensation. Equipment shall include but not be limited to switchgear, switchboards, panelboards, transformers, motor control centers, motor controllers, uninterruptible power systems, enclosures, controllers, circuit protective devices, cables, wire, light fixtures, electronic equipment, and accessories.

C. During installation, equipment shall be protected against entry of foreign matter; and be vacuum-cleaned both inside and outside before testing and operating. Compressed air shall not be used to clean equipment. Remove loose packing and flammable materials from inside equipment.

D. Damaged equipment shall be, as determined by the Engineer, placed in first class operating condition or be returned to the source of supply for repair or replacement.

E. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.

F. Damaged paint on equipment and materials shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

3.3 UTILITY CONNECTIONS:

A. Coordinate the connection of the electrical system with the local power company. Comply with the requirements of governing regulations, franchised service companies and controlling agencies. Pay all utility fees and charges.

3.4 ELECTRICAL WORK:

A. Electrical work shall be accomplished with all affected circuits or equipment de-energized. When an electrical outage cannot be accomplished in this manner for the required work, the following requirements are mandatory:

1. Electricians must use full protective equipment (i.e., certified and tested insulating material to cover exposed energized electrical components, certified and tested

insulated tools, etc.) while working on energized systems in accordance with NFPA 70E.

2. Electricians must wear personal protective equipment while working on energized systems in accordance with NFPA 70E.

3. Before initiating any work, a job specific work plan must be developed by the contractor with a peer review conducted and documented by the Contractor. The work plan must include procedures to be used on and near the live electrical equipment, barriers to be installed, safety equipment to be used and exit pathways.

4. Work on energized circuits or equipment cannot begin until prior written approval is obtained from the Owner/ Architect.

END OF SECTION 260500

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SUMMARY

A. Division 27 and 28 requirements shall be a sub-contract to Division 26. Division 26 shall be responsible for all requirements listed on electrical drawings, and Division 26, 27, and 28 specifications.

B. Section includes building wire and cable and wiring connectors and connections.

1.2 REFERENCES

A. International Electrical Testing Association:
   1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

B. National Fire Protection Association:
   1. NFPA 70 - National Electrical Code.
   2. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

C. Underwriters Laboratories, Inc.:
   1. UL Standard 83 for Thermoplastic-Insulated Wires and Cables.
   2. UL Standard 44 for Thermoset-Insulated Wires and Cables.
   3. UL 514B – Standard for Conduit, Tubing, and Cable Fittings.
   4. UL 1277 - Standard for Safety for Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.

1.3 SYSTEM DESCRIPTION

A. Product Requirements: Provide products as follows:
   1. Solid conductor for branch circuits 10 AWG and smaller.
   2. Stranded conductors for control circuits.
   3. Conductor not smaller than 12 AWG for power and lighting circuits.
   4. Conductor not smaller than 14 AWG for control circuits.
   5. Increase wire size in branch circuits to limit voltage drop to a maximum of 3 percent.

B. Wiring Methods: Provide the following wiring methods:
   1. Use only building wire, Type THHN/THWN-2 insulation, in raceway unless specifically noted otherwise.

1.4 SUBMITTALS

A. Product Data for the following:

1. Wire and Cable
2. Splice Kits
3. Waterproof Wire Connectors

B. Test Reports: Indicate procedures and values obtained.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of components and circuits.

1.6 QUALITY ASSURANCE

A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5 m) when tested in accordance with NFPA 262.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Conform to requirements of NFPA 70.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to work. Coordinate dimensions with architectural, structural, and civil drawings. Electrical Drawings are diagrammatic only and shall not be scaled.

1.9 COORDINATION

A. Where wire and cable destination is indicated and routing is not shown, determine routing and lengths required.

B. Wire and cable routing indicated is approximate unless dimensioned. Include wire and cable lengths within 10 ft of length shown.

PART 2 PRODUCTS

2.1 BUILDING WIRE

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Southwire
2. AETNA.
3. American Insulated Wire Corp.
4. Colonial Wire
5. General Cable Co.
6. Encore Wire
7. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Single conductor insulated wire.

C. Conductor: Copper.

D. Insulation Voltage Rating: 600 volts.

2.2 TERMINATIONS

A. Terminal Lugs for Wires 6 AWG and Smaller: Solderless, compression type copper.

B. Lugs for Wires 4 AWG and Larger: Color keyed, compression type copper, with insulating sealing collars.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify interior of building has been protected from weather.

B. Verify mechanical work likely to damage wire and cable has been completed.

C. Verify raceway installation is complete and supported.

3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

3.3 EXISTING WORK

A. Remove exposed abandoned wire and cable, including abandoned wire and cable above accessible ceiling finishes. Patch surfaces where removed cables pass through building finishes.

B. Disconnect abandoned circuits and remove circuit wire and cable. Remove abandoned boxes when wire and cable servicing boxes is abandoned and removed. Install blank cover for abandoned boxes not removed.

C. Provide access to existing wiring connections remaining active and requiring access. Modify installation or install access panel.

D. Extend existing circuits using materials and methods compatible with existing electrical installations, or as specified.

E. Clean and repair existing wire and cable remaining or wire and cable to be reinstalled.

3.4 INSTALLATION

A. Route wire and cable to meet Project conditions.

B. Neatly train and lace wiring inside boxes, equipment, and panelboards.

C. Identify wire and cable under provisions of Section 26 05 53. Identify each conductor with its circuit number or other designation indicated.

D. Special Techniques--Building Wire in Raceway:
1. Pull conductors into raceway at same time.
2. Install building wire 4 AWG and larger with pulling equipment.

E. Special Techniques - Wiring Connections:
1. Clean conductor surfaces before installing lugs and connectors.
2. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
3. Tape uninsulated conductors and connectors with electrical tape to 150 percent of insulation rating of conductor.
4. Install split bolt connectors for copper conductor splices and taps, 6 AWG and larger.
5. Install solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
6. Install insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

F. Install stranded conductors for branch circuits 10 AWG and smaller. Install crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under screws.

G. Install terminal lugs on ends of 600 volt wires unless lugs are furnished on connected device, such as circuit breakers.

H. Size lugs in accordance with manufacturer’s recommendations terminating wire sizes. Install 2-hole type lugs to connect wires 4 AWG and larger to copper bus bars.

I. For terminal lugs fastened together such as on motors, transformers, and other apparatus, or when space between studs is small enough that lugs can turn and touch each other, insulate for dielectric strength of 2-1/2 times normal potential of circuit.

3.5 WIRE COLOR

A. General:

1. For wire sizes 6 AWG and smaller, install wire with insulation colors as designated below.
2. For wire sizes 4 AWG and larger, identify wire with colored tape at terminals, splices and boxes. Colors are as follows:

120/208-volt systems:	Phase A - Black Phase B - Red Phase C - Blue Neutral - White Ground - Green

3.6 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.3.1.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Division 27 and 28 requirements shall be a sub-contract to Division 26. Division 26 shall be responsible for all requirements listed on electrical drawings, and Division 26, 27, and 28 specifications.

B. Section Includes:
1. Rod electrodes.
2. Wire.
3. Grounding well components.
4. Mechanical connectors.
5. Exothermic connections.

1.2 REFERENCES

A. Institute of Electrical and Electronics Engineers:
1. IEEE 142 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
2. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment.

B. International Electrical Testing Association:
1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

C. National Fire Protection Association:
1. NFPA 70 - National Electrical Code.
2. NFPA 99 - Standard for Health Care Facilities.

1.3 DESIGN REQUIREMENTS

A. Construct and test grounding systems for access flooring systems on conductive floors accordance with IEEE 1100. Refer to Section 09 69 00.

1.4 PERFORMANCE REQUIREMENTS

A. Grounding System Resistance: 25 ohms maximum.

1.5 SUBMITTALS

A. Product Data: Submit data on grounding electrodes and connections.

B. Test Reports: Indicate overall resistance to ground and resistance of each electrode.

C. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of components and grounding electrodes.

1.7 QUALITY ASSURANCE

A. Provide grounding materials conforming to requirements of NEC, IEEE 142, and UL labeled.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.

B. Installer: Company specializing in performing work of this section with minimum three years experience.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

B. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

C. Do not deliver items to project before time of installation. Limit shipment of bulk and multiple-use materials to quantities needed for immediate installation.

1.10 COORDINATION

A. Complete grounding and bonding of building reinforcing steel prior concrete placement.

PART 2 PRODUCTS

2.1 ROD ELECTRODES

A. Product Description:
   1. Material: Copper-clad steel.
   2. Diameter: 3/4 inch (19 mm).
   3. Length: 10 feet (3.0 m).

B. Connector: Connector for exothermic welded connection.

2.2 WIRE

A. Material: Stranded copper.

B. Foundation Electrodes: 4 AWG.

C. Grounding Electrode Conductor: Copper conductor bare.

D. Bonding Conductor: Copper conductor insulated.

2.3 GROUNDING WELL COMPONENTS

A. Well Pipe: 8 inches NPS (DN200) by 24 inches (600 mm) long fiberglass pipe with belled end.

B. Well Cover: Cast iron with legend "GROUND" embossed on cover.

2.4 MECHANICAL CONNECTORS

A. Description: Bronze connectors, suitable for grounding and bonding applications, in configurations required for particular installation.
   1. Bonding Jumpers: Compression type connectors, using zinc-plated fasteners and external tooth lock washers.
   2. Ground Busbars: Two-hole compression type lugs using tin-plated copper or copper alloy bolts and nuts.
   3. Rack and cabinet ground bars: One-hole compression type lugs using zinc-plated or copper alloy fasteners.

2.5 EXOTHERMIC CONNECTIONS

A. Product Description: Exothermic materials, accessories, and tools for preparing and making permanent field connections between grounding system components.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify final backfill and compaction has been completed before driving rod electrodes.

3.2 PREPARATION

A. Remove paint, rust, mill oils, and other surface contaminants at connection points.

3.3 EXISTING WORK

A. Modify existing grounding system to maintain continuity to accommodate renovations.

B. Extend existing grounding system using materials and methods compatible with existing electrical installations, or as specified.

3.4 INSTALLATION

A. Install in accordance with IEEE 142.

B. Install rod electrodes at locations as indicated on Drawings. Install additional rod electrodes to achieve specified resistance to ground.

C. Install grounding and bonding conductors concealed from view.

D. Install grounding well pipe with cover at each rod location. Install well pipe top flush with finished grade.

E. Install grounding electrode conductor and connect to reinforcing steel in foundation footing. Electrically bond steel together. If it is determined that the reinforcing steel cannot be made electrically continuous, install a 4 AWG bare copper conductor in foundation footing around the perimeter of the building.

F. Equipment Grounding Conductor: Install separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

G. Connect to site grounding system. Refer to Section 337900.

H. Bond to lightning protection system. Refer to Section 264100.

I. Install continuous grounding using underground cold water system and building steel as grounding electrode. Where water piping is not available, install artificial station ground by means of driven rods or buried electrodes.

J. Permanently ground entire light and power system in accordance with NEC, including service equipment, distribution panels, lighting panelboards, switch and starter enclosures, motor frames, grounding type receptacles, and other exposed non-current carrying metal parts of electrical equipment.

K. Accomplish grounding of electrical system by using insulated grounding conductor installed with feeders and branch circuit conductors in conduits. Size grounding conductors in accordance with NEC. Install from grounding bus of serving panel to ground bus of served panel, grounding screw of receptacles, lighting fixture housing, light switch outlet boxes or metal enclosures of service equipment. Ground conduits by means of grounding bushings on terminations at panelboards with installed number 12 conductor to grounding bus.

L. Grounding electrical system using continuous metal raceway system enclosing circuit conductors in accordance with NEC.

M. Permanently attach equipment and grounding conductors prior to energizing equipment.

3.5 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Grounding and Bonding: Perform inspections and tests listed in NETA ATS, Section 7.13.

C. Perform ground resistance testing in accordance with IEEE 142.

D. Perform continuity testing in accordance with IEEE 142.

E. When improper grounding is found on receptacles, check receptacles in entire project and correct. Perform retest.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Division 27 and 28 requirements shall be a sub-contract to Division 26. Division 26 shall be responsible for all requirements listed on electrical drawings, and Division 26, 27, and 28 specifications.

B. Section Includes:
1. Conduit and equipment supports.
2. Anchors and fasteners.

1.2 SUBMITTALS

A. Shop Drawings: Indicate system layout with location and detail of trapeze hangers.

B. Product Data:
1. Hangers and Supports: Submit manufacturers catalog data including load capacity.

C. Design Data: Indicate load carrying capacity of trapeze hangers and hangers and supports.

D. Manufacturer's Installation Instructions:
1. Hangers and Supports: Submit special procedures and assembly of components.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.

B. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

PART 2 PRODUCTS

2.1 CONDUIT SUPPORTS

A. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.

B. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.

C. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.

D. Conduit clamps - general purpose: One hole malleable iron for surface mounted conduits.

E. Cable Ties: High strength nylon temperature rated to 185 degrees F (85 degrees C). Self locking.

2.2 FORMED STEEL CHANNEL

A. Product Description: Galvanized 12 gage (2.8 mm) thick steel. With holes 1-1/2 inches (38 mm) on center.

2.3 SPRING STEEL CLIPS

A. Product Description: Mounting hole and screw closure.

PART 3 EXECUTION

3.1 PREPARATION

A. The use of powder-actuated anchors is not allowed.

B. Do not drill or cut structural members.

3.2 INSTALLATION - HANGERS AND SUPPORTS

A. Anchors and Fasteners:
1. Concrete Structural Elements: Provide precast inserts, expansion anchors and preset inserts.
2. Steel Structural Elements: Provide beam clamps, spring steel clips, and steel ramset fasteners.
3. Concrete Surfaces: Provide self-drilling anchors and expansion anchors.
4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts and hollow wall fasteners.
5. Solid Masonry Walls: Provide expansion anchors and preset inserts.
6. Sheet Metal: Provide sheet metal screws.
7. Wood Elements: Provide wood screws.

B. Install conduit and raceway support and spacing in accordance with NEC.

C. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.

D. Install multiple conduit runs on common hangers.

E. Support wires above suspended ceilings for electrical system fixtures, devices and cabling shall be clearly identified. See section 260553.

F. Supports:
1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
2. Install surface mounted cabinets and panelboards with minimum of four anchors.
3. In wet and damp locations install steel channel supports to stand cabinets and panelboards 1 inch (25 mm) off wall.
4. Support vertical conduit at every other floor.

3.3 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum 3-1/2 inches (87 mm) thick and extending 6 inches (150 mm) beyond supported equipment. Refer to Section 03 30 00.

B. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct supports of steel members. Brace and fasten with flanges bolted to structure.

3.4 PROTECTION OF FINISHED WORK

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION 260529

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes conduit and tubing, surface raceways, wireways, outlet boxes, pull and junction boxes, and handholes.

1.2 REFERENCES

A. American National Standards Institute:
   1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
   2. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.

B. National Electrical Manufacturers Association:
   1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
   2. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
   3. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
   4. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit.
   5. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.3 SYSTEM DESCRIPTION

A. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceway to complete wiring system.

B. Underground: Provide nonmetallic conduit (schedule 40 PVC) with galvanized rigid steel long-sweep 90-degree elbows unless specifically noted otherwise. Provide cast metal boxes or nonmetallic handhole.

C. In or Under Slab on Grade: Provide nonmetallic conduit (schedule 40 PVC). Provide cast or nonmetallic metal boxes.

D. Outdoor Locations, Above Grade: Provide galvanized rigid steel. Provide cast metal outlet, pull, and junction boxes. Provide liquid-tight flexible metal conduit (maximum 6’-0” in length) for connection to vibrating equipment.

E. In Slab Above Grade: Provide nonmetallic conduit (schedule 80). Provide cast or nonmetallic boxes.

F. Interior Wet and Damp Locations: Provide galvanized rigid steel or aluminum conduit. Provide cast metal outlet, junction, and pull boxes. Provide flush mounting outlet box in finished areas.

G. Concealed Dry Locations: Provide electrical metallic tubing. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes. Provide flexible metal conduit (maximum 6’-0” in length) for connection to vibrating equipment.

H. Exposed Dry Locations in unfinished spaces: Provide rigid steel or intermediate metal conduit where subject to damage (see below for defined locations that are subject to damage), electrical metallic tubing. Provide sheet-metal boxes. Provide flush mounting outlet box in finished areas. Provide hinged enclosure for large pull boxes.
   1. Spaces defined as subject to physical damage are as follows:
      a. Mechanical Rooms below 10' above finished floor.
      b. Loading Docks.
      c. Any area with forklift traffic.

I. Exposed Dry Locations in finished spaces (existing conditions only): Provide wiremold (or panduit, or prior approved equal) surface metal raceway. Provide surface metal boxes by same company as raceway. For Communications System, provide deep surface metal boxes.

1.4 DESIGN REQUIREMENTS

A. Minimum Raceway Size: 3/4 inch (19 mm) unless otherwise specified.

1.5 SUBMITTALS

A. Product Data: Submit for the following:

   1. Flexible metal conduit.
   2. Liquidtight flexible metal conduit.
   3. Nonmetallic conduit.
   4. Flexible nonmetallic conduit.
   5. Conduit bodies.
   6. Wireway.
   7. Handholes.

B. Manufacturer's Installation Instructions: Submit application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents:
   1. Record actual routing of conduits larger than 2 inch (DN50).
   2. Record actual locations and mounting heights of outlet, pull, and junction boxes.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

B. Protect PVC conduit from sunlight.

1.8 COORDINATION

A. Coordinate installation of outlet boxes for equipment connected under Section 26 05 03.

B. Coordinate mounting heights, orientation and locations of outlets mounted above counters, benches, and backsplashes.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers listed below are basis of design, or can provide products equal to basis of design.
1. Carlon Electrical Products.
2. Hubbell Wiring Devices.
3. Thomas & Betts Corp.
4. Walker Systems Inc.
5. The Wiremold Co.
6. Substitutions: Division 01 Specifications - Product Requirements.

2.2 METAL CONDUIT

A. Rigid Steel Conduit: ANSI C80.1.

B. Intermediate Metal Conduit (IMC): Rigid steel.

C. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

2.3 FLEXIBLE METAL CONDUIT

A. Product Description: Interlocked steel construction.

B. Fittings: NEMA FB 1.

2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Product Description: Interlocked steel construction with PVC jacket.

B. Fittings: NEMA FB 1.

2.5 ELECTRICAL METALLIC TUBING (EMT)

A. Product Description: ANSI C80.3; galvanized tubing.

B. Fittings and Conduit Bodies: NEMA FB 1; steel compression type.

C. All EMT conduit shall be Anodized with the following color coating:
1. HVAC Equipment Power: Green
2. HVAC Controls: White (To be provided my mechanical controls contractor)
3. Normal Power: Silver
4. Fire Alarm System: Red
5. Communications Systems: Black

2.6 NONMETALLIC CONDUIT

A. Product Description: NEMA TC 2; Schedule 40 PVC.

B. Fittings and Conduit Bodies: NEMA TC 3.

2.7 WIREWAY

A. Product Description: General purpose for interior locations, and Raintight type for exterior locations wireway.

B. Cover: Hinged cover with full gaskets.

C. Finish: Rust inhibiting primer coating with gray enamel finish.

2.8 OUTLET BOXES

A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch (13 mm) male fixture studs where required.
2. Concrete Ceiling Boxes: Concrete type.

B. Cast Boxes: NEMA FB 1, Type FD. Furnish gasketed cover by box manufacturer.

C. Wall Plates for Finished Areas: As specified in Section 26 27 26.

D. Wall Plates for Unfinished Areas: Furnish gasketed cover.

2.9 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

B. Hinged Enclosures: As specified in Section 26 27 16.

C. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:

1. Material: Galvanized cast iron.
2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

D. Fiberglass Concrete composite Handholes: Die-molded, glass-fiber concrete composite hand holes:
1. See details on plans.
2. Cover: Glass-fiber concrete composite, weatherproof cover with nonskid finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify outlet locations and routing and termination locations of raceway prior to rough-in.

3.2 EXISTING WORK

A. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces.

B. Remove concealed abandoned raceway to its source.

C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets when raceway is abandoned and removed. Install blank cover for abandoned outlets not removed.

D. Maintain access to existing boxes and other installations remaining active and requiring access. Modify installation or provide access panel.

E. Extend existing raceway and box installations using materials and methods compatible with existing electrical installations, or as specified.

F. Clean and repair existing raceway and boxes to remain or to be reinstalled.

3.3 INSTALLATION

A. Ground and bond raceway and boxes in accordance with Section 260526.

B. Fasten raceway and box supports to structure and finishes in accordance with Section 260529.

C. Identify raceway and boxes in accordance with Section 260553.

D. Arrange raceway and boxes to maintain headroom and present neat appearance.

E. Do not install raceways or boxes within 1-1/2” of roof decking to prevent damage from roof installation or repair.

3.4 INSTALLATION - RACEWAY

A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.

B. Arrange raceway supports to prevent misalignment during wiring installation.

C. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.

D. Group related raceway; support using conduit rack. Construct rack using steel channel specified in Section 260529; provide space on each for 25 percent additional raceways.

E. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports

F. Do not attach raceway to ceiling support wires or other piping systems.

G. Construct wireway supports from steel channel specified in Section 260529.

H. Route exposed raceway parallel and perpendicular to walls.

I. Route raceway installed above accessible ceilings parallel and perpendicular to walls.

J. Route conduit in and under slab from point-to-point.

K. Maximum Size Conduit in Slab Above Grade: 3/4 inch (19 mm). Do not cross conduits in slab.

L. Maintain clearance between raceway and piping for maintenance purposes.

M. Maintain 12 inch (300 mm) clearance between raceway and surfaces with temperatures exceeding 104 degrees F (40 degrees C).

N. Cut conduit square using saw or pipe cutter; de-burr cut ends.

O. Bring conduit to shoulder of fittings; fasten securely.

P. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for minimum 20 minutes.

Q. Install conduit hubs or sealing locknuts to fasten conduit to cast boxes.

R. Install no more than equivalent of three 90 degree bends between boxes for power systems. Install conduit bodies to make sharp changes in direction, as around beams. Install factory elbows for bends in metal conduit larger than 2 inch (50 mm) size.

S. Install no more than equivalent of two 90 degree bends between boxes for communications systems. Install conduit bodies to make sharp changes in direction, as around beams. Install factory elbows for bends in metal conduit larger than 2 inch (50 mm) size.

T. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.

U. Install fittings to accommodate expansion and deflection where raceway crosses seismic, control and expansion joints.

V. Install suitable pull string or cord in each empty raceway except sleeves and nipples.

W. Install suitable caps to protect installed conduit against entrance of dirt and moisture.

X. Close ends and unused openings in wireways, junction boxes, and pull boxes.

3.5 INSTALLATION - BOXES

A. Install wall mounted boxes at elevations to accommodate mounting heights as indicated on Drawings.

B. Adjust box location up to 10 feet (3 m) prior to rough-in to accommodate intended purpose.

C. Orient boxes to accommodate wiring devices oriented as specified in Section 262726.

D. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.

E. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches (150 mm) from ceiling access panel or from removable recessed luminaire.

F. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.

G. Do not install flush mounting box back-to-back in walls; install with minimum 6 inches (150 mm) separation. Install with minimum 24 inches (600 mm) separation in acoustic rated walls.

H. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.

I. Install stamped steel bridges to fasten flush mounting outlet box between studs.

J. Install flush mounting box without damaging wall insulation or reducing its effectiveness.

K. Install adjustable steel channel fasteners for hung ceiling outlet box.

L. Do not fasten boxes to ceiling support wires or other piping systems.

M. Support boxes independently of conduit.

N. Install gang box where more than one device is mounted together. Do not use sectional box.

O. Install gang box with plaster ring for single device outlets.

P. Install junction boxes or pull boxes at locations that can be accessed through existing ceiling with a standard ladder. Maximum height of junction boxes above accessible ceiling or through an access panel in a non-accessible is 4’ above top of ceiling frame.

3.6 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods in accordance with Section 078400.

B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installer.

C. Locate outlet boxes to allow luminaires positioned as indicated on Drawings.

D. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

3.7 ADJUSTING

A. Adjust flush-mounting outlets to make front flush with finished wall material.

B. Install knockout closures in unused openings in boxes.

3.8 CLEANING

A. Clean interior of boxes to remove dust, debris, and other material.

B. Clean exposed surfaces and restore finish.

END OF SECTION 260533

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

A. Division 27 and 28 requirements shall be a sub-contract to Division 26. Division 26 shall be responsible for all requirements listed on electrical drawings, and Division 26, 27, and 28 specifications.

B. Section Includes:
1. Nameplates.
2. Labels.
3. Wire markers.
4. Underground Warning Tape.
5. Lockout Devices.

1.2 DELIVERY, STORAGE, AND HANDLING

A. Accept identification products on site in original containers. Inspect for damage.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.3 ENVIRONMENTAL REQUIREMENTS

A. Install nameplates and labels only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

PART 2 PRODUCTS

2.1 NAMEPLATES

A. Product Description: Laminated three-layer plastic with engraved letters on contrasting background color. See specification sections for specific equipment for nameplate color schemes. If no color scheme is specified for specific equipment, provide black letters on a white background.

B. Letter Size:
1. 1/8 inch (3 mm) high letters for identifying individual equipment and loads.

C. Minimum nameplate thickness: 1/8 inch (3 mm).

2.2 LABELS

A. Labels: Embossed adhesive tape, with 3/16 inch (5 mm) black letters on clear background.

2.3 WIRE MARKERS

A. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
1. Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 deg F (23 deg C), According to ASTM D 638: 7000 psi (48.2 MPa).
3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: -50 deg F to +284 deg F (-46 deg C to +140 deg C).

B. Legend:
1. Control Circuits: Control wire number as indicated on shop drawings.

2.4 SUPPORT WIRES

A. Support wires above suspended ceilings for electrical system fixtures, devices, and cabling shall be painted red such that they are easily identified from below.

2.5 UNDERGROUND WARNING TAPE

A. Description: 4 inch (100 mm) wide plastic tape, detectable type, colored yellowwith suitable warning legend describing buried electrical lines.

2.6 LOCKOUT DEVICES

A. Lockout Hasps:
1. Reinforced nylon hasp with erasable label surface; size minimum 7-1/4 x 3 inches (184 x 75 mm).

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 EXISTING WORK

A. Install identification on unmarked existing equipment.

B. Replace lost nameplates.

3.3 INSTALLATION

A. Install identifying devices after completion of painting.

B. Nameplate Installation:
1. Install nameplate parallel to equipment lines.
2. Install nameplate for each electrical distribution and control equipment enclosure with corrosive-resistant mechanical fasteners, or adhesive.

3. Install nameplates for each control panel and major control components located outside panel with corrosive-resistant mechanical fasteners, or adhesive.
4. Secure nameplate to equipment front using screws, or adhesive.
5. Install nameplates for the following:
    a. Switchboards.
    b. Panelboards.
    c. Transformers.
    d. Disconnect Switches.
    e. Enclosed Circuit Breakers.
    f. Transfer Switches.
    g. Lighting Control Panels.

C. Label Installation:
1. Install label parallel to equipment lines.
2. Install label for identification of branch circuit and panelboard supporting each wiring devices.
3. Install labels for permanent adhesion and seal with clear lacquer.

D. Wire Marker Installation:
1. Install wire marker for each conductor at panelboard gutters, pull boxes, outlet and junction boxes, and each load connection.
2. Mark data cabling at each end. Install additional marking at accessible locations along the cable run.
3. Install labels at data outlets identifying patch panel and port designation.

E. Underground Warning Tape Installation:
1. Install underground warning tape along length of each underground conduit, raceway, or cable 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried conduit, raceway, or cable.

END OF SECTION

SECTION 26 05 83 - EQUIPMENT WIRING CONNECTIONS

PART 1 GENERAL

1.1 SUMMARY

A. Division 27 and 28 requirements shall be a sub-contract to Division 26. Division 26 shall be responsible for all requirements listed on electrical drawings, and Division 26, 27, and 28 specifications.

B. Section includes electrical connections to equipment.

1.2 REFERENCES

A. National Electrical Manufacturers Association:
   1. NEMA WD 1 - General Requirements for Wiring Devices.
   2. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

1.3 SUBMITTALS

A. Product Data: Submit wiring device manufacturer’s catalog information showing dimensions, configurations, and construction.

B. Signed Letter from Contractor indicating that shop drawings have been reviewed for all equipment requiring electrical connections that are furnished by other divisions prior to ordering equipment.

C. Manufacturer's installation instructions.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations, sizes, and configurations of equipment connections.

1.5 COORDINATION

A. Obtain and review shop drawings, product data, manufacturer’s wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.

B. Prior to ordering electrical gear, compare to electrical requirements listed on electrical drawings for each piece of equipment. Notify architect / engineer immediately of any changes.

C. Coordinate with equipment shop drawings for devices such as drinking fountains, hand dryers, other appliances, etc. such that devices are located concealed behind appliances and/or maintenance panels unless specifically noted otherwise. Where GFCI protection is required, provide remote means for GFCI protection (circuit breaker unless noted otherwise).

D. Sequence rough-in of electrical connections to coordinate with installation of equipment.

E. Sequence electrical connections to coordinate with start-up of equipment.

PART 2 PRODUCTS

2.1 EQUIPMENT REQUIRING ELECTRICAL SERVICE

A. Provide electrical connections for all electrically driven equipment. Final connections are electrical work, unless specifically noted otherwise. Obtain a copy of the shop drawings of equipment. Review shop drawings to verify electrical characteristics and to determine rough-in requirements, final connection requirements, location of disconnect switch, etc. Notify the General Contractor if the information received is ambiguous or incomplete. Keep a copy of these shop drawings at the project site throughout the course of construction.

B. Equipment to be connected includes, but is not limited to the following:
1. HVAC Equipment
2. Telephone/Computer Systems
3. Fire Alarm System
4. Elevators
5. Site Lighting
6. Control Systems

C. The design of circuits for electrically driven equipment is based on the product of one manufacturer and may not be representative of all acceptable manufacturers. If equipment furnished has differing characteristics, make necessary adjustments to circuit components at no additional cost to the Owner, subject to the approval of the Architect.

D. Provide disconnects for all equipment and appliances unless specifically noted otherwise on the drawings.

E. Provide motor starters for all mechanical equipment unless provided by the mechanical contractor.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify equipment is ready for electrical connection, for wiring, and to be energized.

3.2 EXISTING WORK

A. Remove exposed abandoned equipment wiring connections, including abandoned connections above accessible ceiling finishes.

B. Disconnect abandoned utilization equipment and remove wiring connections. Remove abandoned components when connected raceway is abandoned and removed. Install blank cover for abandoned boxes and enclosures not removed.

C. Extend existing equipment connections using materials and methods as specified.

3.3 INSTALLATION

A. Make electrical connections.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations. Flexible conduit shall be limited to 6’ in length unless specifically noted otherwise.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Install receptacle outlet to accommodate connection with attachment plug.

E. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

F. Install terminal block jumpers to complete equipment wiring requirements.

G. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

3.4 ADJUSTING

A. Cooperate with utilization equipment installers and field service personnel during checkout and starting of equipment to allow testing and balancing and other startup operations. Provide personnel to operate electrical system and checkout wiring connection components and configurations.

END OF SECTION 260583

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. Division 27 and 28 requirements shall be a sub-contract to Division 26. Division 26 shall be responsible for all requirements listed on electrical drawings, and Division 26, 27, and 28 specifications.

B. Section Includes:
1. Lighting contactors.
2. Time Clocks
3. Switches.
4. Switch plates.
5. Occupancy sensors.
6. Photocells.

1.2 REFERENCES

A. National Electrical Manufacturers Association:
1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
2. NEMA FU 1 - Low Voltage Cartridge Fuses.
3. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contractors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
4. NEMA ICS 4 - Industrial Control and Systems: Terminal Blocks.
5. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
6. NEMA ICS 6 - Industrial Control and Systems: Enclosures.
7. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

1.3 SYSTEM DESCRIPTION

A. Interior Lighting controls shall be based on lighting control scheme as defined on the drawings. Contractor is responsible for providing system, components, wiring, and programming as required to provide all automatic and manual control functions as defined.

B. Exterior Lighting Controls shall be based on combination Time Clock, Photocells, and contactors as required to support astronomical time based scheduling, measurement of daylight, and a combination of the two.

1.4 SUBMITTALS

A. Time Line for delivery, installation, and factory start-up. Lighting controls shall be completed, and factory commissioned prior to final walk-through.

B. Shop Drawings: Indicate dimensioned drawings of lighting control system components and accessories.
   1. One Line Diagram: Indicating system configuration indicating panels, number and type of switches or devices.
   2. Include typical wiring diagrams for each component.
   3. Plans showing locations of all lighting control devices, and associated coverage patterns.
   4. Relay Panel Schedules including circuit breaker origination, load description, and auxiliary control inputs.

C. Product Data: Submit manufacturer's standard product data for each system component.

D. Manufacturer's Installation Instructions: Submit for each system component.

E. Manufacturer's Certificate: Certify Products and system meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record the following information:
   1. Actual locations of components and record circuiting and switching arrangements.
   2. Wiring diagrams reflecting field installed conditions with identified and numbered, system components and devices.

B. Operation and Maintenance Data:
   1. Submit replacement parts numbers.
   2. Submit manufacturer's published installation instructions and operating instructions.
   3. Recommended renewal parts list.
   4. Product Components and System Warranty Information.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept components on site in manufacturer's packaging. Inspect for damage.

B. Protect components by storing in manufacturer's containers indoor protected from weather.

1.8 WARRANTY

A. Furnish five year manufacturer warranty for all control devices and panels.

1.9 EXTRA MATERIALS

A. Furnish two of each switch type.

B. Furnish two of each occupancy sensor type.

C. Furnish two of each photocell type.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Interior Lighting Controls Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Lutron
2. Wattstopper
3. Hubbell Automation
4. Leviton
5. nLight
6. Cooper
7. Crestron
8. Substitutions: Division 01 Specifications - Product Requirements.

B. Exterior Lighting Controls Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Intermatic
2. Tork

2.2 LIGHTING CONTACTORS

A. Manufacturers:
1. GE
2. Cutler-Hammer
3. Square D
4. Siemens.
5. Substitutions: Division 01 Specifications - Product Requirements.

B. Product Description: NEMA ICS 2, magnetic lighting contactor.

C. Configuration: Electrically held, 2 wire control.

D. Coil Operating Voltage: 120 volts, 60 Hertz.

E. Poles: To match circuit configuration and control function.

F. Contact Rating: Conductor overcurrent protection, considering derating for continuous loads.

G. Enclosure: NEMA ICS 6, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
1. Interior Dry Locations: Type 1.
2. Exterior Locations: Type 3R.

2.3 SWITCHES

A. Wall Switch: Specification Grade, momentary pushbutton type for overriding relays.
1. Color: See wiring devices Section 262726.

B. Switch may be low-voltage type, tied to lighting control system, or line-voltage type with integral relay. See plans for additional information on lighting control scheme.

2.4 SWITCH PLATES

A. Product Description: Specification Grade.
1. Color: See wiring devices Section 262726.

2.5 OCCUPANCY / VACANCY SENSOR

A. Sensors shall be field selectable for either Occupancy Sensing or Vacancy Sensing.

B. Separate sensitivity and time delay adjustments with LED indication of sensed movement. User adjustable time-delay: 30 seconds to 20 minutes.

C. Furnish with manual override.

D. Operation: Silent.

E. Room Sensors: Direction or Omni-Direction with coverage pattern as required to cover 100% of space.

2.6 PHOTOCELLS

A. Interior: Provide closed loop sensor mounted as required to provide accurate measurements within the daylighting zone.

B. Exterior: Rated for exterior lighting voltage as indicated on plan. Mount high on wall and aim north.

C. Sensor Devices: Each sensor employs photo diode technology to allow linear response to daylight within illuminance range.
1. Exterior Lighting: Hooded sensor, horizontally mounted, employing flat lens, and working range. Entire sensor encased in optically clear epoxy resin.
a. Range shall be 1-5 fc to close circuit, 3-15fc to open circuit.

b. Sensor shall have up to a 2-minute time delay for both close and open feature.

2. Indoor Lighting: Sensor shall measure both the daylight contribution and the controlled electric light contribution.
   a. Photocell shall have an extremely linear response with greater than 1% accuracy over the sensed range.
   b. Photosensor shall utilize an internal photocell that measures only in the visible spectrum and has a response curve that closely matches the photopic curve. The photocell shall not measure energy in either the ultraviolet or infrared spectrums. The photocell shall have a sensitivity of less than 5% for any wavelengths less than 400 nanometers or greater than 700 nanometers.
   c. Photosensor shall provide dimming over the full range.
   d. Photosensor shall have a control range of 20-60 footcandles.

PART 3 EXECUTION

3.1 INSTALLATION

A. Provide electrical connection to relay panels, time clocks, or other controllers that require powered connections. Coordinate all connection points with system shop drawings.

B. Mount switches, occupancy sensors, and photocells to provide system control to match scheme indicated on drawings.

C. Occupancy / Vacancy Sensors shall be located and shielded as required to optimally cover 100% of the space and prevent nuisance detection from outside of the room.

D. Install wiring in accordance with Section 260519 and manufacturers written instructions.

E. Label each low voltage wire clearly indicating connecting relay panel.

F. Mount relay as indicated on final shop drawings. Wire numbered relays in panel to control power to each load. Install relays to be accessible. Allow space around relays for ventilation and circulation of air.

G. Identify power wiring with circuit breaker number controlling load. When multiple circuit breaker panels are feeding into relay panel, label wires to indicate originating panel designation.

H. Label each low voltage wire with relay number at each switch or sensor.

3.2 MANUFACTURER'S FIELD SERVICES

A. Furnish services for check, test, and start-up. Perform the following services:
   1. Check installation of panelboards.
   2. Test operation of remote controlled devices.
   3. Repair or replace defective components.

4. Manufacturer's factory authorized respresentative shall start-up and verify a complete fully functional system.

B. Furnish 4 hours to instruct Owner's personnel in operation and maintenance of system. Schedule training with Owner, provide at least 7 days notice to Owner of training date.

3.3 ADJUSTING

A. Test each system component after installation to verify proper operation.

B. Confirm correct loads are recorded on directory card in each panel.

END OF SECTION

SECTION 262416 - PANELBOARDS

PART 1 GENERAL

1.1 SUMMARY

A. Division 27 and 28 requirements shall be a sub-contract to Division 26. Division 26 shall be responsible for all requirements listed on electrical drawings, and Division 26, 27, and 28 specifications.

B. Section includes distribution and branch circuit panelboards, electronic grade branch circuit panelboards.

C. Related Sections:
1. Section 260526 - Grounding and Bonding for Electrical Systems.
2. Section 260553 - Identification for Electrical Systems.

1.2 REFERENCES

A. Institute of Electrical and Electronics Engineers:
1. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.

B. National Electrical Manufacturers Association:
1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
2. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
3. NEMA ICS 5 - Industrial Control and Systems: Control Circuit and Pilot Devices.
4. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
5. NEMA PB 1 - Panelboards.
6. NEMA PB 1.1 - General Instructions for Proper Installation, Operation, and Maintenance of Panelboards Rated 600 Volts or Less.

C. International Electrical Testing Association:
1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

D. National Fire Protection Association:
1. NFPA 70 - National Electrical Code.

E. Underwriters Laboratories Inc.:
1. UL 67 - Safety for Panelboards.
2. UL 1283 - Electromagnetic Interference Filters.

1.3 SUBMITTALS

A. Shop Drawings: Include all of the following information:
   1. Indicate outline and support point dimensions.
   2. Product data
   3. Enclosure type
   4. Circuit directory
   5. Bussing Diagrams
   6. Integrated short circuit ampere rating
   7. Device Nameplate Data

B. Product Data: Submit catalog data showing specified features of standard products.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of panelboards and record actual circuiting arrangements.

B. Operation and Maintenance Data: Submit spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.6 MAINTENANCE MATERIALS

A. Furnish two of each panelboard key.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following manufacturers:
   1. GE Electric
   2. Square D
   3. Eaton
   4. Siemens
   5. Substitutions: Division 01 Specifications - Product Requirements.

2.2 DISTRIBUTION PANELBOARDS

A. Product Description: NEMA PB 1, circuit breaker type panelboard.

B. Panelboard Bus: Copper current carrying components, ratings as indicated on Drawings. Furnish copper and neutral ground bus in each panelboard.

C. See circuit breaker section below for information on types of circuits required.

D. Enclosure: NEMA PB 1
1. Indoor Locations - Type 1, unless noted otherwise below.
2. Outdoor Locations - Type 3R.

E. Cabinet Front: Door-in-door type, fastened with concealed trim clamps, hinged door with flush lock all keyed alike, metal directory frame, finished in manufacturer's standard gray enamel.

F. All panelboards shall be hinged "door in door" type with:
1. Interior hinged door with hand operated latch or latches as required to provide access to circuit breaker operating handles only, not to energized parts.
2. Outer hinged door shall be securely mounted to the panelboard box with factory bolts, screws, clips or other fasteners requiring a tool for entry, hand operated latches are not acceptable.
3. Both inner and outer doors shall open left to right.

G. All panelboards shall have bolt-on style breakers.

H. Provide labeling on panelboard such that each 1.5” space is numbered. This may imply that larger breakers may take up more than 3-spaces.

I. Provisions for future breakers shall be fully bussed complete with all necessary mounting hardware.

2.3 BRANCH CIRCUIT PANELBOARDS

A. Product Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.

B. Panelboard Bus: Copper current carrying components, ratings as indicated on Drawings. Furnish copper ground and neutral bus in each panelboard

C. See circuit breaker section below for information on types of circuits required.

D. Enclosure: NEMA PB 1
1. Indoor Locations - Type 1, unless noted otherwise below.
2. Outdoor Locations - Type 3R.

E. Cabinet Box: 6 inches (153 mm) deep, 20 inches (508 mm) wide.

F. Cabinet Front: Door-in-door type, fastened with concealed trim clamps, hinged door with flush lock all keyed alike, metal directory frame, finished in manufacturer's standard gray enamel.

G. All panelboards shall be hinged "door in door" type with:
1. Interior hinged door with hand operated latch or latches as required to provide access to circuit breaker operating handles only, not to energized parts.

2. Outer hinged door shall be securely mounted to the panelboard box with factory bolts, screws, clips or other fasteners requiring a tool for entry, hand operated latches are not acceptable.
3. Both inner and outer doors shall open left to right.

H. All panelboards shall have bolt-on style breakers.

I. Provisions for future breakers shall be fully bussed complete with all necessary mounting hardware.

2.4 CIRCUIT BREAKERS

A. For Circuit breakers rated at 1000 amps and over: Provide low voltage AC power circuit breaker, with fixed mounting, stored energy and solid state trip devices.
1. Provide individual adjustable solid-state elements as an integral part of the solid-state trip devices for complete system selective coordination. Breakers shall have LSGI settings.
2. Position indicator: Provide an indicator visible from the front of the unit to indicate whether the breaker is open or closed.
3. Trip button: Provide a mechanical trip button accessible from the front of the door to trip the breaker.
4. Padlocking: Include provisions for padlocking the breaker in the open position.
5. Trip devices shall have the following features:
a. Trip device in each pole.
b. Metering, voltage, current memory and LED display.
c. Mechanically and electrically trip free.
d. Long time element with adjustable pick-up and selective maximum, intermediate, and minimum time delay bands.
e. Short time element with adjustable pick-up and selective maximum, intermediate, and minimum time delay bands.
f. Ground fault element with adjustable pick-up and selective maximum, intermediate and minimum time delay bands.
g. Maintenance setting option to reduce Arc Flash hazards.

B. For Circuit breakers rated over 200 amps: Provide adjustable trip molded case, solid state adjustable trip type circuit breakers.
1. Ground-Fault Equipment Protection (GFEP) Circuit Breakers (where scheduled): Class B ground-fault protection (30-mA trip).
2. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
3. Shunt-trip: 120 volt trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
4. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1 to 0.6 second time delay.
5. Trip units shall have field adjustable tripping characteristics as follows:
a. Ampere Setting (Continuous)
b. Long time band.
c. Short time trip point.
d. Short time delay.

e. Instantaneous trip point.

C. For all circuit breakers 200 amps and smaller: Provide Molded Case Thermal Magnetic Trip type Circuit Breakers.
1. Type SWD for lighting circuits.
2. Type HACR for all air conditioning equipment circuits.
3. Ground-Fault Equipment Protection (GFEP) Circuit Breakers (where scheduled): Class B ground-fault protection (30-mA trip).
4. Class A ground fault interrupter circuit breakers where scheduled.
5. Do not use tandem circuit breakers.
6. GFCI Circuit breakers: Single and two-pole configurations with Class A ground-fault protection (6-mA trip).

D. Circuit breakers serving elevators shall have adjustable long-time setting and shall be provided with a shunt trip coil rated for 120 volt operation. Breaker shall also have a set of Form C contacts. Connect shunt trip coil to operate as indicated on the drawings.

2.5 SHORT CIRCUIT CURRENT RATING

A. Devices which achieve the level of fault protection indicated by means of "series" or "integrated" rating shall be acceptable unless specifically indicated on the drawings. All panelboards shall be fully rated.

B. For existing equipment, provide circuit breakers with short circuit current ratings that match ratings indicated on panel, if no markings indicate panelboard rating, then provide ratings that match highest rated circuit breaker in panelboard.

PART 3 EXECUTION

3.1 EXISTING WORK

A. Disconnect abandoned panelboards. Remove abandoned equipment unless specifically noted otherwise.

3.2 INSTALLATION

A. Install panelboards in accordance with NEMA PB 1.1.

B. Install panelboards plumb.

C. Height: 6 feet (1800 mm) to top of panelboard; install panelboards taller than 6 feet (1800 mm) with bottom no more than 4 inches (100 mm) above floor.

D. Install filler plates for unused spaces in panelboards.

E. Ground and bond panelboard enclosure according to Section 260526. Connect equipment ground bars of panels in accordance with NFPA 70.

F. Provide a circuit breaker locking device for all circuit breakers that serve fire alarm system panels and power supplies. These circuit breakers shall be locked in the "closed" position. Identify these circuit breakers with a red marking.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform circuit breaker inspections and tests listed in NETA ATS, Section 7.6.

C. Perform controller inspections and tests listed in NETA ATS, Section 7.16.1.

3.4 ADJUSTING

A. Measure steady state load currents at each panelboard feeder; rearrange circuits in panelboard to balance phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

B. Touch-up scratched or marred surfaces to match original finish.

C. Clean all debris from panel interiors.

3.5 LABELING

A. Install engraved plastic nameplates in accordance with Section 260553.

B. Provide nameplates on all new electrical panelboards. Indicate the following information on the nameplate:
1. Panel Name
2. Panel fed from
3. Voltage, Phase, Wire, Short Circuit Current Rating
4. Date Installed

C. Use the following color coding for panelboard nameplates:
1. Normal Power: White with Black Letters.

D. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes to balance phase loads.

E. Identify load served and location by room names assigned by user, not by room numbers on floor plans. Note spares and spaces as such. Spare circuit breakers shall be left in the open position.

3.6 CLEARANCE AND WORKSPACE

A. Maintain workspace and clearances as required by the NEC for voltages encountered. No pipes or ducts shall pass above the outline of the panelboard. It shall be the responsibility of this Contractor to make sure that other trades do not encroach on this space.

END OF SECTION

SECTION 262726 - WIRING DEVICES

PART 1 GENERAL

1.1 SUMMARY

A. Section includes wall switches; receptacles; and device plates and decorative box covers.

1.2 REFERENCES

A. National Electrical Manufacturers Association:
   1. NEMA WD 1 - General Requirements for Wiring Devices.
   2. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's catalog information showing dimensions, colors, and configurations.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.5 EXTRA MATERIALS

A. Furnish two of each style, size, and finish wall plate.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following manufacturers:
   1. Arrow Hart
   2. Eagle
   3. Hubbell
   4. Leviton
   5. Legrand
   6. Lutron
   7. Substitutions: Division 01 Specifications - Product Requirements.

2.2 WALL SWITCHES

A. Product Description: NEMA WD 1, UL20 and Fed Spec WS-896 AC only snap switch. Switch shall have back and side wire options.

B. Body and Handle: Nylon with toggle handle. Color as selected by architect.

C. Ratings: Match branch circuit and load characteristics.

2.3 MOTOR RATED SWITCHES

A. Product Description: Heavy-Duty, AC type snap switch.

B. Body and Handle: Plastic with toggle handle. Color to match other devices.

C. Provide lockout accessory (Garvin Industries: TOGLOK or equal) installed on all motor-rated toggle switches.

D. Ratings: Match branch circuit and load characteristics.

2.4 RECEPTACLES

A. Product Description: Tamper-Resistant, NEMA WD 1, UL498 and Fed Spec WC-596 Commercial Specification Grade receptacle. Receptacle shall have back and side wire options.

B. Configuration: NEMA WD 6, type as specified.

C. GFCI Receptacle (2015 UL 943): Duplex receptacle with integral self-test ground fault circuit interrupter to meet regulatory requirements. Self-test system conducts an automatic test every 15 minutes minimum. If device fails the self-test, visual and audible indicators provide an alert and power to unit is disconnected.
1. GFCI receptacles shall not be used as feed through devices.
2. Where devices are installed behind equipment where not easily accessible, a dead-front GFCI device may be used with a standard device for GFCI protection. See plans for additional information.
3. Where installed in wet locations, the device shall be listed weather resistant type.

D. Receptacle installed outdoors shall be listed as Weather-Resistant “WR” type.

E. All Receptacle types shall be NEMA 5-20 unless noted specifically noted otherwise.

F. Device Body: PVC back body with Nylon Face. Color as selected by architect.

G. Special Purpose Receptacles: Provide heavy-duty type as indicated on the drawings.

2.5 WALL PLATES

A. Decorative Cover Plate: Impact resistant nylon (color to match associated device); or smooth-stainless steel, as determined by the Architect.

B. Weatherproof Cover Plate: All devices installed outdoor and indoor devices specifically indicated, shall be provided with weatherproof covers. Covers shall be metallic and of

the type that maintain weatherproof integrity when in-use and not in-use, as required by the NEC.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify outlet boxes are installed at proper height.

B. Verify wall openings are neatly cut and completely covered by wall plates.

C. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

A. Clean debris from outlet boxes.

3.3 EXISTING WORK

A. Disconnect and remove abandoned wiring devices.

B. Modify installation to maintain access to existing wiring devices to remain active.

C. Clean and repair existing wiring devices to remain or to be reinstalled.

3.4 INSTALLATION

A. Install devices plumb and level.

B. Install switches with OFF position down.

C. Install receptacles with grounding pole on bottom.

D. Connect wiring device grounding terminal to outlet box with bonding jumper and branch circuit equipment grounding conductor.

E. Install decorative plates on switch, receptacle, and blank outlets in finished areas.

F. Connect wiring devices by wrapping solid conductor around screw terminal. Install stranded conductor for branch circuits 10 AWG and smaller. When stranded conductors are used in lieu of solid, use crimp on fork terminals for device terminations. Do not place bare stranded conductors directly under device screws.

G. Use jumbo size plates for outlets installed in masonry walls.

H. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.

3.5 INTERFACE WITH OTHER PRODUCTS

A. Coordinate with equipment shop drawings for devices such as drinking fountains, hand dryers, other appliances, etc. such that devices are located concealed behind appliances and/or maintenance panels unless specifically noted otherwise. Where GFCI protection is required, provide remote means for GFCI protection (circuit breaker unless noted otherwise).

B. Coordinate locations of outlet boxes provided under Section 260533 and as indicated on drawings.

C. Coordinate installation of wiring devices with floor box service fittings provided under Section 260534.

3.6 FIELD QUALITY CONTROL

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFCI receptacle device for proper operation.

3.7 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

3.8 CLEANING

A. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION

SECTION 262813 - FUSES

PART 1 GENERAL

1.1 SUMMARY

A. Division 27 and 28 requirements shall be a sub-contract to Division 26. Division 26 shall be responsible for all requirements listed on electrical drawings, and Division 26, 27, and 28 specifications.

B. Section includes fuses.

1.2 REFERENCES

A. National Electrical Manufacturers Association:
1. NEMA FU 1 - Low Voltage Cartridge Fuses.

1.3 FUSE PERFORMANCE REQUIREMENTS

A. Main Service Switches Larger than 600 amperes: Class L (time delay).

B. Main Service Switches Less than or equal to 600 amperes: Class J.

C. Motor Branch Circuits: Class RK5.

D. Lighting Branch Circuits: Class G.

1.4 SUBMITTALS

A. Product Data: Submit data sheets showing electrical characteristics, including time-current curves.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual sizes, ratings, and locations of fuses.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.7 MAINTENANCE MATERIALS

A. Furnish one fuse pullers for each size fuse installed.

1.8 EXTRA MATERIALS

A. Furnish three spare fuses of each Class, size, and rating installed.

PART 2 PRODUCTS

2.1 FUSES

A. Manufacturers:
   1. Cooper Bussmann.
   2. Ferraz Shawmut.
   3. Littelfuse.
   4. Substitutions: Division 01 Specifications - Product Requirements.

B. Dimensions and Performance: NEMA FU 1, Class as specified or as indicated.

C. Voltage: Rating suitable for circuit phase-to-phase voltage.

PART 3 EXECUTION

3.1 EXISTING WORK

A. Remove fuses from abandoned circuits.

B. Maintain access to existing fuses and other installations remaining active and requiring access. Modify installation or provide access panel.

3.2 INSTALLATION

A. Install fuse with label oriented so manufacturer, type, and size are easily read.

END OF SECTION

SECTION 262819 - ENCLOSED SWITCHES

PART 1 GENERAL

1.1 SUMMARY

A. Division 27 and 28 requirements shall be a sub-contract to Division 26. Division 26 shall be responsible for all requirements listed on electrical drawings, and Division 26, 27, and 28 specifications.

B. Section includes fusible and nonfusible switches.

C. Related Sections:
   1. Section 262813 - Fuses.

1.2 REFERENCES

A. National Electrical Manufacturers Association:
   1. NEMA FU 1 - Low Voltage Cartridge Fuses.
   2. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).

B. International Electrical Testing Association:
   1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 SUBMITTALS

A. Product Data:
   1. Switch ratings (Voltage, Amperage, Poles, SSCR)
   2. Enclosure type and dimensions.
   3. Control Wiring Diagrams

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of enclosed switches and ratings of installed fuses.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following manufacturers:
   1. GE Electric
   2. Square D
   3. Eaton
   4. Siemens
   5. Substitutions: Division 01 Specifications - Product Requirements.

2.2 FUSIBLE SWITCH ASSEMBLIES

A. Product Description: NEMA KS 1, Type GD with externally operable handle interlocked to prevent opening front cover with switch in ON position, enclosed load interrupter knife switch. Handle lockable in OFF position.

B. Fuse clips: Designed to accommodate NEMA FU 1, Class fuses as defined for application in Section 262813.

C. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
   1. Interior Dry Locations: Type 1.
   2. Exterior Locations: Type 3R.

D. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.

E. Furnish switches with entirely copper current carrying parts.

2.3 NONFUSIBLE SWITCH ASSEMBLIES

A. Product Description: NEMA KS 1, Type GD with externally operable handle interlocked to prevent opening front cover with switch in ON position enclosed load interrupter knife switch. Handle lockable in OFF position.

B. Enclosure: NEMA KS 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
   1. Interior Dry Locations: Type 1.
   2. Exterior Locations: Type 3R.

C. Furnish switches with entirely copper current carrying parts.

2.4 SWITCH RATINGS

A. Switch Rating: Horsepower rated for AC or DC as indicated on Drawings.

B. Short Circuit Current Rating: UL listed for 200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses (15-600 ampere switches employing appropriate fuse rejection schemes) or protected by Class L fuses (800-1200 ampere).

PART 3 EXECUTION

3.1 EXISTING WORK

A. Disconnect and remove abandoned enclosed switches.

B. Maintain access to existing enclosed switches and other installations remaining active and requiring access. Modify installation or provide access panel.

C. Clean and repair existing enclosed switches to remain or to be reinstalled.

3.2 INSTALLATION

A. Install enclosed switches plumb. Provide supports in accordance with Section 260529.

B. Height: 5 feet (1500 mm) to operating handle.

C. Install fuses for fusible disconnect switches. Refer to Section 262813 for product requirements.

3.3 LABELING

A. Install engraved plastic nameplates in accordance with Section 260553. Nameplates on all switch enclosures wherein circuits are modified or installed shall indicate the following:
1. Equipment Switch Serves
2. Panel and Circuit Switch is served from.
3. Voltage, Phase, Wire, Short Circuit Current Rating
4. Date Installed.

B. Use the following color coding for switch nameplates:
1. Normal Power: White with Black Letters.

C. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

3.4 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.5.

END OF SECTION

SECTION 262823 - ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.1 SUMMARY

A. Division 27 and 28 requirements shall be a sub-contract to Division 26. Division 26 shall be responsible for all requirements listed on electrical drawings, and Division 26, 27, and 28 specifications.

B. Section includes molded-case and insulated-case circuit breakers in individual enclosures.

1.2 REFERENCES

A. National Electrical Manufacturers Association:
   1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.

B. International Electrical Testing Association:
   1. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.

1.3 SUBMITTALS

A. Division 01 Specifications - Submittal Procedures: Submittal procedures.

B. Product Data:
   1. Submit catalog sheets showing ratings, trip units, time current curves, SSCR
   2. Enclosure type and dimensions.
   3. Control Wiring Diagrams
   4. Accessories

1.4 CLOSEOUT SUBMITTALS

A. Division 01 Specifications - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations and continuous current ratings of enclosed circuit breakers.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following manufacturers:
   1. GE Electric
   2. Square D
   3. Eaton
   4. Siemens
   5. Substitutions: Division 01 Specifications - Product Requirements.

2.2 CIRCUIT BREAKERS

A. Product Description: Enclosed, molded-case circuit breaker conforming to NEMA AB 1.

B. For Circuit breakers rated at 1000 amps and over: Provide low voltage AC power circuit breaker, with fixed mounting, stored energy and solid state trip devices.
   1. Provide individual adjustable solid-state elements as an integral part of the solid-state trip devices for complete system selective coordination. Breakers shall have LSGI settings.
   2. Position indicator: Provide an indicator visible from the front of the unit to indicate whether the breaker is open or closed.
   3. Trip button: Provide a mechanical trip button accessible from the front of the door to trip the breaker.
   4. Padlocking: Include provisions for padlocking the breaker in the open position.
   5. Trip devices shall have the following features:
      a. Trip device in each pole.
      b. Metering, voltage, current memory and LED display.
      c. Mechanically and electrically trip free.
      d. Long time element with adjustable pick-up and selective maximum, intermediate, and minimum time delay bands.
      e. Short time element with adjustable pick-up and selective maximum, intermediate, and minimum time delay bands.
      f. Ground fault element with adjustable pick-up and selective maximum, intermediate and minimum time delay bands.
      g. Maintenance setting option to reduce Arc Flash hazards.

C. For Circuit breakers rated over 200 amps: Provide adjustable trip molded case, solid state adjustable trip type circuit breakers.
   1. Ground-Fault Equipment Protection (GFEP) Circuit Breakers (where scheduled): Class B ground-fault protection (30-mA trip).
   2. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
   3. Shunt-trip: 120 volt trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
   4. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage with field-adjustable 0.1 to 0.6 second time delay.

5. Trip units shall have field adjustable tripping characteristics as follows:
   a. Ampere Setting (Continuous)
   b. Long time band.
   c. Short time trip point.
   d. Short time delay.
   e. Instantaneous trip point.

D. For all circuit breakers 200 amps and smaller: Provide Molded Case Thermal Magnetic Trip type Circuit Breakers.
   1. Type SWD for lighting circuits.
   2. Type HACR for all air conditioning equipment circuits.
   3. Class A ground fault interrupter circuit breakers where scheduled.

E. Circuit breakers serving elevators shall have adjustable long-time setting and shall be provided with a shunt trip coil rated for 120 volt operation. Breaker shall also have a set of Form C contacts. Connect shunt trip coil to operate as indicated on the drawings.

F. Enclosure: NEMA AB 1, to meet conditions. Fabricate enclosure from steel finished with manufacturer's standard gray enamel.
   1. Interior Dry Locations: Type 1.
   2. Exterior Locations: Type 3R.

G. Service Entrance: Switches identified for use as service equipment are to be labeled for this application. Furnish solid neutral assembly and equipment ground bar.

PART 3 EXECUTION

3.1 EXISTING WORK

A. Disconnect and remove abandoned enclosed circuit breakers.

B. Maintain access to existing enclosed circuit breakers and other installations remaining active and requiring access. Modify installation or provide access panel.

C. Clean and repair existing enclosed circuit breakers to remain or to be reinstalled.

3.2 INSTALLATION

A. Install enclosed circuit breakers plumb. Provide supports in accordance with Section 260529.

B. Height: 5 feet (1500 mm) to operating handle.

3.3 LABELING

A. Locate and install engraved plastic nameplates in accordance with Section 260553. Nameplates on all switch enclosures wherein circuits are modified or installed shall indicate the following:

1. Equipment Switch Serves
2. Panel and Circuit Switch is served from.
3. Voltage, Phase, Wire, Short Circuit Current Rating
4. Date Installed.

B. Use the following color coding for switch nameplates:
1. Normal Power: White with Black Letters.

3.4 FIELD QUALITY CONTROL

A. Division 01 Specifications - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.6.1.1.

3.5 ADJUSTING

A. Division 01 Specifications - Execution and Closeout Requirements: Testing, adjusting, and balancing.

B. Adjust trip settings to coordinate circuit breakers with other overcurrent protective devices in circuit.

C. Adjust trip settings to provide adequate protection from overcurrent and fault currents.

END OF SECTION

SECTION 264100 - FACILITY LIGHTNING PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes air terminals, interconnecting conductors, grounding, and bonding for lightning protection.

1.2 REFERENCES

A. Lightning Protection Institute:
   1. LPI 175 - Standard of Installation.

B. National Fire Protection Association:
   1. NFPA 780 - Standard for the Installation of Lightning Protection Systems.

C. Underwriters Laboratories Inc.:
   1. UL 96 - Lightning Protection Components.
   2. UL 96A - Installation Requirements for Lightning Protection Systems.

1.3 SYSTEM DESCRIPTION

A. Description: Conductor system protecting entire building and having UL Master Label.

1.4 SUBMITTALS

A. Shop Drawings: Indicate layout of air terminals, grounding electrodes, and bonding connections to structure and other metal objects. Include terminal, electrode, and conductor sizes, and connection and termination details.

B. Product Data: Submit catalog sheets showing dimensions and materials of each component, and include indication of listing in accordance with UL 96.

C. Test Reports: Indicate procedures and results for specified factory and field testing and inspection.

D. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

E. Certificate of Compliance: Submit certificate from Underwriter's Laboratories indicating approval of lightning protection systems.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of air terminals, grounding electrodes, bonding connections, and routing of system conductors.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with UL 96A and furnish Master Label.

B. Maintain one copy of document on site.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in lightning protection equipment with minimum three years experience.

B. Installer: Authorized installer of manufacturer with minimum three years documented experience.

C. Inspection Agency: Underwriter's Laboratories, Inc. (UL).

1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.9 COORDINATION

A. Coordinate Work with roofing and exterior and interior finish installations.

PART 2 - PRODUCTS

2.1 COMPONENTS

A. Product Listing: UL 96.

B. Air Terminals:
   1. Material: Aluminum.
   2. Use adhesive base for single-ply roof installations.
   3. Grounding Rods: Solid copper.
   4. Ground Plate: Copper.
   5. Conductors:
      a. Material: Aluminum.
      b. Configuration: Cable.

C. Connectors and Splicers: Aluminum.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with UL 96A.

B. Connect conductors using mechanical connectors. Protect adjacent construction elements and finishes from damage.

C. Conceal interior conductors within building finishes. Conceal exterior conductors where practical.

D. Bond exterior metal bodies on building to lightning protection system, and provide intermediate level interconnection loops 60 feet (18 m) on center.

E. Provide building ground loop with #3/0 AWG bare copper ground wire. Provide exothermic (CADweld type) connection of loop to each ground rod.

F. Do not use mechanical system enclosures as the only path from aerials to horizontal conductor runs. Extend conductor up equipment enclosure to aerials. Do not block any access panels, nameplates, or other accessories with conductors.

G. Provide spring air terminals with blunt tips for mid-roof air terminals.

3.2 FIELD QUALITY CONTROL

A. Perform inspection and testing in accordance with UL 96A.

END OF SECTION 264100

SECTION 264300 – SURGE PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Division 27 and 28 requirements shall be a sub-contract to Division 26. Division 26 shall be responsible for all requirements listed on electrical drawings, and Division 26, 27, and 28 specifications.

B. Section Includes: Surge Protection Devices Type 1 and Type 2 Devices

1.2 REFERENCES

A. Institute of Electrical and Electronics Engineers:
1. IEEE 1100 - Recommended Practice for Powering and Grounding Electronic Equipment.
2. IEEE C62.41 - Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
3. IEEE C62.45 - Guide on Surge Testing for Equipment Connected to Low-Voltage AC Power Circuits.

B. National Fire Protection Association:
1. NFPA 70 - National Electrical Code.
2. NFPA 780 - Standard for the Installation of Lightning Protection Systems.

C. Underwriters Laboratories Inc.:
1. UL 1283 - Electromagnetic Interference Filters.
2. UL 1449 Third Edition - Surge Protective Devices.

1.3 SUBMITTALS

A. Product Data: Submit the following
1. Unit Dimensions and Weights
2. Wiring configuration.
3. Warranty Statement
4. Current Ratings
5. Clamping Voltages
6. Response Time

B. Test Reports:
1. Indicate Let-Through voltage test data.
2. Submit spectrum analysis of each unit.
3. Submit test reports from nationally recognized independent testing laboratory verifying suppressors can survive published surge current rating.

C. Manufacturer's Installation Instructions: Submit installation instructions and connection requirements.

D. Manufacturer's Certificate: Certify transient voltage surge suppression device complies with UL 1449 Third Edition Surge Voltage Ratings.

1.4 QUALITY ASSURANCE

A. Reference Standard: Comply with the latest edition of the applicable provisions and recommendations of the following, except as otherwise stated in this document:
   1. UL 1449 3rd Edition 2009 Revision
   2. UL 1283.
   3. ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
   4. ANSI/IEEE C62.45, Guide for Surge Testing for equipment connected to Low-Voltage AC Power Circuits.
   5. IEEE 1100 Emerald Book.
   6. National Fire Protective Association (NFPA 70: National Electrical Code).

1.5 WARRANTY

A. Provide a 5 year product warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following manufacturers:
   1. ASCO
   2. Current Technologies
   3. Ditek
   4. GE Electric
   5. Square D
   6. Eaton
   7. Substitutions: Division 01 Specifications - Product Requirements

2.2 ELECTRICAL REQUIREMENTS

A. Declared Maximum Continuous Operating Voltage (MCOV) shall be greater than 115 percent of the nominal system operating voltage and in compliance with test and evaluation procedures outlined in the nominal discharge surge current test of UL1449 3rd Edition, section 37.7. MCOV values claimed based on the component's value or on the 30-minute 115% operational voltage test, section 38 in UL1449 will not be accepted.

B. Unit shall have not more than 10% deterioration or degradation of the UL1449 3rd Edition Voltage Protective Rating VPR) due to repeated surges. Unit shall have a monitoring option available to be able to test and determine the percentage of protective available at all times.

C. Protection Modes: SVR(6kV, 500A) and UL1449 3rd Edition VPR(6kV, 3kA) for grounded WYE/delta and High Leg Delta circuits with voltages of (480Y/277), (208Y/120),

(600Y/347) 3-Phase/4 wire and (120/240) Split phase/3 wire circuits shall be as follows and comply with test procedures outlined in UL1449 3rd Edition section 37.6

System Voltage	Mode	MCOV	B3 Ringwave	C3 Comb. Wave	UL 1449 Second Edition SVR Rating	UL 1449 Third Edition VPR Rating
120/240	L-N	150	325/375	650/775	400/400	700/700
120/208	L-G	150	400/450	650/825	500/500	700/700
	N-G	150	350/350	500/500	500/500	900/900
	L-L	300	400/500	950/1250	700/700	900/900
277/480	L-N	320	550/600	1125/1225	900/900	1000/1000
	L-G	320	850/875	1075/1225	1000/1000	1200/1200
	N-G	320	700/700	900/900	800/800	1200/1200
	L-L	550	650/750	1950/2200	1500/1500	1800/1800

D. Electrical Noise Filter- each unit shall include a high performance EMI/RFI noise rejection filter. Noise attenuation for electric noise shall be as follows using the MIL-STD-220B insertion loss test method.
   1. 100 kHz at 44 db or better.
   2. All other frequencies should be 32 db or better.

E. Each fuse shall be individually sealed in a manner that eliminates the potential for cross arcing.

F. Each unit shall provide the following features:

   1. Phase Indicator lights, Form C dry contacts, surge counter and audible alarm.
   2. Field testable while installed.
   3. Measuring capability to indicate the percent protective available in SPD.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Each unit shall be installed per Manufacturer's recommended installation and wiring practices.

B. The UL 1449 Voltage Protective Rating (VPR) shall be permanently affixed to the SPD unit.

C. The UL 1449 Nominal Discharge Surge Current Rating shall be a minimum of 20kA.

D. Surge Current Rating of device shall be as noted on drawings.

E. The SCCR rating of the SPD shall be 200kAIC without requiring an upstream protective device for safe operation.

F. Locate SPDs and associated circuit breaker in panelboard or switchboard so as to minimize conductor lengths and bends.

1. Conductors between SPD and circuit breaker shall be no more than 24" in length.
2. There shall be no sharp bends or kinks in conductors.
3. Conductors shall be continuous from device to breaker.
4. Do not bundle or tie-wrap conductors together.
5. If conductor's must exceed 24" in length or contain multiple bends due to location constraints, contractor shall provide manufacturer's specialty cable for excessive lengths at no additional cost.

G. The SPD manufacturer's technician shall perform a system checkout and start-up in the field to assure proper installation, operation and to initiate the warranty of the system. The technician will be required to do the following:
   1. Verify voltage clamping levels using the DTS-2 test equipment.
   2. Verify N-G connection when applicable.
   3. Record information to product signature card for each product installed.

END OF SECTION

SECTION 265100 - INTERIOR LIGHTING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes interior luminaires, lamps, ballasts, and accessories.

1.2 REFERENCES

A. Illuminating Engineering Society (IES)
   1. LM-79 - Approved Method: electrical and Photometric Testing of Solid-State Lighting Devices.
   2. LM-80 - Approved Method: Measuring Lumen Depreciation of LED Light Sources.
   3. TM-21 - Projecting Long Term Lumen Maintenance of LED Light Sources.

B. National Electrical Manufacturers Association (NEMA)
   1. ANSI/NEMA/ANSLG C78.377 - American National Standard for the Chromaticity of Solid State Lighting Products
   2. SSL-1 - Electronic Drivers for LED Devices, Arrays, or Systems.

C. National Fire Protection Association (NFPA)
   1. NFPA 70 - National Electrical Code (NEC)

D. Underwriters laboratories, Inc. (UL)
   1. 8750 - Light Emitting Diode (LED) Light Sources for Use in Lighting Products.

1.3 SUBMITTALS

A. Shop Drawings: Indicate dimensions and components for each luminaire not standard product of manufacturer.

B. Product Data: Submit dimensions, ratings, and performance data.

C. Submittal Data for LED fixtures shall be based on the specified "basis-of-design" fixture and shall include the following:
   1. Wattage
   2. Color Temperature
   3. CRI
   4. Distribution Pattern
   5. Total Lumen Output for Fixture Assembly based on the data above.
   6. Submit US DOE LED Lighting Facts label, or other 3rd party testing reports that include the information above.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.5 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

1.6 MAINTENANCE MATERIALS

A. Furnish two of each plastic lens type.

B. Furnish a minimum of one replacement lamps for each lamp installed.

PART 2 PRODUCTS

2.1 INTERIOR LUMINAIRES

A. See Lighting fixture schedule on plans for information on luminaires.
   1. Basis-of-Design Product: The design for each lighting fixture is based on the product named from the first manufacturer listed in the schedule. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified, or a prior approved manufacturer.
   2. A prior approved manufacturer does not specifically approve a fixture. It only indicates that the manufacturer can provide a fixture equal to the specified.
   3. Substitutions: Division 01 Specifications - Product Requirements.

B. Product Description: Provide complete interior luminaire assemblies, with features, options, and accessories as required to provide a complete working system mounted to or recessed in wall or ceiling system as described on Architectural Reflected Ceiling Plans.

2.2 LED LUMINAIRES

A. LED light fixtures shall be in accordance with IES, NFPA, UL standards as shown on the drawings and as specified.

B. All electrical components shall be RoHS compliant.

C. LED fixtures shall be complete assemblies. Fixtures designed around a different lamp source with an LED type replacement lamp shall not be accepted.

D. Lighting shall be completely diffused through internal shielding, or fixture lens. Multiple Individual Diodes shall not be visible through the lens of the fixture.

E. LED modules shall include the following features unless otherwise indicated:
   1. Comply with LM-79 and LM-80 requirements.

2. Minimum CRI of 80 unless otherwise specified in the Lighting Fixture Schedule.
3. Color Temperatures for each fixture shall be enclosed inside a 2-step MacAdam ellipse.
4. Minimum Rated Life: 50,000 hours per IES L70.
5. Total Fixture Light Output in lumens shall be a minimum of 95% of Lumens listed in Lighting Fixture Schedule.
6. Total Fixture Efficacy in Lumens / Watt minimum of 95% of "Basis-of-Design" fixture.

F. LED drivers, modules, and reflectors shall be accessible for servicing and replacement from below the ceiling.

G. Active cooling for LED systems shall not be allowed.

2.3 LED DRIVERS

A. LED drivers shall include the following features unless otherwise indicated:
1. Minimum efficiency: 85% at full load.
2. Minimum operating Ambient Temperature: -20° C (-4° F)
3. Include integral short circuit, open circuit, and overload protection.
4. Power Factor: ≥ 0.95.
5. Total Harmonic Distortion: $\leq 20\%$

PART 3 EXECUTION

3.1 EXISTING WORK

A. Disconnect and remove abandoned luminaires, lamps, and accessories.

B. Extend existing interior luminaire installations using materials and methods compatible with existing installations, or as specified.

C. Clean and repair existing interior luminaires to remain or to be reinstalled.

3.2 INSTALLATION

A. Install suspended luminaires using pendants supported from swivel hangers. Install pendant length required to suspend luminaire at indicated height.

B. Support luminaires independent of ceiling framing as follows:
1. All lighting fixtures shall be positively attached to the suspended ceiling system by mechanical means as specified in the NEC unless independently supported. The attachment device shall have the capacity of supporting 100% of the lighting fixture weight acting in any direction. A minimum of two attachment devices are required for each fixture.
2. Surface-mounted lighting fixtures shall be attached to the ceiling system with a positive clamping device that completely surround the supporting members. Safety wires shall be attached between the clamping device and the adjacent

ceiling hanger to the structure above. In no case shall the fixture exceed the design carrying capacity of the supporting members.

3. Lighting fixtures weighing less than 10 lbs. (5 kg) shall have one (1) slack #12-gauge safety wire connected from the fixture housing (not the detachable end plates) to the structure above.
4. Lighting fixtures weighing less than 56 lbs. (25 kg) shall have two (2) slack #12-gauge safety hanger wires connected from the fixture housing to the structure above. Hanger wires shall be attached on opposite corners of fixture.
5. Lighting fixtures weighing 56 lbs. (25 kg) or more shall be supported directly from the structure above by approved hangers. The ceiling suspension system shall not provide any direct support.
6. Pendant-hung lighting fixtures shall be supported directly from the structure above using no less than #9-gauge wire or an approved alternate support. The ceiling suspension system shall not provide any direct support.
7. All support wires shall connect directly to structure. Do not connect to support systems for any other systems. Support wires must be arranged so that they are not touching sprinkler piping and would not touch sprinkler piping in the event the ceiling was removed and the cables were the sole support for the fixtures.
8. Paint support wires for lighting fixtures and lighting whips red such that they are easily identified from below.

C. Locate recessed ceiling luminaires as indicated on Drawings and on architectural reflected ceiling plans.

D. Install surface mounted luminaires plumb and adjust to align with building lines and with each other. Secure to prevent movement.

E. Install recessed luminaires to permit removal from below.

F. Flexible conduit is required for attachment of the fixtures in dropped ceilings. Direct connection with Rigid or EMT or other hard-piped solution is not allowed.

G. In accessible ceilings, provide a junction box for each light fixture and single flexible connection to light fixture. Flexible connections shall be limited to 6’-0” in length.

H. Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.

I. Install clips to secure recessed grid-supported luminaires in place.

J. Install wall-mounted luminaires at height as indicated on Drawings.

K. Install accessories furnished with each luminaire.

L. Connect luminaires to branch circuits using flexible conduit.

M. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.

N. Install specified lamps in each luminaire.

O. Ground and bond interior luminaires in accordance with Section 260526.

3.3 FIELD QUALITY CONTROL

A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.4 ADJUSTING

A. Aim and adjust luminaires as indicated on Drawings.

3.5 CLEANING

A. Remove dirt and debris from enclosures.

B. Clean photometric control surfaces as recommended by manufacturer.

C. Clean finishes and touch up damage.

3.6 PROTECTION OF FINISHED WORK

A. Replace components in luminaires having failed at Substantial Completion.

END OF SECTION 265100

SECTION 265200 - EMERGENCY LIGHTING

PART 1 GENERAL

1.1 SUMMARY

A. Division 27 and 28 requirements shall be a sub-contract to Division 26. Division 26 shall be responsible for all requirements listed on electrical drawings, and Division 26, 27, and 28 specifications.

B. Section includes emergency lighting units and exit signs.

1.2 REFERENCES

A. National Electrical Manufacturers Association:
   1. NEMA WD 6 - Wiring Devices-Dimensional Requirements.

B. National Fire Protection Association (NFPA)
   1. NFPA 70 - National Electrical Code (NEC)

C. Underwriter Laboritories (UL)
   1. UL1008 – Transfer Switch Equipment

1.3 SUBMITTALS

A. Product Data: Submit dimensions, ratings, and performance data.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.5 MAINTENANCE MATERIALS

A. Furnish one replacement lamps for each lamp installed.

B. Furnish one replacement battery for each battery type and size.

PART 2 PRODUCTS

2.1 EMERGENCY LIGHTING UNITS

A. Manufacturers: See Lighting fixture schedule on plans for information on luminaires.
   1. Basis-of-Design Product: The design for each lighting fixture is based on the product named from the first manufacturer listed in the schedule. Subject to compliance with requirements, provide either the named product or a comparable

product by one of the other manufacturers specified, or a prior approved manufacturer.

2. A prior approved manufacturer does not specifically approve a fixture. It only indicates that the manufacturer can provide a fixture equal to the specified.
3. Substitutions: Division 01 Specifications - Product Requirements.

B. Product Description: Self-contained LED emergency lighting unit.

C. Battery: 1.5 hour capacity.

D. Battery Charger: Dual-rate type, with sufficient capacity to recharge discharged battery to full charge within twelve hours.

E. Indicators: Lamps to indicate AC ON and RECHARGING.

F. TEST switch: Transfers unit from external power supply to integral battery supply.

G. Electrical Connection: Conduit connection.

H. Input Voltage: As indicated on drawings.

2.2 EXIT SIGNS

A. Manufacturers: See Lighting fixture schedule on plans for information on luminaires.
1. Basis-of-Design Product: The design for each lighting fixture is based on the product named from the first manufacturer listed in the schedule. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified, or a prior approved manufacturer.
2. A prior approved manufacturer does not specifically approve a fixture. It only indicates that the manufacturer can provide a fixture equal to the specified.
3. Substitutions: Division 01 Specifications - Product Requirements.

B. Product Description: Exit sign fixture.

C. Housing: As indicated on drawings.

D. Face: As indicated on Drawings.

E. Directional Arrows: As indicated on Drawings with Universal type for field adjustment.

F. Battery: 1.5 hour capacity.

G. Battery Charger: Dual-rate type, with sufficient capacity to recharge discharged battery to full charge within twelve hours.

H. Lamps: LED.

2.3 LED SYSTEM EMERGENCY POWER SUPPLY

A. Product Description: Emergency battery power supply suitable for installation in ballast compartment of luminaire.
   1. Battery packs shall be installed at the factory inside the ballast compartment.
   2. For recessed downlights, battery packs shall be installed on the fixture frame to allow for access from below. The charging light and test switch shall be discreetly installed on the top of the reflector and shall be accessible/visible from below.

B. Emergency ballast shall contain a maintenance-free, sealed high-temperature nickel-cadmium or nickel-metal hydride battery with an expected service life of not less than 10 years.

C. Emergency Battery Packs:
   1. Constant Power 5-watt, 7-watt, 10-watt, or 12-watt unit as defined in contract documents.
   2. The emergency driver shall accommodate an LED load with a forward voltage requirement ranging from 10 to 60 VDC.
   3. The output voltage sensing shall be automatic and instantaneous with a resulting, inversely-proportional current to maintain constant power to the LED array with an output tolerance of +/- 3%. The unit shall supply the rated load for a minimum of 1 1/2 hours.
   4. The output power to the LED load during emergency operation shall be held constant from the start throughout the entire emergency run time resulting in no loss or degradation of the light source during emergency operation.

D. The unit shall be furnished with an electronic, AC-lockout circuit which will connect the battery when the AC circuit is activated, and an electronic brownout circuit which will enable a transfer to emergency operation when utility power dips below an acceptable level.

E. Include TEST switch and AC ON indicator light, installed to be operable and visible from outside of assembled luminaire.

F. Where field installation of emergency ballasts are specifically noted on drawings, provide emergency ballast with 2-wire AC input. Ballasts shall be universal voltage type compatible with 120 thru 277 VAC, 50/60 Hz and be UL listed to Category Control Number (CCN) FTBV, Emergency Lighting-Emitting-Diode Drivers for field installation. Maximum remote mounting distance of the emergency driver shall be 50-feet.

2.4 EMERGENCY LIGHTING MINI-INVERTERS (Up to 1000-watts)

A. Manufacturers:
   1. Iota Engineering
   2. Bodine
   3. Myers
   4. Perfect Power Systems

5. Emergi-Lite
6. Substitutions: Division 01 Specifications - Product Requirements.

B. Emergency lighting inverter shall be provided by a Bodine ELI Series inverter or prior approved equal with the following characteristics:
1. The device shall comply with the standards set forth in UL 924, "Emergency Lighting and Power Equipment", and UL Listed for installation for field installation. Emergency illumination shall exceed the NEC and Life Safety Code (NFPA-LSC) requirements.
2. Upon failure of normal power, the device shall instantly begin providing emergency power to the connected lighting load for a minimum of 90 minutes. The device shall support lumen output at 91% of the lamp's rating throughout the 90-minute duration.
3. The device shall operate at 120 or 277 VAC, 60 Hz and an ambient temperature of 68 degrees F to 86 degrees F.
4. The device shall produce a true sine wave output.
5. The unit shall be provided with a 5-year full coverage warranty.

2.5 EMERGENCY LOAD TRANSFER DEVICE (ELTC)

A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the following manufacturers:
1. Bodine – GTD Series
2. Iota – ETS Series
3. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: The ballast load transfer control operates automatically on a continuous standby mode. Unit bypasses any electrical control device when normal power fails and emergency generator or inverter power is needed for egress lighting regardless of switching device (standard toggle switch, photo electric cell, time clock, energy management equipment) on/off position. In order to comply with article 700 of the National Electrical Code (NEC) and UL 1008, the ELTC must have the following components:
1. Failsafe continuously monitored relay with contacts instantaneous or time delay electrically operated mechanically latched operation relays opens and closes emergency power with no possibility of current cross over.
2. Test switch required to test under load.
3. Indication LEDs. Unit to have a red LED signal lamp that indicates fixture is on emergency power and that there is power (normal and/or emergency) is connected to device.
4. Provide label that reads "Caution two electrical power sources in this unit."
5. Unit to have a power link to isolate catastrophic faults internally or external of device. Unit shall be able to withstand direct short to load with no adverse effect to switching device.
6. Device shall include integral Surge protection.

C. Where 0-10V dimming is indicated on plans, contractor shall provide either a dual relay emergency load transfer device, or two emergency load transfer devices so that dimming signal from emergency fixture is cancelled and fixture illuminates at 100% output.

PART 3 EXECUTION

3.1 EXISTING WORK

A. Disconnect and remove abandoned emergency lighting units, exit signs, lamps, and accessories.

B. Extend existing emergency lighting and exit sign installations using materials and methods compatible with existing installations, or as specified.

C. Clean and repair existing emergency lighting units and exit signs remaining or are to be reinstalled. Provide full 90-minute test on all battery backed lighting systems and exit signs noted to remain in place. Indicate to Architect all units that do not pass test.

3.2 INSTALLATION

A. Install suspended exit signs using pendants supported from swivel hangers. Install pendant length required to suspend sign at indicated height.

B. Install surface-mounted emergency lighting units and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.

C. Install wall-mounted emergency lighting units and exit signs at height as indicated on Drawings.

D. Install accessories furnished with each emergency lighting unit and exit sign.

E. Connect emergency lighting units and exit signs to branch circuits as indicated on Drawings.

F. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within unit.

G. Install specified lamps in each emergency lighting unit and exit sign.

H. Ground and bond emergency lighting units and exit signs in accordance with Section 260526.

3.3 FIELD QUALITY CONTROL

A. Operate each unit after installation and connection. Inspect for proper connection and operation.

3.4 ADJUSTING

A. Aim and adjust lamp fixtures as indicated on Drawings.

B. Position exit sign directional arrows as indicated on Drawings.

3.5 PROTECTION OF FINISHED WORK

A. Relamp emergency lighting units having failed lamps at Substantial Completion.

END OF SECTION

SECTION 265600 - EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SUMMARY

A. Division 27 and 28 requirements shall be a sub-contract to Division 26. Division 26 shall be responsible for all requirements listed on electrical drawings, and Division 26, 27, and 28 specifications.

B. Section includes exterior luminaries, poles, and accessories.

1.2 REFERENCES

A. Illuminating Engineering Society (IES)
   1. LM-79 - Approved Method: electrical and Photometric Testing of Solid-State Lighting Devices.
   2. LM-80 - Approved Method: Measuring Lumen Depreciation of LED Light Sources.
   3. TM-21 - Projecting Long Term Lumen Maintenance of LED Light Sources.

B. National Electrical Manufacturers Association (NEMA)
   1. ANSI/NEMA/ANSLG C78.377 - American National Standard for the Chromaticity of Solid State Lighting Products
   2. SSL-1 - Electronic Drivers for LED Devices, Arrays, or Systems.

1.3 SUBMITTALS

A. Reference Division 01 Specifications - Submittal Procedures: Submittal procedures and Specification 260500 – Common Work Results for Electrical: Submittal Requirements.

B. Shop Drawings: Indicate dimensions and components for each luminaire.

C. Product Data: Submit dimensions, ratings, and performance data.

D. Submittal Data for LED Fixtures shall be based on specified "basis-of-design" fixture and shall include the following:
   1. Wattage
   2. Color Temperature
   3. CRI
   4. Distribution Pattern
   5. Total Lumen Output for Fixture Assembly based on the data above.
   6. Submit US DOE LED Lighting Facts label, or other 3rd party testing reports that include the information above.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store and handle solid wood poles in accordance with ANSI O5.1.

1.6 COORDINATION

A. Furnish bolt templates and pole mounting accessories to installer of pole foundations.

1.7 MAINTENANCE MATERIALS

A. Furnish two of each lamp installed.

B. Furnish two gallons of touch-up paint for each different painted finish and color.

PART 2 PRODUCTS

2.1 LUMINARIES

A. See Lighting fixture schedule on plans for information on luminaires.
   1. Basis-of-Design Product: The design for each lighting fixture is based on the product named from the first manufacturer listed in the schedule. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified, or a prior approved manufacturer.
   2. A prior approved manufacturer does not specifically approve a fixture. It only indicates that the manufacturer can provide a fixture equal to the specified.
   3. Substitutions: Section 01 60 00 - Product Requirements.

B. Product Description: Provide complete exterior luminaire assemblies, with features, options, and accessories as required to provide a complete working system mounted as described in contract documents.

2.2 LED LUMINAIRES

A. LED light fixtures shall be in accordance with IES, NFPA, UL standards as shown on the drawings and as specified.

B. All electrical components shall be RoHS compliant.

C. LED fixtures shall be complete assemblies. Fixtures designed around a different lamp source with an LED type replacement lamp shall not be accepted.

D. LED modules shall include the following features unless otherwise indicated:

1. Comply with LM-79 and LM-80 requirements.
2. Minimum CRI of 70 unless otherwise specified in the Lighting Fixture Schedule.
3. Color Temperatures for each fixture shall be enclosed inside a 3-step MacAdam ellipse.
4. Minimum Rated Life: 50,000 hours per IES L70.
5. Total Fixture Light Output in lumens shall be no less than 95% of Lumens listed in Lighting Fixture Schedule.
6. Total Fixture Efficacy in Lumens / Watt shall be no less than 95% of "Basis-of-Design" fixture.

E. LED drivers, modules, and reflectors shall be accessible for servicing and replacement.

2.3 LED DRIVERS

A. LED drivers shall include the following features unless otherwise indicated:
1. Minimum efficiency: 85% at full load.
2. Minimum operating Ambient Temperature: -20° C (-4° F)
3. Include integral short circuit, open circuit, and overload protection.
4. Power Factor: ≥ 0.95.
5. Total Harmonic Distortion: $\leq 20\%$

B. Provide dimming drivers where noted on fixture schedule. Dimming systems shall conform to the following:
1. Compatibility: Certified by manufacturer for use with specific dimming control system indicated.
2. Maximum inrush current of 2 amperes for 120V and 277V drivers.
3. Class A sound Rating.
4. Drivers shall track evenly across multiple fixtures at all light levels.
5. Dimming Range shall be continuous from 100 percent to 10 percent relative light output minimum. See drawings for other applications that may require a more stringent dimming range.

2.4 METAL POLES

A. Material: 6061-T6 Structural Grade Aluminum; pole welded for single unit construction.

B. Finish: Match Luminaire Finish.

C. Section Shape and Dimensions: 5" round pole, 0.188 wall thickness.

D. Height: 14-0" (base to top of pole excluding luminaire).

E. Base: Standard with 4 anchor bolts and ground lug. Two piece bases are not acceptable.

F. Tenon: Single 3" post top.

G. Accessories:
1. Access door (handhole) in base with stainless steel allen head screws.

2. Provide Bussman HEB or equal fuseholder and KTK (480v) / FNB (208v) or equal fuse for each phase conductor in each pole, accessible from handhole.

H. Foundation: Pole shall be mounted on a concrete foundation with rebar reinforcement. Chamfer edges and fill voids in foundation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify foundations are ready to receive fixtures.

3.2 EXISTING WORK

A. Disconnect and remove abandoned exterior luminaries.

B. Extend existing exterior luminaire installations using materials and methods compatible with existing installations, or as specified.

C. Clean and repair existing exterior luminaries to remain or to be reinstalled.

3.3 INSTALLATION

A. Install concrete bases for lighting poles at locations as indicated on Drawings, in accordance with Section 033000.

B. Install poles plumb. Install double nuts to adjust plumb. Grout around each base.

C. Install lamps in each luminaire.

D. Bond and ground luminaries ,metal accessories and metal poles in accordance with Section 260526. Install supplementary grounding electrode at each pole.

3.4 FIELD QUALITY CONTROL

A. Operate each luminaire after installation and connection. Inspect for improper connections and operation.

B. Measure illumination levels and submit to engineer for review.
1. Take measurements during night sky, without moon or with heavy overcast clouds effectively obscuring moon.

3.5 ADJUSTING

A. Aim and adjust luminaries to provide illumination levels and distribution as directed by engineer in the field.

3.6 CLEANING

A. Clean photometric control surfaces as recommended by manufacturer.

B. Clean finishes and touch up damage.

3.7 PROTECTION OF FINISHED WORK

A. Relamp luminaries having failed lamps at Substantial Completion.

END OF SECTION 265600

SECTION 278306 – RADIO ENHANCEMENT SYSTEM

PART 1 GENERAL

1.1 ELECTRICAL DIVISIONS

A. Division 27 and 28 requirements shall be a sub-contract to Division 26. Division 26 shall be responsible for all requirements listed on electrical drawings, and Division 26, 27, and 28 specifications.

1.2 SUMMARY

A. Division 27 and 28 requirements shall be a sub-contract to Division 26. Division 26 shall be responsible for all requirements listed on electrical drawings, and Division 26, 27, and 28 specifications.

B. Section includes design, installation, and testing of a Radio Enhancement System (RES) as defined in IFC 510, NFPA 1221 and NFPA 72.

1.3 REFERENCES

A. NFPA 1 – Fire Code.

B. NFPA 1221 – Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems

C. International Fire Code.

D. National Electrical Safety Code.

E. UL2524

F. FCC Rules and Regulations 47 CFR.

G. Telecommunications Industry Association (TIA)

1.4 SYSTEM DESCRIPTION

A. Provide an emergency responder radio coverage enhancement system per IFC 510 and install NFPA 1221.

B. Coordinate with local AHJ for radio frequencies and bandwidth requirements prior to design. For bidding purposes assume the following:
1. 700 MHz and 800 MHz Analog / Digital bands (T25 compliant).

C. Prior to installation, test radio coverage throughout building per NFPA 72-24.5.2 to define areas where enhanced coverage is required. Submit drawing to architect showing

areas where coverage is required. In lieu of Pre-Install testing, modelling may be provided to ensure coverage is obtained through building.

D. For bidding purposes, assume system is required throughout entire building. A credit shall be provided to the owner once areas that require coverage is defined.

E. Install system only where required per testing. Provide power requirements, including battery back-up, as required for system regardless of whether power is shown on drawings.

1.5 SUBMITTALS

A. Pre-Install Testing: Submit floor plan showing location of testing points and signal strength at each of those points.

B. Design: Submit design information as required for review and approval. If requested by the Architect / Engineer, a design review meeting shall be held for the contractor to present the design submittal.

C. Shop Drawings: Indicate electrical characteristics and connection requirements; cable routing; connection diagrams; and equipment arrangement.
1. Equipment and component cut sheets.
2. Submit detail drawings including panel and cabinet layouts, equipment interconnection diagrams, equipment and material lists.
3. Note proposed location of exterior antenna on shop drawings.

D. Product Data: Submit manufacturer’s descriptive and technical literature, catalog data, and installation instructions showing electrical characteristics and connection requirements.

E. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

F. Manufacturer's Field Reports: Indicate activities on site, adverse findings, and recommendations.

1.6 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of each item of equipment and show interconnecting wiring.

B. Operation and Maintenance Data: Submit operator instructions for each required mode of operation, routine troubleshooting procedures, and manufacturer's operation and maintenance manual for each item of equipment and accessory.

1.7 QUALITY ASSURANCE

A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5 m) when tested in accordance with NFPA 262.

B. Maintain one copy of each document on site.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience, and with the ability to respond to service calls within 4 hours.

1.9 MAINTENANCE SERVICE

A. Furnish service and maintenance of equipment for one year from Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to the following manufacturers:
   1. Honeywell.
   2. Mobile Communications.
   3. SideBand System.
   4. Bird Technologies.
   5. Substitutions: Division 01 Specification - Product Requirements.

2.2 GENERAL

A. The RES system shall be designed and furnished to operate in the frequency band provided by the AHJ with the ability to make minor adjustments (within 50MHz) without component change.

B. The RES system shall be designed to provide a minimum -90 dBm RF signal level, or a minimum of 10 dB above the RF noise floor, at any point within the building, or elsewhere as designated in the contract documents.

C. The RES RF output shall be close-coupled to the RF input so as to prevent feedback saturation. The minimum output-to-input path loss shall equal the maximum operating gain of the amplifier plus 10 dB. System component selection and layout shall take this requirement into consideration when placing the RES system components in and around the building.

D. The RES system shall be capable of accurately and properly amplifying and distributing radio signals without causing any sort of radio system degradation. It shall be capable of using the following modulation techniques and formats:
   1. Analog FM
   2. Digital FM
   3. EDACS™

4. TDMA
5. CDMA
6. P25 Phase II
7. GSM

E. The RES system shall be FCC type-accepted and labeled as such prior to placing it into operation.

2.3 BI-DIRECTIONAL AMPLIFIER (BDA)

A. Provide an all-inclusive and fully integrated BDA with UL2524 1st edition for in-building 2-way emergency radio communication enhancement system listing.

B. BDA shall be monitored through fire alarm system control panel.

C. The BDA shall be an automatic gain adjusting or OLC (output level control) type, where the gain is automatically set over a wide operating range. The BDA system shall be FCC type accepted and labeled as such prior to placing it into operation.

D. An input signal level of -60 dBm is the nominal input signal level applied into the BDA system. The contractor shall take steps to augment local input signal reception to this level. If the contractor cannot make the input level reach the nominal level, the contractor shall notify the engineer, and provide the expected input signal level, and corresponding output level as part of the design submittal.

E. The RES system shall amplify all signals within the specified frequency band. The effective output power per channel is reduced as more channels are amplified. The contractor must account for the reduction in signal strength when calculating the signal distribution within the building. The following table depicts the typical effect of multiple channel amplification.

Number of Frequencies In The Passband	Maximum Output Power Per Single Channel
2	24.7 dBm
4	20.0 dBm
6	17.5 dBm
8	15.5 dBm
10	14.1 dBm
20	9.8 dBm

F. The maximum output power of the amplifier shall be set below the amplifier's 1 dB compression point to prevent damage to the amplifier and minimize signal distortion. If necessary, external attenuator pads shall be inserted before the electronic attenuator to prevent overdriving the BDA OLC circuitry.

G. Decoupled RF test points shall be provided to permit performance testing or alignment while the RES is in operation. They shall be clearly labeled as test points and depicted on a block diagram with the rest of the RES circuitry.

H. The RES system shall be powered by the building's electrical distribution system.
1. A surge suppression device shall be provided as part of the RES system design, to protect the incoming power line from transients.
2. Provide a backup electrical power supply capable of supporting entire RES system for a minimum of four hours. Provide recharging system for power supply and warranty power supply and charging system for a minimum of 1 year.

I. Provide hinged door type, lockable cabinet to support RES system components. Cabinet shall be sized by contractor with adequate space inside the cabinet for servicing the unit. Provide a nameplate on cabinet that reads "RES System Cabinet #" where # indicates a number where multiple cabinets are required. Provide labels for internal components. Provide system schematic diagram inside a plastic sleeve on inside of each cabinet.

J. If installed outdoors or in unprotected locations, the cabinet shall be weatherproof stainless steel NEMA 4X. All penetrations into the cabinet shall be made with RGS or IMC conduit, and weatherproofed.

2.4 EXTERIOR ANTENNA SYSTEM

A. The exterior antenna system shall consist of a highly directional gain antenna, and antenna mount, coaxial lightning surge suppression, and a minimum ½" type LDF coaxial cable feed to the BDA. The specific size of the feed line coaxial cable shall depend on the system design. A short (2' max) super flexible cable may be used to connect the antenna to the RF feed line cable. The exterior antenna shall be configured to mount on or near the building rooftop, at a location affording the best view towards the nearest radio repeater site. The antenna shall be oriented towards the nearest system repeater site. Coordinate exact location of antenna with architect prior to rough-in.

B. A lightning surge suppressor shall be connected in the RF coaxial feed line in-between the antenna and the BDA. A copper grounding plate shall be provided with the surge suppressor, and bonded to the grounding system. Locate the surge suppressor inside the building at the cable penetration point. Building penetration for the RF feed line cabling shall be protected with an electrical service weatherhead and coaxial cable drip loop.

C. The antenna system, antenna mast, coaxial cable, and surge suppressor shall be grounded by attachment to the building's grounding system. The coaxial cable shall be connected to the ground system by means of the cable manufacturer's shield grounding kit. A ground system connection to the coaxial cable shall be at both ends of the exterior-run cable if it exceeds 100 feet in length, otherwise within 20 feet of the building entrance. The coaxial lightning surge suppressor shall be grounded per the manufacturer's recommendations. Grounding cables shall be sized according to manufacturer's recommendations.

D. The antenna installation shall be suitable for operation with wind loading of 95 mph. All components shall be suitable for outdoor installation. All outdoor RF connections and coaxial cable grounding kits shall be covered in weatherproof connector boot coverings.

2.5 INTERIOR ANTENNA SYSTEM

A. The interior antenna system shall consist of a sufficient number of antennas and / or radiating cable distributed within the building to meet the -90 dBm, or 10 dB above noise floor, design criteria throughout the building. Coaxial power dividers shall distribute and balance the radio signals into appropriate branch circuits connecting back to the BDA.

B. The coaxial cable shall be a minimum of ½" type foam dielectric low loss type. Radiating coaxial cable shall be minimum of 7/8" foam dielectric and shall be installed a minimum of 2 inches off any wall surface. Cable jackets for any coaxial cables installed indoors shall be low smoke, non-halogen construction. Attachment between the cable and building shall be by plastic cable clamps, expressly designed for the application.

C. Each splitter shall be mounted in a separate junction box located so as to be easily accessible for maintenance while maintaining security from unauthorized tampering. Each junction box shall be labeled externally.

PART 3 EXECUTION

3.1 COORDINATION

A. Provide a copy of approved design submittals to the local AHJ prior to installation.

3.2 INSTALLATION

A. Consolidate all cabinets, back-up power supplies, and accessories in one location. Mount cabinets adjacent to each other. Coordinate location with all other trades prior to rough-in.

B. Provide two 120-volt, 20 amp branch circuits to each RES system cabinet.

C. All cabling shall be installed in metallic conduit (EMT). All exterior cable shall be installed in 2" conduit.

D. Conduit penetration through roof shall extend to a minimum of two feet above the roof deck and be terminated with an electrical weatherhead.

3.3 SYSTEM OPTIMIZATION

A. The RES system shall be adjusted to the level of desired signal and avoid inter-modulation. Fixed attenuators may be used to set the BDA levels if required.

B. THE BDA's OLC circuits shall provide a dynamic range of 30 to 40 dB. If the input level to the BDA causes continual output limiting, a fixed value coaxial RF attenuator shall be inserted at a point provided in the RES's input circuit.

3.4 FIELD QUALITY CONTROL

A. Perform all work necessary to plan, schedule, and conduct tests, and to complete the required documentation as specified in the contract.

B. Perform operational test on each item of equipment and on system.

C. Verify that the RES has been installed in accordance with the specifications, and the system performance criteria. This includes inspections, test, and measurements of the DC power, the BDA gain, and the signal levels within and outside of the building. Record all test measurements.

D. Provide diagrams showing equipment placement and routing for antennas, coaxial cables, and AC power to the engineer prior to testing. After testing, provide another copy of the final documents inside the cabinet.

E. Submit an Rf compliance certificate for the RES at the conclusion of acceptance testing.

END OF SECTION 278306

SECTION 283100 - FIRE DETECTION AND ALARM

PART 1 GENERAL

1.1 SUMMARY

A. Division 27 and 28 requirements shall be a sub-contract to Division 26. Division 26 shall be responsible for all requirements listed on electrical drawings, and Division 26, 27, and 28 specifications.

B. Section includes fire alarm control panels, manual fire alarm stations, automatic smoke and heat detectors, fire alarm signaling appliances, and auxiliary fire alarm equipment and power and signal wire and cable.

1.2 REFERENCES

A. National Fire Protection Association:
   1. NFPA 72 - National Fire Alarm Code.
   2. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.

1.3 SYSTEM DESCRIPTION

A. General: Provide a complete, non-coded, addressable microprocessor-based fire alarm system with initiating devices, notification appliances, and monitoring and control devices as indicated on the drawings and as specified herein.

B. History Logs: The system shall provide a means to recall alarms and trouble conditions in chronological order for the purpose of recreating an event history. A separate alarm and trouble log shall be provided.

C. Wiring/Signal Transmission:
   1. Transmission shall be hard-wired, addressable signal transmission, dedicated to fire alarm service only.
   2. System connections for initiating, signaling line circuits and notification appliance circuits shall be Class A.
   3. Circuit Supervision: Circuit faults shall be indicated by a trouble signal at the FACP. Provide a distinctive indicating audible tone and alphanumeric annunciation.

D. Required Functions: The following are required system functions and operating features:
   1. Transmission to Remote Central Station: Automatically route alarm, supervisory, and trouble signals to a remote central station service transmitter provided under another contract.
   2. Annunciation: Operation of alarm and supervisory initiating devices shall be annunciated at the FACP and the remote annunciator, indicating the location and type of device.
   3. General Alarm: A system general alarm shall include:

a. Indication of alarm condition at the FACP and the annunciator(s).
b. Identification of the device that is the source of the alarm at the FACP and the annunciator(s).
c. Operation of audible and visible notification devices throughout the building until silenced at FACP.
d. Notifying the local fire department.
e. Initiation of elevator recall in accordance with ASME/ANSI A17.1, when specified detectors or sensors are activated.

4. Supervisory Operations: Upon activation of a supervisory device such as tamper switch, the system shall operate as follows:
   a. Activate the system supervisory service audible signal and illuminate the LED at the control unit and the remote annunciator.
   b. Pressing the Supervisory Acknowledge Key will silence the supervisory audible signal while maintaining the Supervisory LED "on" indicating off-normal condition.
   c. Record the event in the FACP historical log.
   d. Transmission of supervisory signal to remote central station.
   e. Restoring the condition shall cause the Supervisory LED to clear and restore the system to normal.
5. Alarm Silencing: If the "Alarm Silence" button is pressed, all audible and visible alarm signals shall cease operation.
6. System Reset:
   a. The "System Reset" button shall be used to return the system to its normal state. Display messages shall provide operator assurance of the sequential steps ("IN PROGRESS", "RESET COMPLETED") as they occur. The system shall verify all circuits or devices are restored prior to resetting the system to avoid the potential for re-alarming the system. The display message shall indicate "ALARM PRESENT, SYSTEM RESET ABORTED."
   b. Should an alarm condition continue, the system will remain in an alarmed state.
7. A manual evacuation (drill) switch shall be provided to operate the notification appliances without causing other control circuits to be activated.
8. WALKTEST: The system shall have the capacity of 8 programmable passcode protected one person testing groups, such that only a portion of the system need be disabled during testing. The actuation of the "enable one person test" program at the control unit shall activate the "One Person Testing" mode of the system as follows:
   a. The city circuit connection and any suppression release circuits shall be bypassed for the testing group.
   b. Control relay functions associated to one of the 8 testing groups shall be bypassed.
   c. The control unit shall indicate a trouble condition.
   d. The alarm activation of any initiation device in the testing group shall cause the audible notification appliances assigned only to that group to sound a code to identify the device or zone.
   e. The unit shall automatically reset itself after signaling is complete.

f. Any opening of an initiating or notification appliance circuit wiring shall cause the audible signals to sound for 4 seconds indicating the trouble condition.

E. Analog Smoke Sensors:
1. Monitoring: FACP shall individually monitor sensors for calibration, sensitivity, and alarm condition, and shall individually adjust for sensitivity. The control unit shall determine the condition of each sensor by comparing the sensor value to the stored values.
2. Environmental Compensation: The FACP shall maintain a moving average of the sensor's smoke chamber value to automatically compensate for dust, dirt, and other conditions that could affect detection operations.
3. Programmable Sensitivity: Photoelectric Smoke Sensors shall have 7 selectable sensitivity levels ranging from 0.2% to 3.7%, programmed and monitored from the FACP.
4. Sensitivity Testing Reports: The FACP shall provide sensor reports that meet NFPA 72 calibrated test method requirements. The reports shall be viewed on a CRT Display or printed for annual recording and logging of the calibration maintenance schedule.
5. The FACP shall automatically indicate when an individual sensor needs cleaning. The system shall provide a means to automatically indicate when a sensor requires cleaning. When a sensor's average value reaches a predetermined value, (3) progressive levels of reporting are provided. Thefirst level shall indicate if a sensor is close to a trouble reporting condition and will be indicated on the FACP as "ALMOST DIRTY." This condition provides a means to alert maintenance staff of a sensor approaching dirty without creating a trouble in the system. If this indicator is ignored and the second level is reached, a "DIRTY SENSOR" condition shall be indicated at the FACP and subsequently a system trouble is reported [to the Central Monitoring Station]. The sensor base LED shall glow steady giving a visible indication at the sensor location. The "DIRTY SENSOR" condition shall not affect the sensitivity level required to alarm the sensor. If a "DIRTY SENSOR" is left unattended, and its average value increases to a third predetermined value, an "EXCESSIVELY DIRTY SENSOR" trouble condition shall be indicated at the control unit.
6. The FACP shall continuously perform an automatic self-test on each sensor which will check sensor electronics and ensure the accuracy of the values being transmitted. Any sensor that fails this test shall indicate a "SELF TEST ABNORMAL" trouble condition.
7. Magnet test of smoke sensors shall be distinguished by its label and history log entry as being activated by a magnet.

F. Alarm Notification: By Visual Strobes and Horns in areas as indicated on drawings.
1. Notification device locations are recommendations based on room type, sizes, finishes and other components.
2. Contractor is responsible for device layout, strobe intensity, and horn volume to provide a fully compliant system with required sound levels and intelligibility of message. Provide audibility and intelligibility calculations for voice notification system.

G. Fire Suppression Monitoring:
1. Water flow: Activation of water flow switch shall initiate general alarm operations.
2. Sprinkler valve tamper switch: The activation of any valve tamper switch shall activate system supervisory operations.
3. Pressure switch in dry pipe systems.
4. Provide 24-volt connection from fire alarm panel to sprinkler system alarm bell furnished under Division 21.

H. Power Requirements
1. The control unit shall receive AC power via a dedicated fused disconnect circuit.
2. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal AC power in a normal supervisory mode for a period as defined under Emergency Power Supply in this Specification. The system shall automatically transfer to battery standby upon power failure. All battery charging and recharging operations shall be automatic.
3. All circuits requiring system-operating power shall be 24 VDC and shall be individually fused at the control unit.
4. The incoming power to the system shall be supervised so that any power failure will be indicated at the control unit. A green "power on" LED shall be displayed continuously at the user interface while incoming power is present.
5. The system batteries shall be supervised so that a low battery or a depleted battery condition, or disconnection of the battery shall be indicated at the control unit and displayed for the specific fault type.
6. The system shall support NAC Lockout feature to prevent subsequent activation of Notification Appliance Circuits after a Depleted Battery condition occurs in order to make use of battery reserve for front panel annunciation and control.
7. The system shall support 100% of addressable devices in alarm or operated at the same time, under both primary (AC) and secondary (battery) power conditions.
8. Loss of primary power shall sound a trouble signal at the FACP. FACP shall indicate when the system is operating on an alternate power supply.

1.4 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Prepare on "E-Size" (30x42) sheets.
1. Indicate system wiring diagrams
2. Floor plans with each device lcoation, conduit routing and wiring connections.
3. Annunciator layout
4. Battery calculations.
5. Voltage Drop Calculations
6. System riser diagram
7. Audibility / Intelligibility Calculations
8. List of all devices on each signaling line circuit, with spare capacity indicated.
9. Clear and concise description of operation, with input/output matrix.

C. Product Data: Submit catalog data showing electrical characteristics and connection requirements.

D. Warranty

E. Submission to Authority Having Jurisdiction: In addition to routine submission of the above material, make an identical submission to the authority having jurisdiction. Include copies of shop drawings as required to depict component locations to facilitate review. Upon receipt of comments from the Authority, make resubmissions if required to make clarifications or revisions to obtain approval.

F. Inspection and Test Reports:
1. Submit inspection and test plan prior to closeout demonstration
2. Submit documentation of satisfactory inspections and tests.
3. Submit NFPA 72 "Inspection and Test Form," filled out.

G. Test Reports: Indicate procedures and results for specified field testing and inspection.

H. Manufacturer's Field Reports: Indicate activities on site, adverse findings, and recommendations.

1.5 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.

B. Project Record Documents: Record actual locations of fire alarm equipment.

C. Operation and Maintenance Data: Submit manufacturer’s standard operating and maintenance instructions.

1.6 QUALITY ASSURANCE

A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5 m) when tested in accordance with NFPA 262.

B. Installer Qualifications: NICET Level III certified fire alarm technician.

1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.

C. Each and all items of the Fire Alarm System shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the "UL" label.

D. Maintain one copy of contract documents and shop drawings on site.

1.7 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years experience,and with service facilities within 50 miles of project.

B. Installer: Certified fire alarm installer with service facilities within 50 miles of Project.

C. Design fire alarm under direct supervision of NICET Level III technician.

1.8 MAINTENANCE SERVICE

A. Section 01 70 00 - Execution and Closeout: Maintenance service.

B. Furnish service and maintenance of fire alarm equipment for one year from Date of Substantial Completion.

1.9 MAINTENANCE MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Furnish six keys of each type.

1.10 EXTRA MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Furnish three of each type of automatic smoke detector.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: The equipment and service described in this specification are those supplied and supported by SimplexGrinnell and represent the base bid for the equipment.
   1. Subject to compliance with requirements, provide alternate products by one of the following:
      a. SimplexGrinnell
      b. Edwards Systems Technology
      c. Notifier
      d. Gamewell FCI

2.2 CONTROL PANEL

A. General: Comply with UL 864, "Control Units for Fire-Protective Signaling Systems."

B. Product Description: Modular fire alarm control panel with surface wall-mounted enclosure.

C. The following hardware shall be provided:
   1. Power Limited base panel with red cabinet and door, 120 VAC input power.

2. 2,000 point capacity minimum where (1) point equals (1) monitor (input) or (1) control (output).
3. 2,000 points of Network Annunciation minimum at FACP Display when applied as a Network Node
4. 2000 points of annunciation minimum where one (1) point of annunciation equals:
   a. 1 LED driver output on a graphic driver or 1 switch input on a graphic switch input module.
   b. 1 LED on panel or 1 switch on panel.
5. From all battery charging circuits in the system provide battery voltage and ammeter readouts on the FCP LCD Display.
6. Municipal City Circuit Connection with Disconnect switch, 24VDC Remote Station (reverse polarity), local energy, shunt master box, or a form "C" contact output .
7. One Auxiliary electronically resetable fused 2A @24VDC Output, with programmable disconnect operation for 4-wire detector reset.
8. One Auxiliary Relay, SPDT 2A @32VDC, programmable as a trouble relay, either as normally energized or de-energized, or as an auxiliary control.
9. Three (3) Class B or A (Style Y/Z) Notification Appliance Circuits (NAC; rated 3A@24VDC, resistive).
10. Four (4) form "C" Auxiliary Relay Circuits (Form C contacts rated 2A @ 24VDC, resistive), operation is programmable for trouble, alarm, supervisory of other fire response functions. Relays shall be capable of switching up to ½ A @ 120VAC, inductive.
11. The FACP shall support (6) RS-232-C ports and one service port.
12. Remote Unit Interface: supervised serial communication channel for control and monitoring of remotely located annunciators and I/O panels.
13. Remote Station Signal Transmitter: Electrically supervised digital alarm communicator transmitter (DACT), capable of transmitting alarm and trouble signals over telephone lines to central station receiver. Programmable DACT for either Common Event Reporting or per Point Reporting.
14. Service Port Modem for dial in passcode access to all fire control panel information.
15. System Supervision: Component or power supply failure places system in trouble mode.

D. Initiating Device Circuits: Supervised zone module with alarm and trouble indication; occurrence of single ground or open condition places circuit in trouble mode but does not disable circuit from initiating alarm.

E. Indicating Appliance Circuits: Supervised march time signal module, sufficient for signal devices connected to system; occurrence of single ground or open condition places circuit in trouble mode but does not disable circuit from signaling alarm.

F. Cabinet: Lockable steel enclosure. Arrange unit so all operations required for testing or for normal care and maintenance of the system are performed from the front of the enclosure. If more than a single unit is required to form a complete control unit, provide exactly matching modular unit enclosures.

G. Alphanumeric Display and System Controls: Panel shall include an 80 character LCD display to indicate alarm, supervisory, and component status messages and shall include a keypad for use in entering and executing control commands.

2.3 EMERGENCY POWER SUPPLY

A. General: Components include battery, charger, and an automatic transfer switch.

B. Battery: Sealed lead-acid or nickel cadmium type. Provide sufficient capacity to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 48 hours. Following this period of operation on battery power, the battery shall have sufficient capacity to operate all components of the system, including all alarm indicating devices in alarm or supervisory mode for a period of 10 minutes.

2.4 MANUAL FIRE ALARM STATIONS

A. Product Description: Manual double-action station. Station will mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units.

B. Mounting: Semi-Flush.

C. Backbox: Manufacturer's standard. Surface mount applications shall utilize manufacturer's surface mount box. Do not mount on a standard outlet box.

2.5 SPOT HEAT DETECTOR

A. Thermal Sensor: Combination fixed-temperature and rate-of-rise unit with plug-in base and alarm indication lamp; 135-deg F fixed-temperature setting except as indicated.

B. Thermal sensor shall be of the epoxy encapsulated electronic design. It shall be thermistor-based, rate-compensated, self-restoring and shall not be affected by thermal lag.

C. Sensor fixed temperature sensing shall be independent of rate-of-rise sensing and programmable to operate at 135-deg F. Sensor rate-of-rise temperature detection shall be selectable at the FACP for either 15-deg F per minute.

D. Sensor shall have the capability to be programmed as a utility monitoring device to monitor for temperature extremes in the range from 32-deg F to 155-deg F.

2.6 CEILING SMOKE DETECTOR

A. General: Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems." Include the following features:
   1. Factory Nameplate: Serial number and type identification.
   2. Operating Voltage: 24 VDC, nominal.
   3. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore normal operation.

4. Plug-In Arrangement: Sensor and associated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. Base shall provide break-off plastic tab that can be removed to engage the head/base locking mechanism. No special tools shall be required to remove head once it has been locked. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control unit.
5. Each sensor base shall contain an LED that will flash each time it is scanned by the Control Unit (once every 4 seconds). In alarm condition, the sensor base LED shall be on steady.
6. Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.
7. Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a "wrong device", the control unit shall operate with the installed device at the default alarm settings for that sensor; 2.5% obscuration for photoelectric sensor, 135-deg F and 15-deg F rate-of-rise for the heat sensor, but shall indicate a "Wrong Device" trouble condition.
8. The sensor's electronics shall be immune from false alarms caused by EMI and RFI.
9. Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in base to eliminate false addressing when replacing sensors.
10. Removal of the sensor head for cleaning shall not require the setting of addresses.

B. Bases: Relay output, isolator bases shall be supported alternatives to the standard base.

2.7 DUCT-MOUNTED SMOKE DETECTOR

A. Duct Smoke Sensor: Photoelectric type, with sampling tube of design and dimensions as recommended by the manufacturer for the specific duct size and installation conditions where applied. Sensor includes relay as required for fan shutdown.
1. Environmental compensation, programmable sensitivity settings, status testing, and monitoring of sensor dirt accumulation for the duct sensor shall be provided by the FACP.
2. The Duct Housing shall provide a supervised relay driver circuit for driving up to 15 relays with a single "Form C" contact rated at 7A@ 28VDC or 10A@ 120VAC. This auxiliary relay output shall be fully programmable. Relay shall be mounted within 3 feet of HVAC control circuit.
3. Duct Housing shall provide a relay control trouble indicator Yellow LED.
4. Compact Duct Housing shall have a transparent cover to monitor for the presence of smoke. Cover shall secure to housing by means of four (4) captive fastening screws.
5. Duct Housing shall provide two (2) Test Ports for measuring airflow and for testing. These ports will allow aerosol injection in order to test the activation of the duct smoke sensor.
6. Duct Housing shall provide a magnetic test area and Red sensor status LED.

7. For maintenance purposes, it shall be possible to clean the duct housing sampling tubes by accessing them through the duct housing front cover.
8. Each duct sensor shall have a Remote Test Station with an alarm LED and test switch.
9. Where indicated provide a NEMA 4X weatherproof duct housing enclosure shall provide for the circulation of conditioned air around the internally mounted addressable duct sensor housing to maintain the sensor housing at its rated temperature range. The housing shall be UL Listed to Standard 268A.

2.8 ALARM NOTIFICATION APPLIANCES

A. Horn: Listed to UL 464. Horn appliances shall have a High/Lo Setting, programmable by channel from the addressable controller or by appliance from the host FACP. The horn shall have a minimum sound pressure level of 83 or 89 dBA @ 24VDC. The horn shall mount directly to a standard single gang, double gang or 4" square electrical box, without the use of special adapter or trim rings. Appliances shall be wired with UTP conductors, having a minimum of 3 twists per foot.

B. Visible/Only: Listed to UL 1971. The V/O shall consist of a xenon flash tube and associated lens/reflector system. The V/O enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings. Appliances shall be wired with UTP conductors, having a minimum of 3 twists per foot. V/O appliances shall be provided with different minimum flash intensities of 15cd, 75cd and 110cd. Provide a label inside the strobe lens to indicate the listed candela rating of the specific Visible/Only appliance.

C. Audible/Visible: Addressable combination Audible/Visible (A/V) Notification Appliances shall be listed to UL 1971 and UL 464. The strobe light shall consist of a xenon flash tube and associated lens/reflector system. Provide a label inside the strobe lens to indicate the listed candela rating of the specific strobe. The horn shall have a minimum sound pressure level of 83 or 89 dBA @ 24VDC. The audible/visible enclosure shall mount directly to standard single gang, double gang or 4" square electrical box, without the use of special adapters or trim rings. Appliances shall be wired with UTP conductors, having a minimum of 3 twists per foot. The appliance shall be capable of two-wire synchronization with one of the following options:
1. Synchronized Strobe with Horn on steady
2. Synchronized Strobe with Temporal Code Pattern on Horn
3. Synchronized Strobe with March Time cadence on Horn
4. Synchronized Strobe firing to NAC sync signal with Horn silenced

2.9 WIRE AND CABLE

A. Fire Alarm wire and cabling shall be installed in conduit. See Section 26 05 33 for more information.

B. Contractor shall coordinate conduit requirements with Fire Alarm System installer prior to bid.

2.10 SURGE PROTECTION DEVICE (Line Voltage)

A. Basis-of-Design Product: Subject to compliance with requirements, provide DITEK Surge Protection; Model DTK-120X12 or DTK-DF120S1 or comparable product by one of the following:
   1. Advanced Protection Technologies Inc. (APT)
   2. Liebert; a brand of Vertiv

B. Provide SPDs on nominal 120 V ac electrical circuits that supply power to main Fire-Alarm Control Panel (FACP), booster power supply units, and amplifiers.
   1. Provide units having series-wired design with replaceable surge-protection module.
   2. Provide units having audible alarm notification, LED diagnostic status indicator, and a Form C (SPDT) contact terminal block for remote notification of protection status.

C. SPDs shall be Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the following:
   1. UL 1449, Type 1 or Type 2 SPD.
   2. UL 1283 for EMI and RFI filtering.

D. Performance Criteria:
   1. MCOV: 150 V.
   2. Peak Surge Current Rating: Minimum single-pulse surge current withstand rating per phase is 50 kA, minimum.
      a. Peak surge current rating must be arithmetic sum of the ratings of individual MOVs in a given mode.
   3. Maximum Operating Current: 20 A.
   4. Protection modes and UL 1449 VPR for 240/120 V, single-phase, three-wire circuits.
      a. Line to Neutral: 700 V, maximum.
      b. Line to Ground: 700 V, maximum.
      c. Neutral to Ground: 1200 V, maximum.
      d. Provide units that automatically self-restore without operator action
   5. SCCR: AIC rating of circuit-breaker feeding circuit, minimum.

2.11 SURGE PROTECTION DEVICE (Communications Circuit)

A. Basis-of-Design Product: Subject to compliance with requirements, provide DITEK Surge Protection; Model DTK-2MHTPWB for telephone circuit, DTK-MRJPOES for Ethernet circuit, and/or DTK-VSPN for external wireless antenna signal or comparable product(s) by one of the following:
   1. Advanced Protection Technologies Inc. (APT)
   2. Liebert; a brand of Vertiv

B. Provide SPDs on metal-conductor communication wiring and circuits extending outdoors, including telephone lines, Ethernet circuits, or wireless communication antenna cabling. Provide units having series-wired design.

C. SPDs shall be Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with the following:
   1. UL 497A, for telephone communications circuit SPD.
   2. UL 497B, for Ethernet data and wireless communication SPD.

D. Peak Surge Current Rating: Minimum single-pulse surge current withstand rating is 10 kA, minimum.

2.12 SURGE PROTECTION DEVICE (Data and Signaling Circuits)

A. Basis-of-Design Product: Subject to compliance with requirements, provide DITEK Surge Protection; Model DTK-2MHLP or comparable product by one of the following:
   1. Advanced Protection Technologies Inc. (APT).
   2. Liebert; a brand of Vertiv.

B. Provide SPDs on metal-conductor data and signal wiring and circuits extending outdoors, including Signaling Line Circuit (SLC), Post Indicator Valve (PIV) supervision circuit, and Notification Appliance Circuit (NAC).
   1. SPDs shall utilize Series-wired design with replaceable surge-protection module.
   2. SPDs shall utilize Multistage, hybrid design that uses minimum two different types of surge-protection technology.

C. SPDs shall be Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 497B, for data communications and fire-alarm circuits.

D. Performance Criteria:
   1. Peak Surge Current Rating: Minimum single-pulse surge current withstand rating is 20 kA, minimum.
   2. Maximum Operating Current: 5 A, for NAC/PIV surge protectors; 1 A for SLC surge protectors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify products and systems receiving devices are ready for installation.

3.2 INSTALLATION

A. Install system components and all associated devices in accordance with applicable NFPA Standards and manufacturer's recommendations.

B. Install conductors for fire alarm detection and signal circuit conductors in conduit.

C. System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electric Code (NEC).
   1. Contractor shall obtain from the Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from the written instruction shall be made by the Contractor without the prior written approval of the Fire Alarm System Manufacturer.
   2. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm initiating device circuits wiring and a different color code for supervisory circuits. Color-code notification appliance circuits differently from alarm-initiating circuits. Paint fire alarm system junction boxes and covers red.

D. Furnish and install a complete Fire Alarm System as described herein and as shown on the plans. Include sufficient control unit(s), annunciator(s), manual stations, automatic fire detectors, smoke detectors, audible and visible notification appliances, wiring, terminations, electrical boxes, and all other necessary material for a complete operating system.

E. Water-Flow and Valve Supervisory Switches: Connect to each sprinkler valve and Flow center assembly. Provide for quantity and locations shown on Fire Suppression shop drawings regardless of how many are shown on fire alarm system plans. Coordinate with fire suppression installer prior to bid.

F. Mount outlet box for electric door holder to withstand 80 pounds (36.4 kg) pulling force.

G. Connect conduit and wire to door release devices, sprinkler flow switches, sprinkler valve tamper switches, fire suppression system control panels, duct smoke detectors, elevator controllers and all other systems requiring fire alarm monitoring or interface.

H. Automatic Detector Installation: Conform to NFPA 72.

I. Install engraved plastic nameplates in accordance with Section 260553.

J. Ground and bond fire alarm equipment and circuits in accordance with Section 260526.

K. SPD Installation shall be as follows:
   1. Do not splice and extend SPD leads unless specifically permitted by manufacturer.
   2. Minimum Lead Length for Series-Wired SPDs: 3 ft. (915 mm).
   3. Provide continuous ground wire from SPD to ground bar with bolted lug connections. Spliced ground conductors are unacceptable.
      a. Do not connect ground wires from multiple SPD in series, daisy chain arrangement.
      b. Do not connect ground wires from multiple SPDs in daisy chain arrangement. Connect each SPD ground to common grounding bus bar.
   4. Install SPD in separate enclosure, outside equipment panel of system being protected.

3.3 FIELD QUALITY CONTROL

A. See Division 01 Specification - Quality Requirements: Field inspecting, testing, adjusting, and balancing.

B. Provide fire alarm documentation box adjacent to fire alarm panel per NFPA 72-7.7.2. Provide all record documents as well as all documentation defined in submittal section and NFPA 72-7.2.

C. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pretesting, testing, and adjustment of the system.

D. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm systems. Examples of qualified personnel shall include, but not be limited to, the following:
1. Factory trained and certified personnel.
2. National Institute of Certification in Engineering Technologies (NICET) fire alarm level III certified personnel.
3. International Municipal Signal Association (IMSA) fire alarm certified.
4. Personnel licensed or certified by state or local authority.
5. Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.

E. Test entire fire alarm system in accordance with NFPA 72 and local fire department requirements.

F. Pretesting: Determine, through pretesting, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.

G. Final Test Notice: Provide a 10-day minimum notice in writing when the system is ready for final acceptance testing. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

H. Retesting: Correct deficiencies indicated by tests and completely retest work affected by such deficiencies. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

I. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log.

J. Final Test, Certificate of Completion, and Certificate of Occupancy:
1. Test the system as required by the Authority Having Jurisdiction in order to obtain a certificate of occupancy.

3.4 CLEANING AND ADJUSTING

A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by manufacturer.

B. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

3.5 DEMONSTRATION AND TRAINING

A. Provide the services of a factory-authorized service representative to demonstrate the system and train Owner's maintenance personnel as specified below.
   1. Train Owner's maintenance personnel in the procedures and schedules involved in operating, troubleshooting, servicing, and preventive maintaining of the system. Provide a minimum of 8 hours' training.
   2. Schedule training with the Owner at least seven days in advance.

END OF SECTION 283100

SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Disconnecting, capping or sealing, and abandoning site utilities in place.
7. Temporary erosion and sedimentation control.

1.2 DEFINITIONS

A. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

B. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil," but in disturbed areas such as urban environments, the surface soil can be subsoil.

C. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow. Its appearance is generally friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects larger than 2 inches in diameter; and free of weeds, roots, toxic materials, or other nonsoil materials.

D. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.

E. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.3 MATERIAL OWNERSHIP

A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.4 INFORMATIONAL SUBMITTALS

A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plant designated to remain.

B. Record Drawings: Identifying and accurately showing locations of capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.5 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.

B. Salvageable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.

C. Utility Locator Service: Notify One Call for area where Project is located before site clearing.

D. Do not commence site clearing operations until temporary erosion- and sedimentation-control and plant-protection measures are in place.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."
1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Verify that trees, shrubs, and other vegetation to remain or to be relocated have been flagged and that protection zones have been identified and enclosed.

C. Protect existing site improvements to remain from damage during construction.
1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.

B. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.

C. Remove erosion and sedimentation controls, and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

A. Protect trees and plants remaining on-site.

B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations.

3.4 EXISTING UTILITIES

A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
   1. Arrange with utility companies to shut off indicated utilities.

B. Locate, identify, and disconnect utilities indicated to be abandoned in place.

C. Removal of underground utilities is included in earthwork sections; in applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security, and utilities sections; and in Section 024116 "Structure Demolition" and Section 024119 "Selective Demolition."

3.5 CLEARING AND GRUBBING

A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
   1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
   2. Grind down stumps and remove roots larger than 2 inches in diameter, obstructions, and debris to a depth of 18 inches below exposed subgrade.
   3. Use only hand methods or air spade for grubbing within protection zones.
   4. Chip removed tree branches and dispose of off-site.

B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
   1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

A. Remove sod and grass before stripping topsoil.

B. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.
   1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.

C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
   1. Limit height of topsoil stockpiles to 72 inches.
   2. Do not stockpile topsoil within protection zones.
   3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.
   4. Stockpile surplus topsoil to allow for respreading deeper topsoil.

3.7 SITE IMPROVEMENTS

A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
   1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
   2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.

B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials, and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for slabs-on-grade, walks, pavements, turf and grasses, and plants.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Subbase course for concrete walks and pavements.
6. Subbase course and base course for asphalt paving.
7. Subsurface drainage backfill for walls and trenches.
8. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Requirements:
1. Section 311000 "Site Clearing" for site stripping, grubbing, stripping and stockpiling topsoil, and removal of above- and below-grade improvements and utilities.
2. Section 315000 "Excavation Support and Protection" for shoring, bracing, and sheet piling of excavations.

1.2 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.

3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, will be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other fabricated stationary features constructed above or below the ground surface.

I. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

J. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

K. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:
1. Geotextiles.
2. Controlled low-strength material, including design mixture.
3. Geofoam.
4. Warning tapes.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
1. Classification according to ASTM D2487.
2. Laboratory compaction curve according to ASTM D698 or ASTM D1557.

C. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.5 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E329 and ASTM D3740 for testing indicated.

1.6 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: Notify "One Call" for area where Project is located before beginning earth-moving operations.

C. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures are in place.

D. The following practices are prohibited within protection zones:
   1. Storage of construction materials, debris, or excavated material.
   2. Parking vehicles or equipment.
   3. Foot traffic.
   4. Erection of sheds or structures.
   5. Impoundment of water.
   6. Excavation or other digging unless otherwise indicated.
   7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

E. Do not direct vehicle or equipment exhaust towards protection zones.

F. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification GW, GP, GM, GC, ML, CL, SW, SP, SC, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
   1. Liquid Limit: 50.
   2. Plasticity Index: 20.

C. Unsatisfactory Soils: Soil Classification Groups OL, CH, MH, OH, and PT according to ASTM D2487, or a combination of these groups.
   1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

H. Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.

J. Sand: ASTM C33/C33M; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Survivability:
      a. Class 2; AASHTO M 288.
      b. Apparent Opening Size: No. 60 sieve, maximum; ASTM D4751.
      c. Permittivity: 0.5 per second, minimum; ASTM D4491.
      d. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:
   1. Survivability:
      a. Class 2; AASHTO M 288.
      b. Apparent Opening Size: No. 60 sieve, maximum; ASTM D4751.
      c. Permittivity: 0.02 per second, minimum; ASTM D4491.
      d. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355.

2.3 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
   1. Red: Electric.
   2. Yellow: Gas, oil, steam, and dangerous materials.
   3. Orange: Telephone and other communications.
   4. Blue: Water systems.
   5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Provide dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
   1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

D. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

3.3 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
   1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
   2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
      a. 24 inches outside of concrete forms other than at footings.
      b. 12 inches outside of concrete forms at footings.
      c. 6 inches outside of minimum required dimensions of concrete cast against grade.
      d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
      e. 6 inches beneath bottom of concrete slabs-on-grade.
      f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or 42 inches wide.

3.4 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
   1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
   2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:
   1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
   2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.5 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.6 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
   1. Clearance: 12 inches each side of pipe or conduit.

C. Trench Bottoms:
   1. Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
      a. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trenches in Tree-Protection Zones:
   1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
   2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
   3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.7 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
   1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
   2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.8 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean

concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.9 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring, bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.11 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete."

D. Trenches under Roadways: Provide 4-inch- thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Section 033000 "Cast-in-Place Concrete."

E. Backfill voids with satisfactory soil while removing shoring and bracing.

F. Initial Backfill:

1. Soil Backfill: Place and compact initial backfill of satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
    a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

G. Final Backfill:
1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.

H. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.12 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:
1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.13 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D698 or ASTM D1557:
   1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
   2. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 92 percent.
   3. Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 85 percent.
   4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.15 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
   1. Provide a smooth transition between adjacent existing grades and new grades.
   2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
   1. Turf or Unpaved Areas: Plus or minus 1 inch.
   2. Walks: Plus or minus 1 inch.
   3. Pavements: Plus or minus 1/2 inch.

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.16 SUBSURFACE DRAINAGE

A. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches of filter material, placed in compacted layers 6 inches thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
   1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D698.

B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade, in compacted layers 6 inches thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches.
   1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D698.
   2. Place and compact impervious fill over drainage backfill in 6-inch-thick compacted layers to final subgrade.

3.17 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
   1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
   2. Place base course material over subbase course under hot-mix asphalt pavement.
   3. Shape subbase course and base course to required crown elevations and cross-slope grades.
   4. Place subbase course[**and base course**] 6 inches or less in compacted thickness in a single layer.
   5. Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
   6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D698 or ASTM D1557.

C. Pavement Shoulders: Place shoulders along edges of subbase course and base course to prevent lateral movement. Construct shoulders, at least 12 inches wide, of satisfactory soil materials and compact simultaneously with each subbase and base layer to not less than 95 percent of maximum dry unit weight according to ASTM D698 or ASTM D1557.

3.18 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:
   1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
   2. Place drainage course 6 inches or less in compacted thickness in a single layer.
   3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
   4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D698.

3.19 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
   1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
   2. Determine that fill material classification and maximum lift thickness comply with requirements.

3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

E. Testing agency will test compaction of soils in place according to ASTM D1556, ASTM D2167, ASTM D2937, and ASTM D6938, as applicable. Tests will be performed at the following locations and frequencies:
1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length but no fewer than two tests.

F. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.20 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 312319 - DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Construction dewatering.

B. Related Requirements:
   1. Section 015723 "Temporary Storm Water Pollution Control" for temporary storm water pollution controls mandated under the EPA's National Pollutant Discharge Elimination System.
   2. Section 312000 "Earth Moving" for excavating, backfilling, site grading, and controlling surface-water runoff and ponding.

1.2 ACTION SUBMITTALS

A. Shop Drawings: For dewatering system, prepared by or under the supervision of a qualified professional engineer.
   1. Include plans, elevations, sections, and details.
   2. Show arrangement, locations, and details of wells and well points; locations of risers, headers, filters, pumps, power units, and discharge lines; and means of discharge, control of sediment, and disposal of water.
   3. Include layouts of piezometers and flow-measuring devices for monitoring performance of dewatering system.
   4. Include written plan for dewatering operations, including sequence of well and well-point placement coordinated with excavation shoring and bracings and control procedures to be adopted if dewatering problems arise.

B. Delegated Design Submittals: For dewatering system, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Field Quality-Control Submittals:
   1. Field quality-control reports.

B. Qualification Statements: For Installer and land surveyor.

C. Delegated design engineer qualifications.

D. Existing Conditions: Using photographs or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by dewatering operations. Submit before Work begins.

E. Record Drawings: Identify locations and depths of capped wells and well points and other abandoned-in-place dewatering equipment.

1.4 QUALITY ASSURANCE

A. Qualifications:
   1. Installer: An experienced installer that has specialized in design of dewatering systems and dewatering work.
   2. Delegated Design Engineer: A professional engineer who is legally qualified to practice in state where Project is located and who is experienced in providing engineering services of the type indicated.
   3. Land Surveyor: A professional land surveyor who is legally qualified to practice in state where Project is located.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design dewatering system.

B. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of groundwater and permit excavation and construction to proceed on dry, stable subgrades.
   1. Design dewatering system, including comprehensive engineering analysis by a qualified professional engineer.
   2. Continuously monitor and maintain dewatering operations to ensure erosion control, stability of excavations and constructed slopes, prevention of flooding in excavation, and prevention of damage to subgrades and permanent structures.
   3. Prevent surface water from entering excavations by grading, dikes, or other means.
   4. Accomplish dewatering without damaging existing buildings, structures, and site improvements adjacent to excavation.
   5. Remove dewatering system when no longer required for construction.

C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning dewatering. Comply with water- and debris-disposal regulations of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by dewatering operations.
   1. Prevent surface water and subsurface or groundwater from entering excavations, from ponding on prepared subgrades, and from flooding site or surrounding area.
   2. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.

B. Install dewatering system to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Provide temporary grading to facilitate dewatering and control of surface water.

D. Protect and maintain temporary erosion and sedimentation controls, which are specified in Section 015723 "Temporary Storm Water Pollution Control" and Section 311000 "Site Clearing," during dewatering operations.

3.2 INSTALLATION

A. Install dewatering system utilizing wells, well points, or similar methods complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
   1. Space well points or wells at intervals required to provide sufficient dewatering.
   2. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.

B. Place dewatering system into operation to lower water to specified levels before excavating below groundwater level.

C. Provide sumps, sedimentation tanks, and other flow-control devices as required by authorities having jurisdiction.

D. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.

B. Operate system to lower and control groundwater to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
   1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
   2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
   3. Maintain piezometric water level a minimum of 24 inches below bottom of excavation.

C. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

D. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of 36 inches below overlying construction.

3.4 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks <**Insert time period**> during dewatering and maintain an accurate log of surveyed elevations for comparison with original elevations. Promptly notify Architect if changes in elevations occur or if cracks, sags, or other damage is evident in adjacent construction.

B. Provide continual observation to ensure that subsurface soils are not being removed by the dewatering operation.

C. Prepare reports of observations.

3.5 PROTECTION

A. Protect and maintain dewatering system during dewatering operations.

B. Promptly repair damages to adjacent facilities caused by dewatering.

END OF SECTION 312319

SECTION 313116 - TERMITE CONTROL

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 SUMMARY

A. This Section includes the following:

1. Soil treatment with termiticide.

1.3 PERFORMANCE REQUIREMENTS

A. Service Life of Soil Treatment: Soil treatment by use of a termiticide that is effective for not less than five years against infestation of subterranean termites.

B. SUBMITTALS

C. Product Data: For termiticide.

1. Include the EPA-Registered Label for termiticide products.

D. Product Certificates: For termite control products, signed by product manufacturer.

E. Qualification Data: For Installer of termite control products.

F. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's record information, including the following:

1. Date and time of application.
2. Moisture content of soil before application.
3. Brand name and manufacturer of termiticide.
4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes, and rates of application used.
6. Areas of application.
7. Water source for application.

G. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located.

B. Regulatory Requirements: Formulate and apply termiticides according to the EPA-Registered Label.

C. Source Limitations: Obtain termite control products through one source.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

1.6 COORDINATION

A. Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by Applicator and Contractor certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites. If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

1. Warranty Period: Five years from date of Substantial Completion written in the form of an insurance policy in the amount of $100,000.00 for damages to the building and contents. Rating of insurance company shall be A-, IV (4).
2. Shall be secured with a bond by a State-licensed Surety
3. If evidence of termites occur within warranty period, areas shall be retreated at no cost to the owner.
4. Include optional renewal policy on annual basis after fifth year; fee shall be equitable and agreed upon by applicator and Owner.
5. Inspect and report annually to the Owner in writing.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT

A. Termiticide: Provide an EPA-registered termiticide complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation. Provide

quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.

1. Shall be acceptable to the US Dept. of Agriculture for us in controlling termites without being injurious to plant life.
2. Only manufacturer pre-mixes permitted. No job-mixing of chemicals.
3. Dilutent as recommended by toxicant manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil, interfaces with earthwork, slab and foundation work, landscaping, and other conditions affecting performance of termite control.

1. Proceed with application only after unsatisfactory conditions have been corrected.
2. Notify Architect at least 48 hours prior to application.
3. Post signs in areas of applications, warning that poison has been applied; leave signs in place for minimum 2 weeks following application.

3.2 PREPARATION

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's written instructions for preparation before beginning application of termite control treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION, GENERAL

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.4 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.

1. Slabs-on-Grade: Under ground-supported slab construction, including footings (both sides), building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed. Apply toxicant 12 hours prior to installation of vapor barrier.
2. Foundations: Adjacent soil including soil along the entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating the slab, and around interior column footers, piers, and chimney bases; also along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
3. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.
4. Soil within 10 feet of building perimeter.

B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

D. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 313116

SECTION 315000 - EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes temporary excavation support and protection systems.

B. Related Requirements:
   1. Section 312000 "Earth Moving" for excavating and backfilling, for controlling surface-water runoff and ponding, and for dewatering excavations.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review geotechnical report.
   2. Review existing utilities and subsurface conditions.
   3. Review coordination for interruption, shutoff, capping, and continuation of utility services.
   4. Review proposed excavations.
   5. Review proposed equipment.
   6. Review monitoring of excavation support and protection system.
   7. Review coordination with waterproofing.
   8. Review abandonment or removal of excavation support and protection system.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, performance properties, and dimensions of individual components and profiles, and calculations for excavation support and protection system.

B. Shop Drawings: For excavation support and protection system, prepared by or under the supervision of a qualified professional engineer.
   1. Include plans, elevations, sections, and details.
   2. Show arrangement, locations, and details of soldier piles, piling, lagging, tiebacks, bracing, and other components of excavation support and protection system according to engineering design.
   3. Indicate type and location of waterproofing.
   4. Include a written plan for excavation support and protection, including sequence of construction of support and protection coordinated with progress of excavation.

C. Delegated-Design Submittal: For excavation support and protection systems, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:
   1. Land surveyor.
   2. Professional Engineer: Experience with providing delegated-design engineering services of the type indicated, including documentation that engineer is licensed in the state in which Project is located.

B. Contractor Calculations: For excavation support and protection system. Include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Existing Conditions: Using photographs or video recordings, show existing conditions of adjacent construction and site improvements that might be misconstrued as damage caused by inadequate performance of excavation support and protection systems. Submit before Work begins.

1.5 CLOSEOUT SUBMITTALS

A. Record Drawings: Identify locations and depths of capped utilities, abandoned-in-place support and protection systems, and other subsurface structural, electrical, or mechanical conditions.

1.6 FIELD CONDITIONS

A. Interruption of Existing Utilities: Do not interrupt any utility-serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility according to requirements indicated:
   1. Notify Architect no fewer than two days in advance of proposed interruption of utility.
   2. Do not proceed with interruption of utility without Architect's written permission.

B. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks, and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design excavation support and protection systems to resist all lateral loading and surcharge, including but not limited to, retained soil, groundwater pressure, adjacent building loads, adjacent traffic loads, construction traffic loads, material stockpile loads, and seismic loads, based on the following:
   1. Compliance with OSHA Standards and interpretations, 29 CFR 1926, Subpart P.
   2. Compliance with AASHTO Standard Specification for Highway Bridges or AASHTO LRFD Bridge Design Specification, Customary U.S. Units.
   3. Compliance with requirements of authorities having jurisdiction.

4. Compliance with utility company requirements.
5. Compliance with railroad requirements.

2.2 MATERIALS

A. Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A36/A36M, ASTM A690/A690M, or ASTM A992/A992M.

C. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of size and strength required for application.

D. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.

E. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

F. Tiebacks: Steel bars, ASTM A722/A722M.

G. Tiebacks: Steel strand, ASTM A416/A416M.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.
1. Shore, support, and protect utilities encountered.

3.2 INSTALLATION - GENERAL

A. Locate excavation support and protection systems clear of permanent construction, so that construction and finishing of other work is not impeded.

B. Install excavation support and protection systems to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.

C. Install excavation support and protection systems without damaging existing buildings, structures, and site improvements adjacent to excavation.

3.3 SOLDIER PILES AND LAGGING

A. Install steel soldier piles before starting excavation.
   1. Extend soldier piles below excavation grade level to depths adequate to prevent lateral movement.
   2. Space soldier piles at regular intervals not to exceed allowable flexural strength of wood lagging.
   3. Accurately align exposed faces of flanges to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment.

B. Install wood lagging within flanges of soldier piles as excavation proceeds.
   1. Trim excavation as required to install lagging.
   2. Fill voids behind lagging with soil, and compact.

C. Install wales horizontally at locations indicated on Drawings and secure to soldier piles.

3.4 BRACING

A. Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.
   1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect.
   2. Install internal bracing if required to prevent spreading or distortion of braced frames.
   3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.5 MAINTENANCE

A. Monitor and maintain excavation support and protection system.

B. Prevent surface water from entering excavations by grading, dikes, or other means.

C. Continuously monitor vibrations, settlements, and movements to ensure stability of excavations and constructed slopes and to ensure that damage to permanent structures is prevented.

3.6 FIELD QUALITY CONTROL

A. Survey-Work Benchmarks: Resurvey benchmarks weekly during installation of excavation support and protection systems, excavation progress, and for as long as excavation remains open.
   1. Maintain an accurate log of surveyed elevations and positions for comparison with original elevations and positions.
   2. Promptly notify Architect if changes in elevations or positions occur or if cracks, sags, or other damage is evident in adjacent construction.

B. Promptly correct detected bulges, breakage, or other evidence of movement to ensure that excavation support and protection system remains stable.

C. Promptly repair damages to adjacent facilities caused by installation or faulty performance of excavation support and protection systems.

3.7 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and earth and hydrostatic pressures.
   1. Remove in stages to avoid disturbing underlying soils and rock or damaging structures, pavements, facilities, and utilities.
   2. Remove excavation support and protection systems to a minimum depth of 48 inches below overlying construction, and abandon remainder.
   3. Fill voids immediately with approved backfill compacted to density specified in Section 312000 "Earth Moving."
   4. Repair or replace, as approved by Architect, adjacent work damaged or displaced by removing excavation support and protection systems.

END OF SECTION 315000

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Hot-mix asphalt paving.
2. Hot-mix asphalt overlay.
3. Cold milling of existing asphalt pavement.
4. Hot-mix asphalt patching.
5. Asphalt surface treatments.

B. Related Requirements:
1. Section 024119 "Selective Demolition" for demolition and removal of existing asphalt pavement.
2. Section 312000 "Earth Moving" for subgrade preparation, fill material, separation geotextiles, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.
3. Section 321313 "Concrete Paving" for concrete pavement and for separate concrete curbs, gutters, and driveway aprons.
4. Section 321373 "Concrete Paving Joint Sealants" for joint sealants and fillers at pavement terminations.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
b. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

1.3 ACTION SUBMITTALS

A. Product Data: Include technical data and tested physical and performance properties.
1. Herbicide.
2. Paving geotextile.
3. Joint sealant.

B. Hot-Mix Asphalt Designs:
1. Certification, by authorities having jurisdiction, of approval of each hot-mix asphalt design proposed for the Work.
2. For each hot-mix asphalt design proposed for the Work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For paving-mix manufacturer.

B. Material Certificates: Include statement that mixes containing recycled materials will perform equal to mixes produced from all new materials.
   1. Aggregates.
   2. Asphalt binder.
   3. Asphalt cement.
   4. Cutback prime coat.
   5. Emulsified asphalt prime coat.
   6. Tack coat.
   7. Fog seal.
   8. Undersealing asphalt.

C. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of state in which Project is located.

B. Testing Agency Qualifications: Qualified in accordance with ASTM D3666 for testing indicated.

C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of NCDOT for asphalt paving work.
   1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
   1. Prime Coat: Minimum surface temperature of 60 deg F.
   2. Tack Coat: Minimum surface temperature of 60 deg F.
   3. Slurry Coat: Comply with weather limitations in ASTM D3910.
   4. Asphalt Base Course and Binder Course: Minimum surface temperature of 40 deg F and rising at time of placement.
   5. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

PART 2 - PRODUCTS

2.1 MIXES

A. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and complying with the following requirements:
   1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protection: Provide protective materials, procedures, and worker training to prevent asphalt materials from spilling, coating, or building up on curbs, driveway aprons, manholes, and other surfaces adjacent to the Work.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
   1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph.
   2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
   3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

3.3 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.
   1. Mill to a depth of 1-1/2 inches.
   2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
   3. Control rate of milling to prevent tearing of existing asphalt course.
   4. Repair or replace curbs, driveway aprons, manholes, and other construction damaged during cold milling.
   5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
   6. Patch surface depressions deeper than 1 inch after milling, before wearing course is laid.

7. Keep milled pavement surface free of loose material and dust.
8. Do not allow milled materials to accumulate on-site.

3.4 PATCHING

A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.
   1. Undersealing: Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
   2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.

C. Placing Single-Course Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

D. Placing Two-Course Patch Material: Partially fill excavated pavements with hot-mix asphalt base course mix and, while still hot, compact. Cover asphalt base course with compacted layer of hot-mix asphalt surface course, finished flush with adjacent surfaces.

3.5 REPAIRS

A. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch.
   1. Clean cracks and joints in existing hot-mix asphalt pavement.
   2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.
   3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch wide. Fill flush with surface of existing pavement and remove excess.

3.6 SURFACE PREPARATION

A. Ensure that prepared subgrade has been proof-rolled and is ready to receive paving. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces.

B. Herbicide Treatment: Apply herbicide in accordance with manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.
   1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.

3.7 HOT-MIX ASPHALT PLACEMENT

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
   1. Place hot-mix asphalt base course and binder course in number of lifts and thicknesses indicated.
   2. Place hot-mix asphalt surface course in single lift.
   3. Spread mix at a minimum temperature of 250 deg F.
   4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
   5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
   1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches from strip to strip to ensure proper compaction of mix along longitudinal joints.
   2. Complete a section of asphalt base course and binder course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.8 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
   1. Clean contact surfaces and apply tack coat to joints.
   2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
   3. Offset transverse joints, in successive courses, a minimum of 24 inches.
   4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method in accordance with AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."
   5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
   6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.9 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
   1. Complete compaction before mix temperature cools to 185 deg F.

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
   1. Average Density, "Superpave" Gyratory Compactor Test Method: 96 percent of reference laboratory density in accordance with ASTM D6925, but not less than 94 percent or greater than 100 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.10 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce thickness indicated within the following tolerances:
   1. Base Course and Binder Course: Plus or minus 1/2 inch.
   2. Surface Course: Plus 1/4 inch, no minus.

B. Pavement Surface Smoothness: Compact each course to produce surface smoothness within the following tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas:
   1. Base Course and Binder Course: 1/4 inch.
   2. Surface Course: 1/8 inch.
   3. Crowned Surfaces: Test with crowned template centered and at right angle to crown. Maximum allowable variance from template is 1/4 inch.

C. Asphalt Traffic-Calming Devices: Compact and form asphalt to the shapes indicated and within a tolerance of plus or minus 1/8 inch of height indicated above pavement surface.

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined in accordance with ASTM D3549/D3549M.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement in accordance with ASTM D979/D979M or AASHTO T 168.
   1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared in accordance with ASTM D2041/D2041M, and compacted in accordance with job-mix specifications.
   2. In-place density of compacted pavement will be determined by testing core samples in accordance with ASTM D1188 or ASTM D2726/D2726M.
      a. One core sample will be taken for every 1000 sq. yd. or less of installed pavement, with no fewer than three cores taken.
      b. Field density of in-place compacted pavement may also be determined by nuclear method in accordance with ASTM D2950/D2950M and coordinated with ASTM D1188 or ASTM D2726/D2726M.

E. Replace and compact hot-mix asphalt where core tests were taken.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.12 WASTE HANDLING

A. General: Handle asphalt-paving waste in accordance with approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."

END OF SECTION 321216

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes exterior cement concrete pavement for the following:
   1. Curbs and gutters.
   2. Walkways.
   3. Concrete pads.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, and ground granulated blast-furnace slag.

1.3 SUBMITTALS

A. Product Data: For each type of manufactured material and product indicated.

B. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Field quality-control test reports.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.
   1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.
   1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.

C. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete," unless modified by requirements in the Contract Documents.

D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.5 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.
   1. Use flexible or curved forms for curves with a radius 100 feet or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source throughout the Project:
   1. Portland Cement: ASTM C 150, Type I/II. Supplement with the following:
      a. Fly Ash: ASTM C 618, Class C.
      b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, Class 4S coarse aggregate, uniformly graded. Provide aggregates from a single.
   1. Maximum Coarse-Aggregate Size: 1 inch.
   2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M.

D. Air-Entraining Admixture: ASTM C 260.

E. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
   1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
   2. Retarding Admixture: ASTM C 494/C 494M, Type B.
   3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
   4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
   5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
   6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.3 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

E. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.4 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene

2.5 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
   1. Use a qualified independent testing agency for preparing and reporting proposed concrete mixture designs for the trial batch method.

B. Proportion mixtures to provide normal-weight concrete with the following properties:
   1. Compressive Strength (28 Days): As specified on the plans and details.
   2. Maximum Water-Cementitious Materials Ratio at Point of Placement: 0.45.
   3. Slump Limit: 4 inches, plus or minus 1 inch.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
   1. Air Content: 3-1/2 percent plus or minus 1.0 percent.

D. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

E. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement according to ACI 301 requirements

2.6 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For concrete mixes of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete mixes larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding.
1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.
2. Proof-roll with a loaded 10-wheel tandem-axle dump truck weighing not less than 15 tons.
3. Subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch require correction according to requirements in Division 31 Section "Earth Moving."

C. Proceed with concrete pavement operations only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
   1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.
   1. Butt Joints: Use bonding agent or epoxy bonding adhesive at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
   1. Locate expansion joints at intervals of 50 feet, unless otherwise indicated.
   2. Extend joint fillers full width and depth of joint.
   3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
   4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
   5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
   6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows to match jointing of existing adjacent concrete pavement:
   1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
   2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
   3. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to a 1/4-inch radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.

3.5 CONCRETE PLACEMENT

A. Inspection: Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site.

F. Do not add water to fresh concrete after testing.

G. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

H. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
   1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

I. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
   1. Remove and replace concrete that has been placed for more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.

J. Screed pavement surfaces with a straightedge and strike off.

K. Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

L. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.

M. Slip-Form Pavers: When automatic machine placement is used for pavement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of paver machine during operations.

N. When adjoining pavement lanes are placed in separate pours, do not operate equipment on concrete until pavement has attained 85 percent of its 28-day compressive strength.

O. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mix designs.

P. Hot-Weather Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
1. Burlap Finish: Drag a seamless strip of damp burlap across float-finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
2. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
3. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic.

3.7 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
1. Moist Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.8 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:
1. Elevation: 1/4 inch.
2. Thickness: Plus 3/8 inch, minus 1/4 inch.
3. Surface: Gap below 10-foot- long, unleveled straightedge not to exceed 1/4 inch.
4. Lateral Alignment and Spacing of Tie Bars and Dowels: 1 inch.
5. Vertical Alignment of Tie Bars and Dowels: 1/4 inch.
6. Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 1/2 inch.
7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches.
8. Joint Spacing: 3 inches.
9. Contraction Joint Depth: Plus 1/4 inch, no minus.
10. Joint Width: Plus 1/8 inch, no minus.

3.9 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
   1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
      a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
   2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
   3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
   4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
   5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
   6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
      a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3 consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 REPAIRS AND PROTECTION

A. Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

C. Protect concrete from damage. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Expansion and contraction joints within cement concrete pavement.
   2. Joints between cement concrete and asphalt pavement.

1.2 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

C. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
   1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
   2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for sealants.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.5 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
   2. When joint substrates are wet or covered with frost.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.

2.2 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
   1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions.

Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of backer materials.
   2. Do not stretch, twist, puncture, or tear backer materials.
   3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses provided for each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
   1. Remove excess sealants from surfaces adjacent to joint.
   2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions, unless otherwise indicated.

G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations with repaired areas are indistinguishable from the original work.

END OF SECTION 321373

SECTION 321723 - PAVEMENT MARKINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes painted markings applied to asphalt and concrete pavement.

B. Related Sections:
   1. Division 32 sports surfacing sections for markings on athletic surfacing.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include technical data and tested physical and performance properties.

B. Shop Drawings: For pavement markings.
   1. Indicate pavement markings, colors, lane separations, defined parking spaces, and dimensions to adjacent work.
   2. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.

C. Samples: For each exposed product and for each color and texture specified; on rigid backing, 8 inches square.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of North Carolina DOT for pavement-marking work.
   1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F for water-based materials, 40 deg F (4 deg C) for oil-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 PAVEMENT-MARKING PAINT

A. Pavement-Marking Paint (Inside public right-of-way) Thermo-plastic, comply with NCDOT Standards Section 1205.
   1. Color: As indicated on Drawings.

B. Pavement-Marking Paint (Outside public right-of-way): MPI #97, latex traffic-marking paint.
   1. Color: As indicated on Drawings.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that pavement is dry and in suitable condition to begin pavement marking according to manufacturer's written instructions.

B. Proceed with pavement marking only after unsatisfactory conditions have been corrected.

3.2 PAVEMENT MARKING

A. Do not apply pavement-marking paint until layout, colors, and placement have been verified with Architect.

B. Allow paving to age for a minimum of 30 days before starting pavement marking.

C. Sweep and clean surface to eliminate loose material and dust.

D. Apply paint with mechanical equipment to produce pavement markings, of dimensions indicated, with uniform, straight edges. Apply at manufacturer's recommended rates to provide a minimum wet film thickness of 15 mils.
   1. Apply graphic symbols and lettering with paint-resistant, die-cut stencils, firmly secured to pavement. Mask an extended area beyond edges of each stencil to prevent paint application beyond the stencil. Apply paint so that it cannot run beneath the stencil.

3.3 PROTECTING AND CLEANING

A. Protect pavement markings from damage and wear during remainder of construction period.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 321723

SECTION 321726 - TACTILE WARNING SURFACING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Detectable warning mats.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For each type of exposed finish requiring color selection.

C. Samples for Verification: For each type of tactile warning surface, in manufacturer's standard sizes unless otherwise indicated, showing edge condition, truncated-dome pattern, texture, color, and cross section; with fasteners and anchors.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For tactile warning surfacing, to include in maintenance manuals.

1.4 PROJECT CONDITIONS

A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

B. Weather Limitations for Adhesive Application:
   1. Apply adhesive only when ambient temperature is above 50 deg F and when temperature has not been below 35 deg F for 12 hours immediately before application. Do not apply when substrate is wet or contains excess moisture.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of tactile warning surfaces that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Deterioration of finishes beyond normal weathering and wear.
      b. Separation or delamination of materials and components.
   2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TACTILE WARNING SURFACING, GENERAL

A. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for tactile warning surfaces.
   1. For tactile warning surfaces composed of multiple units, provide units that when installed provide consistent side-to-side and end-to-end dome spacing that complies with requirements.

B. Source Limitations: Obtain each type of tactile warning surfacing and fastener from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

2.2 DETECTABLE WARNING MATS

A. Surface-Applied Detectable Warning Mats: Accessible truncated-dome detectable warning resilient mats, UV resistant, manufactured for adhering to existing concrete walkway surfaces, with slip-resistant surface treatment on domes, field of mat, and beveled outside edges.
   1. Basis-of-Design Product: Subject to compliance with requirements, provide product of AlertTile; a division of Cape Fear Systems, II, LLC; or a comparable product acceptable to Architect.
   2. Material: Modified rubber compound, UV resistant.
   3. Color: As selected by Architect from manufacturer's full range.
   4. Shapes and Sizes:
      a. Rectangular panel, 24 by 48 inches.
   5. Dome Spacing and Configuration: Manufacturer's standard compliant spacing, in manufacturer's standard pattern.
   6. Mounting: Adhered to pavement surface with adhesive and fastened with fasteners.

2.3 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of tactile warning surfaces, noncorrosive and compatible with each material joined, and complying with the following:
   1. Furnish Type 304 stainless-steel fasteners for exterior use.
   2. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant heads, colored to match tile.

B. Adhesive: As recommended by manufacturer for adhering tactile warning surfacing unit to pavement.

C. Sealant: As recommended by manufacturer for sealing perimeter of tactile warning surfacing unit.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that pavement is in suitable condition to begin installation according to manufacturer's written instructions. Verify that installation of tactile warning surfacing will comply with accessibility requirements upon completion.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF TACTILE WARNING SURFACING

A. General: Prepare substrate and install tactile warning surfacing according to manufacturer's written instructions unless otherwise indicated.

B. Place tactile warning surfacing units in dimensions and orientation indicated. Comply with location requirements of AASHTO MP 12.

3.3 INSTALLATION OF DETECTABLE WARNING MATS

A. Lay out detectable warning mats as indicated and mark concrete pavement at edges of mats.

B. Prepare existing paving surface by grinding and cleaning as recommended by manufacturer.

C. Apply adhesive to back of mat in amounts and pattern recommended by manufacturer, and set mat in place. Firmly seat mat in adhesive bed, eliminating air pockets and establishing full adhesion to pavement. If necessary, temporarily apply weight to mat to ensure full contact with adhesive.

D. Install anchor devices through face of mat and into pavement using anchors located as recommended by manufacturer. Set heads of anchors flush with mat surface.

E. Mask mat perimeter and adjacent concrete, and apply sealant in continuous bead around perimeter of mat.

F. Remove masking, adhesive, excess sealant, and soil from exposed surfaces of detectable warning mat and surrounding concrete pavement using cleaning agents recommended in writing by manufacturer.

G. Protect installed mat from traffic until adhesive has set.

3.4 CLEANING AND PROTECTION

A. Remove and replace tactile warning surfacing that is broken or damaged or does not comply with requirements in this Section. Remove in complete sections from joint to joint unless otherwise approved by Architect. Replace using tactile warning surfacing installation methods acceptable to Architect.

B. Protect tactile warning surfacing from damage and maintain free of stains, discoloration, dirt, and other foreign material.

END OF SECTION 321726

SECTION 330500 - COMMON WORK RESULTS FOR UTILITIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Piping joining materials.
   2. Transition fittings.
   3. Dielectric fittings.
   4. Sleeves.
   5. Identification devices.
   6. Grout.
   7. Flowable fill.
   8. Piped utility demolition.
   9. Piping system common requirements.
   10. Equipment installation common requirements.
   11. Painting.
   12. Concrete bases.
   13. Metal supports and anchorages.

1.2 DEFINITIONS

A. Exposed Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions.

B. Concealed Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

C. ABS: Acrylonitrile-butadiene-styrene plastic.

D. CPVC: Chlorinated polyvinyl chloride plastic.

E. PE: Polyethylene plastic.

F. PVC: Polyvinyl chloride plastic.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Dielectric fittings.
   2. Identification devices.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 QUALITY ASSURANCE

A. **Steel Support Welding**: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. **Steel Piping Welding**: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
   1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
   2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Comply with ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

B. Coordinate installation of identifying devices after completing covering and painting if devices are applied to surfaces.

C. Coordinate size and location of concrete bases. Formwork, reinforcement, and concrete requirements are specified in Division 03.

PART 2 - PRODUCTS

2.1 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
   1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch maximum thickness, unless otherwise indicated.
      a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.

b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

E. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

F. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

G. Solvent Cements for Joining Plastic Piping:
1. ABS Piping: ASTM D 2235.
2. CPVC Piping: ASTM F 493.
3. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
4. PVC to ABS Piping Transition: ASTM D 3138.

H. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.2 TRANSITION FITTINGS

A. Transition Fittings, General: Same size as, and with pressure rating at least equal to and with ends compatible with, piping to be joined.

B. Transition Couplings NPS 1-1/2 and Smaller:
1. Underground Piping: Manufactured piping coupling or specified piping system fitting.
2. Aboveground Piping: Specified piping system fitting.

C. AWWA Transition Couplings NPS 2 and Larger:
1. Description: AWWA C219, metal sleeve-type coupling for underground pressure piping.

D. Plastic-to-Metal Transition Fittings:
1. Description: PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint or threaded end.

E. Plastic-to-Metal Transition Unions:
1. Description: MSS SP-107, PVC four-part union. Include brass or stainless-steel threaded end, solvent-cement-joint or threaded plastic end, rubber O-ring, and union nut.

F. Flexible Transition Couplings for Underground Nonpressure Drainage Piping:

G. Description: ASTM C 1173 with elastomeric sleeve, ends same size as piping to be joined, and corrosion-resistant metal band on each end.

2.3 DIELECTRIC FITTINGS

A. Dielectric Fittings, General: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:
1. Description: Factory fabricated, union, NPS 2 and smaller.
   a. Pressure Rating: **150** psig minimum at 180 deg F.
   b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded ferrous.

C. Dielectric Flanges:
1. Description: Factory-fabricated, bolted, companion-flange assembly, NPS 2-1/2 to NPS 4 and larger.
   a. Pressure Rating: **150** psig minimum.
   b. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Kits:
1. Description: Nonconducting materials for field assembly of companion flanges, NPS 2-1/2 and larger.
   a. Pressure Rating: **150** psig minimum.
   b. Gasket: Neoprene or phenolic.
   c. Bolt Sleeves: Phenolic or polyethylene.
   d. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:
1. Description: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining, NPS 3 and smaller.
   a. Pressure Rating: 300 psig at 225 deg F.
   b. End Connections: Threaded.

F. Dielectric Nipples:
1. Description: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining.
   a. Pressure Rating: 300 psig at 225 deg F.
   b. End Connections: Threaded or grooved.

2.4 SLEEVES

A. Mechanical sleeve seals for pipe penetrations are specified in Division 22 Section "Common Work Results for Plumbing."

B. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

C. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized, plain ends.

D. Cast-Iron Sleeves: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

PVC sleeves in first two paragraphs below may be prohibited for some locations by fire authorities having jurisdiction.

E. Molded PVC Sleeves: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.

G. Molded PE Sleeves: Reusable, PE, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.5 IDENTIFICATION DEVICES

A. General: Products specified are for applications referenced in other Division 33 Sections. If more than single type is specified for listed applications, selection is Installer's option.

B. Equipment Nameplates: Metal permanently fastened to equipment with data engraved or stamped.
   1. Data: Manufacturer, product name, model number, serial number, capacity, operating and power characteristics, labels of tested compliances, and essential data.
   2. Location: Accessible and visible.

Do not specify marker below for hot, 125 deg F (52 deg C), noninsulated pipe systems.

C. Snap-on Plastic Pipe Markers: Manufacturer's standard preprinted, semirigid, snap-on type. Include color-coding according to ASME A13.1, unless otherwise indicated.

D. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers, extending 360 degrees around pipe at each location.

E. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers, at least three times letter height and of length required for label.

F. Lettering: Manufacturer's standard preprinted captions as selected by Architect.

G. Plastic Tape: Manufacturer's standard color-coded, pressure-sensitive, self-adhesive vinyl tape, at least 3 mils thick.
   1. Width: 1-1/2 inches on pipes with OD, including insulation, less than 6 inches; 2-1/2 inches for larger pipes.
   2. Color: Comply with ASME A13.1, unless otherwise indicated.

H. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch sequenced numbers. Include 5/32-inch hole for fastener.
   1. Material: Valve manufacturer's standard solid plastic.
   2. Size: 1-1/2 inches in diameter, unless otherwise indicated.

I. Valve Tag Fasteners: Brass, wire-link or beaded chain; or brass S-hooks.

J. Engraved Plastic-Laminate Signs: ASTM D 709, Type I, cellulose, paper-base, phenolic-resin-laminate engraving stock; Grade ES-2, black surface, black phenolic core, with white melamine subcore, unless otherwise indicated. Fabricate in sizes required for message. Provide holes for mechanical fastening.
   1. Engraving: Engraver's standard letter style, of sizes and with terms to match equipment identification.
   2. Thickness: 1/8 inch, unless otherwise indicated.
   3. Thickness: 1/16 inch, for units up to 20 sq. in. or 8 inches in length, and 1/8 inch for larger units.
   4. Fasteners: Self-tapping, stainless-steel screws or contact-type permanent adhesive.

K. Plastic Equipment Markers: Manufacturer's standard laminated plastic, in the following color codes:
   1. Green: Cooling equipment and components.
   2. Yellow: Heating equipment and components.
   3. Brown: Energy reclamation equipment and components.
   4. Blue: Equipment and components that do not meet criteria above.
   5. Hazardous Equipment: Use colors and designs recommended by ASME A13.1.
   6. Terminology: Match schedules as closely as possible. Include the following:
      a. Name and plan number.
      b. Equipment service.
      c. Design capacity.
      d. Other design parameters such as pressure drop, entering and leaving conditions, and speed.
   7. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.

L. Plasticized Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with mat finish suitable for writing.
   1. Size: 3-1/4 by 5-5/8 inches.
   2. Fasteners: Brass grommets and wire.
   3. Nomenclature: Large-size primary caption such as DANGER, CAUTION, or DO NOT OPERATE.

M. Lettering and Graphics: Coordinate names, abbreviations, and other designations used in piped utility identification with corresponding designations indicated. Use numbers, letters, and terms indicated for proper identification, operation, and maintenance of piped utility systems and equipment.
   1. Multiple Systems: Identify individual system number and service if multiple systems of same name are indicated.

2.6 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.
   1. Characteristics: Post hardening, volume adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
   2. Design Mix: 5000-psi, 28-day compressive strength.
   3. Packaging: Premixed and factory packaged.

2.7 FLOWABLE FILL

A. Description: Low-strength-concrete, flowable-slurry mix.
   1. Cement: ASTM C 150, Type I, portland.
   2. Density: 115- to 145-lb/cu. ft..
   3. Aggregates: ASTM C 33, natural sand, fine and crushed gravel or stone, coarse.
   4. Admixture: ASTM C 618, fly-ash mineral.
   5. Water: Comply with ASTM C 94/C 94M.
   6. Strength: 100 to 200 psig at 28 days.

PART 3 - EXECUTION

3.1 DIELECTRIC FITTING APPLICATIONS

A. Dry Piping Systems: Connect piping of dissimilar metals with the following:
   1. NPS 2 and Smaller: Dielectric unions.
   2. NPS 2-1/2 to NPS 12: Dielectric flanges or dielectric flange kits.

B. Wet Piping Systems: Connect piping of dissimilar metals with the following:
   1. NPS 2 and Smaller: Dielectric couplings or dielectric nipples.
   2. NPS 2-1/2 to NPS 4: Dielectric nipples.
   3. NPS 2-1/2 to NPS 8: Dielectric nipples or dielectric flange kits.
   4. NPS 10 and NPS 12: Dielectric flange kits.

3.2 PIPING INSTALLATION

A. Install piping according to the following requirements and Division 33 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on the Coordination Drawings.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping to permit valve servicing.

E. Install piping at indicated slopes.

F. Install piping free of sags and bends.

G. Install fittings for changes in direction and branch connections.

H. Select system components with pressure rating equal to or greater than system operating pressure.

I. Sleeves are not required for core-drilled holes.

J. Permanent sleeves are not required for holes formed by removable PE sleeves.

K. Install sleeves for pipes passing through concrete and masonry walls and concrete floor and roof slabs.
   1. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors of equipment areas or other wet areas 2 inches above finished floor level.
   2. Install sleeves in new walls and slabs as new walls and slabs are constructed.
      a. Steel Pipe Sleeves: For pipes smaller than NPS 6.
      b. Steel Sheet Sleeves: For pipes NPS 6 and larger, penetrating gypsum-board partitions.

L. Verify final equipment locations for roughing-in.

M. Refer to equipment specifications in other Sections for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 33 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
   1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
   2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

E. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

G. Grooved Joints: Assemble joints with grooved-end pipe coupling with coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

H. Soldered Joints: Apply ASTM B 813 water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy (0.20 percent maximum lead content) complying with ASTM B 32.

I. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

J. Pressure-Sealed Joints: Assemble joints for plain-end copper tube and mechanical pressure seal fitting with proprietary crimping tool to according to fitting manufacturer's written instructions.

K. Plastic Piping Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
4. PVC Nonpressure Piping: Join according to ASTM D 2855.
5. PVC to ABS Nonpressure Transition Fittings: Join according to ASTM D 3138 Appendix.

L. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

M. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

N. Plastic Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.
1. Plain-End PE Pipe and Fittings: Use butt fusion.
2. Plain-End PE Pipe and Socket Fittings: Use socket fusion.

O. Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:
1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Install dielectric fittings at connections of dissimilar metal pipes.

3.5 EQUIPMENT INSTALLATION

A. Install equipment level and plumb, unless otherwise indicated.

B. Install equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference with other installations. Extend grease fittings to an accessible location.

C. Install equipment to allow right of way to piping systems installed at required slope.

3.6 PAINTING

A. Painting of piped utility systems, equipment, and components is specified in Division 09 painting Sections.

B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 IDENTIFICATION

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.
   1. Plastic markers, with application systems. Install on insulation segment if required for hot noninsulated piping.
   2. Locate pipe markers on exposed piping according to the following:
      a. Near each valve and control device.
      b. Near each branch, excluding short takeoffs for equipment and terminal units. Mark each pipe at branch if flow pattern is not obvious.
      c. Near locations where pipes pass through walls or floors or enter inaccessible enclosures.
      d. At manholes and similar access points that permit view of concealed piping.
      e. Near major equipment items and other points of origination and termination.

B. Equipment: Install engraved plastic-laminate sign or equipment marker on or near each major item of equipment.
   1. Lettering Size: Minimum 1/4 inch high for name of unit if viewing distance is less than 24 inches, 1/2 inch high for distances up to 72 inches, and proportionately larger lettering for greater distances. Provide secondary lettering two-thirds to three-fourths of size of principal lettering.
   2. Text of Signs: Provide name of identified unit. Include text to distinguish among multiple units, inform user of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations.

C. Adjusting: Relocate identifying devices that become visually blocked by work of this or other Divisions.

3.8 CONCRETE BASES

Coordinate paragraph and subparagraphs below with Division 33 Sections specifying equipment. Indicate dowel rod quantity, size, and spacing on Drawings.

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.
   1. Construct concrete bases of dimensions indicated, but not less than 4 inches larger in both directions than supported unit.
   2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of base.
   3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
   4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   5. Install anchor bolts to elevations required for proper attachment to supported equipment.
   6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
   7. Use 3000-psi, 28-day compressive-strength concrete and reinforcement as specified in Division 03 concrete section.

3.9 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor piped utility materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

3.10 GROUTING

A. Mix and install grout for equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 330500

SECTION 331000 - WATER UTILITIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes water-distribution piping and related components outside the building for water service and fire-service mains.

B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.3 DEFINITIONS

A. EPDM: Ethylene propylene diene terpolymer rubber.

B. PVC: Polyvinyl chloride plastic.

C. RTRF: Reinforced thermosetting resin (fiberglass) fittings.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.
   1. Wiring Diagrams: Power, signal, and control wiring for alarms.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.

B. Field quality-control test reports.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
   2. Comply with standards of authorities having jurisdiction for potable-water-service piping, including materials, installation, testing, and disinfection.
   3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. Comply with ASTM F 645 for selection, design, and installation of thermoplastic water piping.

E. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.

F. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

G. NSF Compliance:
   1. Comply with NSF 14 for plastic potable-water-service piping. Include marking "NSF-pw" on piping.
   2. Comply with NSF 61 Annex G for materials for water-service piping and specialties for domestic water.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:
   1. Ensure that valves are dry and internally protected against rust and corrosion.
   2. Protect valves against damage to threaded ends and flange faces.
   3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:
   1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
   2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

G. Store plastic piping protected from direct sunlight. Support to prevent sagging and bending.

1.9 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water-distribution service according to requirements indicated:
   1. Notify Architect and Owner no fewer than two days in advance of proposed interruption of service.
   2. Do not proceed with interruption of water-distribution service without Architect's and Owner's written permission.

1.10 COORDINATION

A. Coordinate connection to water main with utility company.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Soft Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L, water tube, annealed temper.
   1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

B. Hard Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L, water tube, drawn temper.
   1. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

C. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.

D. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.2 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
   1. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
   2. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.
   1. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
   2. Gaskets: AWWA C111, rubber.

C. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, rounded-grooved ends.
   1. Grooved-End, Ductile-Iron Pipe Appurtenances:
      a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         1) Anvil International.
         2) Victaulic Company.
      b. Grooved-End, Ductile-Iron Fittings: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron castings with dimensions matching pipe.
      c. Grooved-End, Ductile-Iron-Piping Couplings: AWWA C606, for ductile-iron-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

D. Flanges: ASME 16.1, Class 125, cast iron.

2.3 PVC PIPE AND FITTINGS

A. PVC, Schedule 40 Pipe: ASTM D 1785.
   1. PVC, Schedule 40 Socket Fittings: ASTM D 2466.

B. PVC, AWWA Pipe: AWWA C900, Class 150 and Class 200, with bell end with gasket, and with spigot end.
   1. Comply with UL 1285 for fire-service mains if indicated.
   2. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

2.4 SPECIAL PIPE FITTINGS

A. Ductile-Iron Deflection Fittings:

1. Description: Compound, ductile-iron coupling fitting with sleeve and 1 or 2 flexing sections for up to 15-degree deflection, gaskets, and restrained-joint ends complying with AWWA C110 or AWWA C153. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
   a. Pressure Rating: 250 psig minimum.

2.5 JOINING MATERIALS

A. Refer to Section 330500 "Common Work Results for Utilities" for commonly used joining materials.

B. Brazing Filler Metals: AWS A5.8, BCuP Series.

C. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.6 PIPING SPECIALTIES

A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

B. Split-Sleeve Pipe Couplings:
   1. Manufacturers: Subject to compliance with requirements, provide products by the following:
      a. Victaulic Company.
   2. Description: Metal, bolted, split-sleeve-type, reducing or transition coupling with sealing pad and closure plates, O-ring gaskets, and bolt fasteners.
      a. Standard: AWWA C219.
      b. Sleeve Material: Stainless steel.
      c. Sleeve Dimensions: Of thickness and width required to provide pressure rating.
      d. Gasket Material: O-rings made of EPDM rubber, unless otherwise indicated.
      e. Pressure Rating: 200 psig minimum.
      f. Metal Component Finish: Corrosion-resistant coating or material.

C. Flexible Connectors:
   1. Nonferrous-Metal Piping: Bronze hose covered with bronze wire braid; with copper-tube, pressure-type, solder-joint ends or bronze flanged ends brazed to hose.
   2. Ferrous-Metal Piping: Stainless-steel hose covered with stainless-steel wire braid; with ASME B1.20.1, threaded steel pipe nipples or ASME B16.5, steel pipe flanges welded to hose.

2.7 GATE VALVES

A. AWWA, Cast-Iron Gate Valves:
   1. Nonrising-Stem, Metal-Seated Gate Valves:
      a. Description: Gray- or ductile-iron body and bonnet; with cast-iron or bronze double-disc gate, bronze gate rings, bronze stem, and stem nut.

1) Standard: AWWA C500.
2) Minimum Pressure Rating: 200 psig.
3) End Connections: Mechanical joint.
4) Interior Coating: Complying with AWWA C550.

2. Nonrising-Stem, Resilient-Seated Gate Valves:
   a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.
      1) Standard: AWWA C509.
      2) Minimum Pressure Rating: 200 psig.
      3) End Connections: Mechanical joint.
      4) Interior Coating: Complying with AWWA C550.
3. OS&Y, Rising-Stem, Resilient-Seated Gate Valves:
   a. Description: Cast- or ductile-iron body and bonnet, with bronze or gray- or ductile-iron gate, resilient seats, and bronze stem.
      1) Standard: AWWA C509.
      2) Minimum Pressure Rating: 200 psig.
      3) End Connections: Flanged.

B. UL/FMG, Cast-Iron Gate Valves:
1. UL/FMG, Nonrising-Stem Gate Valves:
   a. Description: Iron body and bonnet with flange for indicator post, bronze seating material, and inside screw.
      1) Standards: UL 262 and FMG approved.
      2) Minimum Pressure Rating: 175 psig.
      3) End Connections: Flanged.

C. Bronze Gate Valves:
1. Nonrising-Stem Gate Valves:
   a. Description: Class 125, Type 1, bronze with solid wedge, threaded ends, and malleable-iron handwheel.
      1) Standard: MSS SP-80.

2.8 BALL VALVES

A. Two-Piece, Bronze Ball Valves with Full Port, and Bronze or Brass Trim:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Industries, LLC; Wilkins; Model 850XL (Lead Free) or comparable product by one of the following:
   a. Milwaukee Valve Company.
   b. NIBCO INC.
2. Description:
   a. Standard: MSS SP-110.
   b. CWP Rating: 600 psig (4140 kPa).
   c. Body Design: Two piece.
   d. Body Material: Bronze.
   e. Ends: Soldered.
   f. Seats: PTFE.
   g. Stem: Bronze or brass.
   h. Ball: Chrome-plated brass.

i. Port: Full.
j. Class: 125.

B. Two-Piece, Bronze Ball Valves with Full Port and Stainless-Steel Trim:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Zurn Industries, LLC; Wilkins or comparable product by one of the following:
a. Conbraco Industries, Inc.; Apollo Valves.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Hammond Valve.
d. Lance Valves; a division of Advanced Thermal Systems, Inc.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
a. Standard: MSS SP-110.
b. CWP Rating: 600 psig (4140 kPa).
c. Body Design: Two piece.
d. Body Material: Bronze.
e. Ends: Soldered.
f. Seats: PTFE.
g. Stem: Stainless steel.
h. Ball: Stainless steel, vented.
i. Port: Full.
j. Class: 125.

2.9 CHECK VALVES

A. AWWA Check Valves:
1. Description: Swing-check type with resilient seat. Include interior coating according to AWWA C550 and ends to match piping.
a. Standard: AWWA C508.
b. Pressure Rating: 175 psig.

B. UL/FMG, Check Valves:
1. Description: Swing-check type with pressure rating; rubber-face checks, unless otherwise indicated; and ends matching piping.
a. Standards: UL 312 and FMG approved.
b. Pressure Rating: 175 psig.

2.10 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:
1. Description: Sleeve and valve compatible with drilling machine.
a. Standard: MSS SP-60.
b. Tapping Sleeve: Cast- or ductile-iron or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Include sleeve matching size and type of pipe material being tapped and with recessed flange for branch valve.

c. Valve: AWWA, cast-iron, nonrising-stem, resilient-seated gate valve with one raised face flange mating tapping-sleeve flange.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER" for domestic and “FIRE” for fire protection, and bottom section with base that fits over valve and with a barrel approximately 5 inches in diameter.
1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.
2. Valve boxes on fire protection valves shall be lockable.

C. Indicator Posts: UL 789, FMG-approved, vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.

2.11 WATER METERS

A. Water meters will be furnished by the utility.

2.12 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:
1. Standard: ASSE 1013 or AWWA C511.
2. Operation: Continuous-pressure applications.
3. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
4. Size: As indicated on Drawings.
5. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
7. Configuration: Designed for vertical inlet, horizontal center section, and vertical outlet flow.
8. Accessories:
a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 and smaller; OS&Y gate type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.
b. Air-Gap Fitting: ASME A112.1.2, matching backflow preventer connection.

B. Backflow Preventer Test Kits:
1. Description: Factory calibrated, with gages, fittings, hoses, and carrying case with test-procedure instructions.

2.13 CONCRETE VAULTS

A. Description: Precast, reinforced-concrete vault, designed for A-16 load designation according to ASTM C 857 and made according to ASTM C 858.
1. Ladder: ASTM A 36/A 36M, steel or polyethylene-encased steel steps.
2. Manhole: ASTM A 48/A 48M Class No. 35A minimum tensile strength, gray-iron traffic frame and cover.
a. Dimension: 24-inch minimum diameter, unless otherwise indicated.

3. Manhole: ASTM A 536, Grade 60-40-18, ductile-iron traffic frame and cover.
   a. Dimension: 24-inch-minimum diameter, unless otherwise indicated.
4. Drain: ASME A112.6.3, cast-iron floor drain with outlet of size indicated. Include body anchor flange, light-duty cast-iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.

2.14 PROTECTIVE ENCLOSURES

A. Freeze-Protection Enclosures:
   1. Description: Insulated enclosure designed to protect aboveground water piping, equipment, or specialties from freezing and damage, with heat source to maintain minimum internal temperature of 40 deg F when external temperatures reach as low as minus 34 deg F.
      a. Standard: ASSE 1060.
      b. Class I: For equipment or devices other than pressure or atmospheric vacuum breakers.
      c. Class I-V: For pressure or atmospheric vacuum breaker equipment or devices. Include drain opening in housing.
         1) Housing: Reinforced-aluminum or -fiberglass construction.
            a) Size: Of dimensions indicated, but not less than those required for access and service of protected unit.
            b) Drain opening for units with drain connection.
            c) Access doors with locking devices.
            d) Insulation inside housing.
            e) Anchoring devices for attaching housing to concrete base.
         2) Electric heating cable or heater with self-limiting temperature control.

B. Weather-Resistant Enclosures:
   1. Description: Uninsulated enclosure designed to protect aboveground water piping, equipment, or specialties from weather and damage.
      a. Standard: ASSE 1060.
      b. Class III: For equipment or devices other than pressure or atmospheric vacuum breakers.
      c. Class III-V: For pressure or atmospheric vacuum breaker equipment or devices. Include drain opening in housing.
         1) Housing: Reinforced-aluminum or -fiberglass construction.
            a) Size: Of dimensions indicated, but not less than those required for access and service of protected unit.
            b) Drain opening for units with drain connection.
            c) Access doors with locking devices.
            d) Anchoring devices for attaching housing to concrete base.

C. Enclosure Bases:
   1. Description: 4-inch- minimum thickness precast concrete, of dimensions required to extend at least 6 inches beyond edges of enclosure housings. Include openings for piping.

2.15 FIRE HYDRANTS

A. Dry-Barrel Fire Hydrants:
   1. Description: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets, 5-1/4-inch main valve, drain valve, and NPS 6 mechanical-joint inlet. Hydrant shall have cast-iron body, compression-type valve opening against pressure and closing with pressure.
      a. Standards: UL 246, FMG approved.
      b. Pressure Rating: 150 psig minimum.
      c. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
      d. Operating and Cap Nuts: Pentagon, 1-1/2 inches point to flat.
      e. Direction of Opening: Open hydrant valve by turning operating nut to left or counterclockwise.
      f. Exterior Finish: Red alkyd-gloss enamel paint, unless otherwise indicated.

2.16 FIRE DEPARTMENT CONNECTIONS

A. Fire Department Connections:
   1. Description: Freestanding, with cast-bronze body, thread inlets according to NFPA 1963 and matching local fire department hose threads, and threaded bottom outlet. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch-high brass sleeve; and round escutcheon plate.
      a. Standard: UL 405.
      b. Connections: Two NPS 2-1/2 inlets and one NPS 6 outlet.
      c. Inlet Alignment: Inline, horizontal.
      d. Finish Including Sleeve: Polished chrome-plated.
      e. Escutcheon Plate Marking: "FDC."
      f. Knox box caps required on FDC’s

2.17 ALARM DEVICES

A. Alarm Devices, General: UL 753 and FMG approved, of types and sizes to mate and match piping and equipment.

B. Supervisory Switches: Single pole, double throw; designed to signal valve in other than fully open position.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. General: Use pipe, fittings, and joining methods for piping systems according to the following applications.

B. Transition couplings and special fittings with pressure ratings at least equal to piping pressure rating may be used, unless otherwise indicated.

C. Do not use flanges or unions for underground piping.

D. Flanges, unions, grooved-end-pipe couplings, and special fittings may be used, instead of joints indicated, on aboveground piping and piping in vaults.

E. Underground water-service piping NPS 3/4 to NPS 3 shall be any of the following:
1. Soft copper tube, ASTM B 88, Type K ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
2. PVC, Schedule 40 pipe; PVC, Schedule 40 socket fittings; and solvent-cemented joints.

F. Underground water-service piping NPS 4 to NPS 8 shall be any of the following:
1. Ductile-iron, push-on-joint pipe; ductile-iron, push-on-joint fittings; and gasketed mechanical-joint pipe; ductile-iron, mechanical-joint fittings; and mechanical joints.
2. PE, AWWA pipe; PE, AWWA fittings; and heat-fusion joints.
3. PVC, Schedule 40 pipe; PVC, Schedule 40 socket fittings; and solvent-cemented joints.
4. NPS 8: PVC, AWWA Class 200 pipe; mechanical-joint, ductile-iron fittings; and gasketed joints.

G. Aboveground and Vault Water-Service Piping NPS 3/4 to NPS 3 shall be any of the following:
1. Hard copper tube, ASTM B 88, Type K ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.

H. Aboveground and vault water-service piping NPS 4 to NPS 8 shall be any of the following:
1. Ductile-iron, grooved-end pipe; ductile-iron, grooved-end appurtenances; and grooved joints.

I. Underground Fire-Service-Main Piping NPS 4 to NPS 12 shall be any of the following:
1. Ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.
2. PVC, AWWA Class 200 pipe listed for fire-protection service; PVC Class 200 fabricated fittings; and gasketed joints.

J. Aboveground and Vault Fire-Service-Main Piping NPS 4 to NPS 12 shall be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

K. Aboveground and Vault Combined Water Service and Fire-Service-Main Piping NPS 6 to NPS 12 shall be ductile-iron, grooved-end pipe; ductile-iron-pipe appurtenances; and grooved joints.

3.3 VALVE APPLICATIONS

A. General Application: Use mechanical-joint-end valves for NPS 3 and larger underground installation. Use threaded- or flanged-end valves for installation in vaults. Use UL/FMG, nonrising-stem gate valves for installation with indicator posts. Use corporation valves and curb valves with ends compatible with piping, for NPS 2 and smaller installation.

B. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
   1. Underground Valves, NPS 3 and Larger: AWWA, cast-iron, nonrising-stem, resilient-seated gate valves with valve box.
   2. Underground Valves, NPS 4 and Larger, for Indicator Posts: UL/FMG, cast-iron, nonrising-stem gate valves with indicator post.
   3. Use the following for valves in vaults and aboveground:
      a. Gate Valves, NPS 2 and Smaller: Bronze, nonrising stem.
      b. Gate Valves, NPS 3 and Larger: AWWA, cast iron, OS&Y rising stem, resilient seated UL/FMG, cast iron, OS&Y rising stem.
      c. Check Valves: AWWA C508 UL/FMG, swing type.
   4. Pressure-Reducing Valves: Use for water-service piping in vaults and aboveground to control water pressure.
   5. Relief Valves: Use for water-service piping in vaults and aboveground.
      a. Air-Release Valves: To release accumulated air.
      b. Air/Vacuum Valves: To release or admit large volume of air during filling of piping.
      c. Combination Air Valves: To release or admit air.
   6. Detector Check Valves: Use for water-service piping in vaults and aboveground to detect unauthorized use of water.

3.4 PIPING SYSTEMS - COMMON REQUIREMENTS

A. See Section 330500 "Common Work Results for Utilities" for piping-system common requirements.

3.5 PIPING INSTALLATION

A. Water-Main Connection: Arrange with utility company for tap of size and in location indicated in water main.

B. Make connections larger than NPS 2 with tapping machine according to the following:
   1. Install tapping sleeve and tapping valve according to MSS SP-60.
   2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
   3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
   4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.

C. Make connections NPS 2 and smaller with drilling machine according to the following:

1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company standards.
2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
4. Install corporation valves into service-saddle assemblies.
5. Install manifold for multiple taps in water main.
6. Install curb valve in water-service piping with head pointing up and with service box.

D. Comply with NFPA 24 for fire-service-main piping materials and installation.
1. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

E. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

F. Install PVC, AWWA pipe according to ASTM F 645 and AWWA M23.

G. Bury piping with depth of cover over top at least 30 inches, with top at least 12 inches below level of maximum frost penetration, and according to the following:
1. Under Driveways: With at least 36 inches cover over top.

H. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.

I. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.
1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.

J. Sleeves are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

K. Mechanical sleeve seals are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

L. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

M. See Section 211200 "Fire-Suppression Standpipes," Section 211313 "Wet-Pipe Sprinkler Systems," and Section 211316 "Dry-Pipe Sprinkler Systems" for fire-suppression-water piping inside the building.

N. See Section 221116 "Domestic Water Piping" for potable-water piping inside the building.

3.6 JOINT CONSTRUCTION

A. See Section 330500 "Common Work Results for Utilities" for basic piping joint construction.

B. Make pipe joints according to the following:

1. Ductile-Iron Piping, Gasketed Joints for Water-Service Piping: AWWA C600 and AWWA M41.
2. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.
3. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts according to coupling manufacturer's written instructions.
4. PVC Piping Gasketed Joints: Use joining materials according to AWWA C900. Construct joints with elastomeric seals and lubricant according to ASTM D 2774 or ASTM D 3139 and pipe manufacturer's written instructions.
5. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
    a. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
    b. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.
    c. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.7 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:
    1. Concrete thrust blocks.
    2. Locking mechanical joints.
    3. Set-screw mechanical retainer glands.
    4. Bolted flanged joints.
    5. Pipe clamps and tie rods.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:
    1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.
    2. Gasketed-Joint, PVC Water-Service Piping: According to AWWA M23.
    3. Fire-Service-Main Piping: According to NFPA 24.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.8 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. AWWA Valves Other Than Gate Valves: Comply with AWWA C600 and AWWA M44.

C. UL/FMG, Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.

D. UL/FMG, Valves Other Than Gate Valves: Comply with NFPA 24.

E. MSS Valves: Install as component of connected piping system.

3.9 BACKFLOW PREVENTER INSTALLATION

A. Install backflow preventers of type, size, and capacity indicated. Include valves and test cocks. Install according to requirements of plumbing and health department and authorities having jurisdiction.

B. Do not install backflow preventers that have relief drain in vault or in other spaces subject to flooding.

C. Do not install bypass piping around backflow preventers.

D. Support NPS 2-1/2 and larger backflow preventers, valves, and piping near floor and on brick or concrete piers.

3.10 CONCRETE VAULT INSTALLATION

A. Install precast concrete vaults according to ASTM C 891.

3.11 PROTECTIVE ENCLOSURE INSTALLATION

A. Install concrete base level and with top approximately 2 inches above grade.

B. Install protective enclosure over valves and equipment.

C. Anchor protective enclosure to concrete base.

3.12 FIRE HYDRANT INSTALLATION

A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.

B. AWWA Fire Hydrants: Comply with AWWA M17.

C. UL/FMG Fire Hydrants: Comply with NFPA 24.

3.13 FIRE DEPARTMENT CONNECTION INSTALLATION

A. Install ball drip valves at each check valve for fire department connection to mains.

B. Install protective pipe bollards on two sides of each fire department connection. Pipe bollards are specified in Section 055000 "Metal Fabrications."

3.14 ALARM DEVICE INSTALLATION

A. General: Comply with NFPA 24 for devices and methods of valve supervision. Underground valves with valve box do not require supervision.

B. Supervisory Switches: Supervise valves in open position.
   1. Valves: Grind away portion of exposed valve stem. Bolt switch, with plunger in stem depression, to OS&Y gate-valve yoke.
   2. Indicator Posts: Drill and thread hole in upper-barrel section at target plate. Install switch, with toggle against target plate, on barrel of indicator post.

C. Locking and Sealing: Secure unsupervised valves as follows:
   1. Valves: Install chain and padlock on open OS&Y gate valve.
   2. Post Indicators: Install padlock on wrench on indicator post.

D. Pressure Switches: Drill and thread hole in exposed barrel of fire hydrant. Install switch.

E. Connect alarm devices to building fire alarm system. Wiring and fire-alarm devices are specified in Section 283111 "Digital, Addressable Fire-Alarm System" and Section 283112 "Zoned (DC Loop) Fire-Alarm System."

3.15 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. See Section 330500 "Common Work Results for Utilities" for piping connections to valves and equipment.

C. Connect water-distribution piping to utility water main provided by utility.

D. Connect water-distribution piping to interior domestic water and fire-suppression piping.

E. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

F. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.16 FIELD QUALITY CONTROL

A. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

B. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours.
   1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for 1 hour; decrease to 0 psig. Slowly increase again to test pressure and hold for 1 more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

C. Prepare reports of testing activities.

3.17 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Section 312000 "Earth Moving."

B. Permanently attach equipment nameplate or marker indicating plastic water-service piping, on main electrical meter panel. See Section 330500 "Common Work Results for Utilities" for identifying devices.

C. Paint valve box covers in accordance with Authority Having Jurisdiction's requirements.
   1. Domestic Water: Blue
   2. Fire Protection Water: Red

3.18 CLEANING

A. Clean and disinfect water-distribution piping as follows:
   1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
   2. Use purging and disinfecting procedure for fire-protection water piping not connected to potable water supply prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
   3. Use purging and disinfecting procedure for water distribution piping connected to potable water supply prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:
      a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
      b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for 3 hours.
      c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
      d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

END OF SECTION 331415

SECTION 334200 - STORMWATER CONVEYANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes gravity-flow, nonpressure storm drainage outside the building, with the following components:
   1. Special fittings for expansion and deflection.
   2. Backwater valves.
   3. Cleanouts.
   4. Drains.
   5. Corrosion-protection piping encasement.
   6. Precast concrete manholes.

1.3 DEFINITIONS

A. FRP: Fiberglass-reinforced plastic.

B. LLDPE: Linear low-density, polyethylene plastic.

C. PE: Polyethylene plastic.

D. PVC: Polyvinyl chloride plastic.

1.4 ACTION SUBMITTALS

A. Product Data: For the following:
   1. Special pipe fittings.
   2. Backwater valves.
   3. Drains.
   4. Channel drainage systems.
   5. Storage and leaching chambers.

B. Shop Drawings: For the following:
   1. Manholes: Include plans, elevations, sections, details, and frames and covers.
   2. Catch Basins and Stormwater Inlets. Include plans, elevations, sections, details, and frames, covers, and grates.
   3. Stormwater Detention Structures: Include plans, elevations, sections, details, frames and covers, design calculations, and concrete design-mix report.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic pipe, and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

D. Handle catch basins and stormwater inlets according to manufacturer's written rigging instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:
   1. Polymer-Concrete, Channel Drainage Systems:
      a. MEA Josam.-U1020.0 channel.
      b. Sports Edge-Pro Channel
      c. ACO SPORTS.-4020 Channel.
   2. Gray-Iron Backwater Valves, Cleanouts, and Drains:
      a. Josam Co.
      b. BarryCraft
      c. McWane, Inc.; Tyler Pipe; Wade Div.
      d. MIFAB
      e. Smith: Jay R. Smith Mfg. Co.
      f. Watts Industries, Inc.: Ancon Drain Div.
      g. Watts Industries, Inc. Enpoco, Inc. Div.
      h. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.
   3. PVC Backwater Valves and Cleanouts:
      a. Canplas, Inc.
      b. IPS Corp.
      c. NDS, Inc.
      d. Plastic Oddities, Inc.
      e. Sioux Chief Manufacturing Co., Inc.
   4. Stormwater Drainage Systems:
      a. Advanced Drainage Systems, Inc.
      b. Cultec, Inc.
      c. Hancor, Inc.
      d. Infiltrator Systems, Inc.
      e. PSA, Inc.
      f. Poly Drain #610 wire trash bucket.
   5. Plastic Cleanouts:
      a. Canplas LLC.
      b. IPS Corporation.
      c. NDS Inc.
      d. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.

e. Sioux Chief Manufacturing Company, Inc.
f. Zurn Light Commercial Products Operation; Zurn Plumbing Products Group.

2.2 PERFORMANCE REQUIREMENTS

A. Gravity-Flow, Nonpressure, Drainage-Piping Pressure Rating: Drainage-Piping Pressure Rating: **10-foot head of water**

B. Pipe joints shall be silttight.

2.3 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, fitting, and joining materials.

2.4 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74 Extra-Heavy classes.

B. Gaskets: ASTM C 564, rubber.

2.5 PE PIPE AND FITTINGS

A. Corrugated PE Drainage Pipe and Fittings NPS 10 and Smaller: AASHTO M 252M, Type S, with smooth waterway for coupling joints.
1. Silttight Couplings: PE sleeve with ASTM D 1056, Type 2, Class A, Grade 2 gasket material that mates with tube and fittings.

2.6 PVC PIPE AND FITTINGS

A. PVC Sewer Pipe and Fittings, NPS 15 and Smaller: ASTM D 3034, SDR 35 with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

B. PVC Sewer Pipe and Fittings, NPS 18 and Larger: ASTM F 679, PS45, with bell-and-spigot ends for gasketed joints with ASTM F 477, elastomeric seals.

2.7 CONCRETE PIPE AND FITTINGS

A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76, with groove and tongue ends and **gasketed joints** with ASTM C 443, rubber gaskets.

Retain paragraph above for installations requiring watertight joints. Retain paragraph below for installations requiring soiltight-only joints. Below is more common.

B. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C 76, with groove and tongue ends and **sealant joints** with ASTM C 990, bitumen or butyl-rubber sealant.

1. Class III, Wall B or C.
2. Class IV, Wall C under areas subject to traffic and where indicated.

2.8 NONPRESSURE-TYPE PIPE COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. Sleeve Materials:
1. For Concrete Pipes: ASTM C 443, rubber.
2. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
3. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
4. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

C. Unshielded Flexible Couplings: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Ring-Type Flexible Couplings: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

2.9 CLEANOUTS

A. PVC Cleanouts: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.10 DRAINS

A. Gray-Iron Area Drains: ASME A112.21.1M, round body with anchor flange and round secured grate. Include bottom outlet with inside calk or spigot connection, of sizes indicated.
1. Top-Loading Classification(s): Medium duty.
2. Top-Loading Classification(s): Heavy duty, at areas subject to traffic and where indicated.

B. Gray-Iron Trench Drains: ASME A112.21.1M, 6-inch- wide top surface, rectangular body with anchor flange or other anchoring device, and rectangular secured grate. Include units of total length indicated and number of bottom outlets with inside calk or spigot connections, of sizes indicated.
1. Top-Loading Classification(s): Extra-heavy duty.

2.11 CORROSION-PROTECTION PIPING ENCASEMENT

A. Encasement for Underground Metal Piping: ASTM A 674 or AWWA C105.
1. Form: Sheet or tube.

2. Material: LLDPE film of 0.008-inch minimum thickness or high-density, crosslaminated PE film of 0.004-inch minimum thickness.

2.12 MANHOLES

A. Standard Precast Concrete Manholes: ASTM C 478 precast, reinforced concrete, designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints. Concrete manholes used in vehicular travel ways shall have pipe penetrations and gasket connections fabricated in the factory. All openings around pipe shall be securely mortared in and watertight. Comply with NCDOT Specifications.
   1. Diameter: 48 inches minimum, unless otherwise indicated.
   2. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
   3. Base Section: 6-inch minimum thickness for floor slab and 4-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
   4. Riser Sections: 4-inch minimum thickness, and lengths to provide depth indicated.
   5. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
   6. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
   7. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
   8. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 inches.
   9. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and diameter matching manhole frame and cover. Include sealant recommended by ring manufacturer.
   10. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, to match diameter of manhole frame and cover.
   11. Manhole Frames and Covers: Ferrous; 24-inch ID by 7- to 9-inch riser with 4-inch-minimum width flange and 26-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "STORM SEWER."
      a. Material: ASTM A 536, Grade 60-40-18 ductile iron, unless otherwise indicated.

2.13 CONCRETE

A. General: Cast-in-place concrete according to ACI 318/318R, ACI 350R, and the following:
   1. Cement: ASTM C 150, Type II.
   2. Fine Aggregate: ASTM C 33, sand.
   3. Coarse Aggregate: ASTM C 33, crushed gravel.
   4. Water: Potable.

B. Portland Cement Design Mix: 4000 psi minimum, with 0.45 maximum water-cementitious materials ratio.
   1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
   2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

C. Ballast and Pipe Supports: Portland cement design mix, 3000 psi minimum, with 0.58 maximum water-cementitious materials ratio.
   1. Reinforcement Fabric: ASTM A 185, steel, welded wire fabric, plain.
   2. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed steel.

2.14 CATCH BASINS

A. Standard Precast Concrete Catch Basins: ASTM C 478 precast, reinforced concrete, designed according to ASTM C 890 for A-16, heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for rubber gasketed joints. Concrete manholes used in vehicular travel ways should have pipe penetrations and gasket connections fabricated in the factory. All openings around pipe shall be securely mortared in and watertight. Comply with NCDOT Specifications.
   1. Base Section: 6-inch minimum thickness for floor slab and 6-inch minimum thickness for walls and base riser section, and having separate base slab or base section with integral floor.
   2. Riser Sections: 6-inch minimum thickness, and lengths to provide depth indicated.
   3. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
   4. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
   5. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
   6. Grade Rings: Include 2 or 3 reinforced-concrete rings, of 6- to 9-inch total thickness, that match frame and grate dimensions.
   7. Steps: Individual FRP steps, wide enough to allow worker to place both feet on 1 step and designed to prevent lateral slippage off of step. Cast or anchor steps into sidewalls at 12- to 16-inch intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 inches.
   8. Pipe Connectors: ASTM C 923, resilient, of size required, for each pipe connecting to base section.

B. Frames and Grates: ASTM A 536, Grade 60-40-18, ductile iron designed for A-16, structural loading. Include flat grate with small square or short-slotted drainage openings.
   1. Size: 24 by 24 inches minimum, unless otherwise indicated.
   2. Grate Free Area: Approximately 50 percent, unless otherwise indicated.

2.15 STORMWATER INLETS

A. Curb Inlets: Made with vertical curb opening, of materials and dimensions according to utility standards.

B. Gutter Inlets: Made with horizontal gutter opening, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.

C. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions according to utility standards. Include heavy-duty frames and grates.

D. Frames and Grates: Heavy-duty frames and grates according to utility standards.

E. Curb Inlets: Vertical curb opening, of materials and dimensions indicated.

F. Gutter Inlets: Horizontal gutter opening, of materials and dimensions indicated. Include heavy-duty frames and grates.

G. Combination Inlets: Vertical curb and horizontal gutter openings, of materials and dimensions indicated. Include heavy-duty frames and grates.

H. Frames and Grates: Dimensions, opening pattern, free area, and other attributes indicated.

2.16 PIPE OUTLETS

A. Head Walls: Cast-in-place reinforced concrete or precast concrete, with apron and tapered sides.

B. Flared End Sections: Performed, reinforced concrete flared end section. To meet requirements of Article 2.6 Concrete Pipe and Fittings.

C. Riprap Basins: Broken, irregular size and shape, graded stone according to NCDOT class designation indicated on plans.

2.17 POLYMER-CONCRETE, CHANNEL DRAINAGE SYSTEMS

A. General: Modular system of precast, polymer-concrete channel sections, grates and appurtenances; designed so grates fit into channel recesses without rocking or rattling. Include number of units required to form total lengths indicated.

B. Narrow-Width, Level-Invert, Polymer-Concrete Systems: Include the following components:
   1. Channel Sections: Interlocking-joint precast, modular units with end caps. Include 4” inside width and 8” minimum inside depth with level invert and NPS 4 (DN 100) outlets in number and locations indicated.
   2. Grates with slots or perforations that fit recesses in channels.
   3. Locking Mechanism: Manufacturer’s standard device for securing grates to channel sections.

C. Standard AIA Drainage Specialties: Precast, polymer-concrete units.
   1. Small catch basins: 19-20” long, 22-24” deep by approximately 6 inches (4” inside width) polymer-concrete body, with outlets in number and sizes indicated. Include galvanized slotted grate. Include a trash bucket with removable galvanized grating.
      a. Frame: Include gray-iron or steel frame for grate.

D. Supports, Anchor, and Setting Devices: Manufacturer’s standard, unless otherwise indicated.

E. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

F. Inlets designated on the drawings as “yard drains” shall be precast polymer concrete yard drains as manufactured by Polydrain, Inc. Troutman #610 with 6” outlets, cast iron frame, bolt down 19” x 12” grate and galvanized steel trash bucket, or approved equal. Zurn Flo-Thru trench drain system model Z886-ST with 8" min. channel depth and galvanized steel trench with slotted grates is also approved.

2.18 DOWNSPOUT ADAPTOR ASSEMBLY

A. Provide one assembly at each downspout
   1. 4 by 43-inch Downspout Adapter
      a. 1– 4” stainless steel downspout adaptor 4 x 4 unless otherwise required. Piedmont Pipe model 44-24 or approved equal
      b. All Stainless steel to be powder coated, standard colors - selection by architect / owner.
   2. 6 by 6-inch Downspout Adapter
      a. 1– 6” stainless steel downspout adaptor 6 x 6 unless otherwise required. Piedmont Pipe model 66-24 or approved equal.
      b. All Stainless steel to be powder coated, standard colors - selection by architect / owner.

2.19 MISCELLANEOUS MATERIALS

A. Paint: SSPC-Paint 16.

   1. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavation, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 PIPING APPLICATIONS

A. Pipe couplings and special pipe fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
   1. Use nonpressure-type flexible couplings where required to join gravity-flow, nonpressure sewer piping, unless otherwise indicated.
      a. Shielded flexible couplings for same or minor difference OD pipes.
      b. Unshielded, increaser/reducer-pattern, flexible couplings for pipes with different OD.
      c. Ring-type flexible couplings for piping of different sizes where annular space between smaller piping's OD and larger piping's ID permits installation.

B. Special Pipe Fittings: Use for pipe expansion and deflection. Pipe couplings and special pipe fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.

C. Gravity-Flow, Nonpressure Sewer Piping: Use the following pipe materials for each size range:
   1. NPS 4 to NPS 6: Hub-and-spigot, Extra-Heavy class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
   2. NPS 4 and NPS 18: Corrugated PE drainage pipe and fittings, silttight couplings, and coupled joints, for building subdrainage systems, unless otherwise indicated.
   3. NPS 4 and NPS 12: PVC sewer pipe and fittings, gaskets, and gasketed joints.
   4. NPS 12 to NPS 36: Reinforced-concrete sewer pipe and fittings, sealant, and sealant joints.
   5. NPS 42 to NPS 60: Reinforced-concrete sewer pipe and fittings, sealant, and sealant joints.
   6. NPS 66 to NPS 144: Reinforced-concrete sewer pipe and fittings, sealant, and sealant joints.

3.3 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Tunneling: Install pipe under streets or other obstructions that cannot be disturbed by tunneling, jacking, or a combination of both.

F. Install gravity-flow, nonpressure drainage piping according to the following:
   1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.
   2. Install minimum NPS 12 piping, unless otherwise indicated on Drawings.
   3. Install piping NPS 6 and larger with restrained joints at tee fittings and at changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place concrete supports or anchors.
   4. Install piping with 36-inch minimum cover.
   5. Install hub-and-spigot, cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook."

6. Install PE corrugated sewer piping according to CPPA's "Recommended Installation Practices for Corrugated Polyethylene Pipe and Fittings."
7. Install PVC sewer piping according to ASTM D 2321 and ASTM F 1668.
8. Install reinforced-concrete sewer piping according to ASTM C 1479 and ACPA's "Concrete Pipe Installation Manual."

G. Install corrosion-protection piping encasement over the following underground metal piping according to ASTM A 674 or AWWA C105:
1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Special pipe fittings.

3.4 STORM PIPE BEDDING

A. RCP – Lay gravity storm sewer lines with Category I, II or III bedding as per Design Data 40 by American Concrete Pipe Association. Compaction per Design Date 40, Type 3 installation. Class IA, IB and II per ASTM D321 may also be used. Class IA and IB must be used in wet conditions. Bedding material shall be placed on trench bottom 4 inch minimum depth. Haunching material to be Category I, II, or III, compaction per Type 3 Installation. Initial backfill from the top of the haunching material up to 12 inched above pipe top consisting of select finely divided earth, hand placed and compacted before placing the remaining backfill.

B. HDPE - Lay gravity storm sewer lines with Class IA, IB, or II bedding as per ASTM D321. Granular bedding material shall be loosely placed, firm but not hard, on trench bottom 6 inch minimum depth. Haunching shall be Class IA, IB or II material and extend up the sides of the pipe to at least ½ pipe outside diameter. Haunching material to be compacted at 90 percent STD proctor. Initial backfill from the top of the granular bedding material up to 12 inches above pipe top consisting of select finely divided earth, hand placed and compacted before placing the remaining backfill. Type IA and IB must be used in wet conditions.

3.5 PIPE JOINT CONSTRUCTION

A. Basic pipe joint construction is specified in Division 33 Section "Common Work Results for Utilities." Where specific joint construction is not indicated, follow piping manufacturer's written instructions.

B. Join gravity-flow, nonpressure drainage piping according to the following:
1. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
2. Join corrugated PE piping according to CPPA 100 and the following:
   a. Use silttight couplings for Type 1, silttight joints.
3. Join PVC sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric gasket joints.
4. Join reinforced-concrete sewer piping according to ACPA's "Concrete Pipe Installation Manual" for rubber-gasket joints.
5. Join dissimilar pipe materials with nonpressure-type flexible couplings.

C. Join dissimilar pipe materials with pressure-type couplings.

3.6 CLEANOUT INSTALLATION

A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
   1. Use medium-duty, top-loading classification cleanouts in earth and unpaved or paved foot-traffic areas.
   2. Use heavy-duty, top-loading classification cleanouts in vehicle-traffic service areas.
   3. Use extra-heavy-duty, top-loading classification cleanouts in roads areas.

B. Set cleanout frames and covers in earth in cast-in-place or precast concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding earth grade.

C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.

3.7 DRAIN INSTALLATION

A. Install type of drains in locations indicated.
   1. Use medium-duty, top-loading classification drains in earth and unpaved and paved foot-traffic areas.
   2. Use heavy-duty, top-loading classification drains in vehicle-traffic service areas.
   3. Use extra-heavy-duty, top-loading classification drains in roads areas.

B. Embed drains in 4-inch minimum depth of concrete around bottom and sides.

C. Fasten grates to drains if indicated.

D. Set drain frames and covers with tops flush with pavement surface.

E. Assemble trench sections with flanged joints.

F. Embed trench sections in 4-inch minimum concrete around bottom and sides.

3.8 MANHOLE INSTALLATION

A. General: Install manholes, complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections according to ASTM C 891.

C. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 2 inches above finished surface elsewhere, unless otherwise indicated.

3.9 CATCH BASIN INSTALLATION

A. Construct catch basins to sizes and shapes indicated.

B. Set frames and grates to elevations indicated.

3.10 STORMWATER INLET AND OUTLET INSTALLATION

A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

B. Construct riprap of broken stone, as indicated. The top of the riprap shall be install flush with the adjacent grade

C. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.

D. Construct energy dissipaters at outlets, as indicated.

3.11 CONCRETE PLACEMENT

A. Place cast-in-place concrete according to ACI 318/318R.

3.12 CONNECTIONS

A. Connect nonpressure, gravity-flow drainage piping in building's storm building drains specified in Division 22 Section "Facility Storm Drainage Piping."

3.13 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tape directly over piping and at outside edge of underground structures.
   1. Use warning tape or detectable warning tape over ferrous piping.
   2. Use detectable warning tape over nonferrous piping and over edges of underground structures.

3.14 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
   1. Submit separate reports for each system inspection.
   2. Defects requiring correction include the following:
      a. Alignment: Less than full diameter of inside of pipe is visible between structures.
      b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
      c. Crushed, broken, cracked, or otherwise damaged piping.
      d. Infiltration: Water leakage into piping.
      e. Exfiltration: Water leakage from or around piping.
   3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
   4. Reinspect and repeat procedure until results are satisfactory.
   5. HDPE Performance Assurance:

a. Upon completion of final backfill, all lines shall be checked for deflection by pulling a nine-point mandrel through the line or by taking diameter measurements (a minimum of 4 measurements space equal distance apart at each locations) at completion of final backfill and again at 11 months after installation. If diameter measurements are taken in lieu of pulling a mandrel, each pipe shall be measured at the joint and a distance of 1/3 the length from each end. Maximum allowable deflection shall be 5 percent. If any pipeline shall fail to pass the deflection test, the pipe shall be removed and replaced with new pipe at no expense to the Owner within the next 30 days. The new pipe shall be retested at completion of final backfill and 11 months. Contractor to perform testing with Owner's representative present. Re-rounding of installed pipe shall not be allowed.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
   1. Do not enclose, cover, or put into service before inspection and approval.
   2. Test completed piping systems according to authorities having jurisdiction.
   3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
   4. Submit separate report for each test.
   5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:
      a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
      b. Option: Test plastic piping according to ASTM F 1417.
      c. Option: Test concrete piping according to ASTM C 924.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.15 CLEANING

A. Clean interior of piping of dirt and superfluous materials. Flush with water.

END OF SECTION 334200

APPENDIX A

ASBESTOS CONTAINING MATERIALS SURVEY: PRE-RENOVATION

200 OREGON AVENUE
GREENWOOD, SOUTH CAROLINA 29646

Prepared For:
Greenwood Development, LLC
104 Maxwell Avenue
Greenwood, South Carolina 29646

BLE Project Number J23-20575-01

August 24, 2023

BUNNELL LAMMONS ENGINEERING
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TABLE OF CONTENTS

Tables

Appendices

1.0 INTRODUCTION

Bunnell-Lammons Engineering, Inc. (BLE) performed a Pre-Renovation Asbestos Containing Materials (ACM) Survey of the commercial building located at 200 Oregon Avenue in Greenwood, Greenwood County, South Carolina (herein referred to as the Site). This survey was performed in accordance with our Proposal No. P23-1162 dated July 14, 2023 and authorized by Ms. Lesley Lane of Greenwood Development, LLC.

On August 2, 2023, Mr. Brian Davis (SC Asbestos Inspector # BI-01648) performed the field survey of the Site. The building layout is depicted in Figure 1. The location of each sample collected is depicted in Figure 2 and Figure 3. The attached Table 1 describes each suspect ACM sampled, and Table 2 notes only those samples confirmed as ACM (>1% asbestos) or presumed to be asbestos containing.

2.0 SURVEY AREA

Survey Area	
Property Name / Occupant	200 Oregon Avenue / Unoccupied
Property Street Address	200 Oregon Avenue
County / City / State / Zip	Greenwood County, Greenwood, South Carolina 29646
Desc. of Survey Area(s)	Interior and exterior of the building, excluding the roof of the showroom, office area, and warehouse.
Date of Construction:	1909

3.0 METHODOLOGY

South Carolina Department of Health and Environmental Control (SCDHEC) Regulation R 61-86.1 states that "*prior to beginning a renovation or demolition operation at any facility, the facility owner and/or owner's representative shall ensure that an asbestos building inspection is performed to identify the presence of ACM*". In accordance with EPA's National Emission Standards for Hazardous Air Pollutants (NESHAPs), the "*owner or operator of a demolition or renovation activity and prior to commencement of the demolition or renovation will thoroughly inspect the affected facility or part of the facility where the demolition or renovation operation will occur for the presence of asbestos*". Certain residential dwellings are exempt may be exempt from State and Federal asbestos regulations. Prior to the demolition of any regulated facility in the State of South Carolina, written notification must be submitted to the SCDHEC at least 10 working days in advance even if a building inspector determines that asbestos is not present at the facility.

An asbestos containing material is defined as a "*material containing…. greater than one percent (1%) asbestos*".

In accordance with the foregoing, the field survey began with a visual inspection of the defined area planned for renovation by the certified building inspector(s). Suspect ACMs were grouped by the material homogeneity, which is defined as materials having uniform texture, color, and wear. A sampling strategy

was determined by the building inspector and bulk samples of suspect ACMs were collected for bulk laboratory analysis.

Samples were placed into individual sample containers, sealed, and clearly labeled. Samples were submitted under strict Chain-of-Custody to a certified laboratory for analysis. Samples were analyzed by a NIST accredited laboratory via Polarized Light Microscopy (PLM) via EPA Method 600/M4-82-020 per 40 CFR 763. Where applicable, non-friable organically bound materials that test <1% asbestos via PLM analysis were subsequently analyzed via Transmission Electron Microscopy (TEM) via TEM Chatfield method for confirmation purposes, in accordance SCDHEC R61-86.1.

4.0 SURVEY SUMMARY

The Site consists of one parcel of land improved with one (1) approximate 23,000-square-foot commercial building. The Site building generally consists of a showroom, office area, warehouse, storage area, and basement (See Figure 1). The building consists of brick masonry exterior walls. Foundations for the Site building include a crawl space for the showroom, a basement for the office area and warehouse, and a concrete slab-on-grade foundation for the western portion of the building.

BLE was unable to access the elevator shaft and locked room on the roof of the Site building. If renovation plans will disturb building materials in these areas, an asbestos survey will need to be performed to determine if ACMs are present.

This Pre-Renovation Asbestos Survey has been prepared to determine if ACM's are present in the planned renovation areas of the building. According to Ms. Lesley Lane, renovation plans do not include the roof of the showroom, office area, or warehouse; therefore, these areas were excluded from this survey.

During the survey, seventeen (17) distinct suspect ACMs were identified in the planned area of renovation. These materials were sampled and assessed for their condition and potential for disturbance. The following is a summary of building materials assessed during this survey:

- Plaster Skim Coat
- Plaster Base Coat
- Floor Tile
- Mastic
- Ceiling Tile
- Caulk
- Carpet Backing
- Tarpaper
- Insulation
- Glazing
- Roofing
- Tar
- Paper

Building materials were assessed to be in a good condition with a low potential for disturbance.

In addition, BLE observed and documented the presence of non-suspect asbestos containing materials, including, but not limited to: silicone, glass, metals, fiberglass, concrete, brick, and rubber.

4.1 Presumed ACMs

The fire brick located in the base of the furnace within the basement was presumed to be asbestos containing due to safety concerns with accessing the fire brick.

5.0 CONCLUSIONS AND RECOMMENDATIONS

A total of fifty-six (56) PLM layers and eleven (11) TEM layers were analyzed as part of this survey. Table 1 provides a summary of all materials analyzed during this survey. **Table 2 summarizes the five (5) confirmed ACMs** and one (1) presumed ACM identified during this assessment.

BLE was unable to access the elevator shaft and locked room on the roof of the Site building. If renovation plans will disturb building materials in these areas, an asbestos survey will need to be performed to determine if ACMs are present.

Additionally, abatement of all ACMs is required by an appropriately licensed asbestos abatement contractor prior to renovation and/or demolition of the survey area. If additional suspect ACMs are identified in the planned area of renovation not specified in Table 1 or the area of renovation expands, additional inspection by a certified Asbestos Inspector is required.

Concentrations of asbestos may have been identified at the Site, but at concentrations less than 1% asbestos (Table 1 and 2). Materials containing <1% asbestos are not considered an Asbestos Containing Material, as defined by US EPA and SCDHEC, and does not require specialized abatement in accordance with US EPA and SCDHEC. However, the Occupational Safety and Health Administration (OSHA) asbestos construction standard (29 CFR 1926.1101) defines special precautions to ensure worker protection while working with asbestos. Specifically, OSHA stipulates that the employer shall ensure that no employee is exposed to an airborne concentration of asbestos in excess of 0.1 fibers per cubic centimeter (f/cc)of air as an eight (8) hour time-weighted average (TWA) or 1.0 f/cc as averaged a sampling period of thirty (30) minutes. Work practices related to the disturbance of materials containing <1% asbestos may apply, as defined by OSHA, such as utilizing wet methods and to promptly clean up and dispose asbestos waste and debris in closed containers. Additional requirements may apply, as defined by OSHA, but are beyond the scope of this ACM Survey.

6.0 CERTIFICATIONS AND QUALIFICATIONS

This Asbestos Survey report describes the conditions of the area of investigation, as observed by the inspector at the time of the field survey. BLE relied upon information provided by the Client to clearly define the area of planned renovation and/or demolition to be inspected during the completion of this survey.

It is possible that additional suspect asbestos containing materials may exist at the Site, which may not have been observed during this investigation due to inaccessibility, safety limitations, or hidden behind or within other structural features. Should suspect ACMs be identified that were not assessed as part of this survey, further inspection by a certified asbestos inspector would be warranted prior to disturbing the material(s).

Building Inspector	Signature	Date of Survey	Certification #
Brian Davis		08/02/2023	BI-01648

Senior Review	Signature	Date	Certification #
Daniel R. Matz, P.E.		08/24/2023	BI-01646

7.0 QUALIFICATION OF REPORT

The findings contained herein are based upon the data that was reviewed and documented in this report along with our experience on similar projects. The discovery of any additional information concerning the environmental conditions at the site should be reported to us for our review so that we can reassess potential environmental impacts and modify our recommendations, if necessary.

Sincerely,

BUNNELL LAMMONS ENGINEERING INC.

Brian Davis
Environmental Scientist
Certification#: BI-01648

Daniel R. Matz, P.E.
Senior Environmental Engineer
Certification#: BI-01646

Table 1: Suspect ACMs Surveyed					
Sample ID:	**Material Desc.**	**Location**	**Quantity**	**Condition**	**% Asbestos**
1 A-G	White Plaster Skim Coat Tan Plaster Base Coat	Showroom and office area	7,000 SF	G	White Plaster Skim Coat: PLM – None Detected Tan Plaster Base Coat: PLM – None Detected
2 A-C	Brown Mastic	Showroom	2,000 SF	G	PLM – None Detected TEM – None Detected
3 A-C	Black Tar	Showroom, along perimeter brick walls	1,200 SF	G	PLM – None Detected TEM – None Detected
4 A-C	**White Floor Tile** **Black Mastic**	**Showroom bathrooms**	**80 SF**	**G**	**White Floor Tile:** **PLM – Chrysotile 7%** **Black Mastic:** **PLM – Chrysotile 2%**
5 A-C	White, Tan Ceiling Tile	Office area	1,000 SF	G	PLM – None Detected
6 A-C	Red Carpet Backing	Portion of office area	1,500 SF	G	PLM – None Detected TEM – None Detected
7 A-C	Tan Floor Tile **Brown Mastic**	**Select office area rooms**	**500 SF**	**G**	Tan Floor Tile: PLM – None Detected TEM – None Detected **Brown Mastic:** **PLM – Chrysotile 2%**
8 A-C	Black Tarpaper	Underneath hardwood floors in showroom, office area, and warehouse area	13,000 SF	G	PLM – None Detected TEM – None Detected
9 A-C	Black Mastic	Mastic pucks in one room of office area	130 SF	G	PLM – None Detected TEM – None Detected
10 A-C	Brown Mastic	Portion of showroom	70 SF	G	PLM – None Detected TEM – None Detected

Table 1: Suspect ACMs Surveyed					
Sample ID:	**Material Desc.**	**Location**	**Quantity**	**Condition**	**% Asbestos**
11 A-C	White Plaster Skim Coat Gray Plaster Base Coat	Along southeastern exterior	950 SF	G	White Plaster Skim Coat: PLM – Chrysotile <1% Gray Plaster Base Coat: PLM – None Detected
12 A-C	White Caulk	Along southeastern exterior	50 LF	G	PLM – None Detected TEM – None Detected
13 A-C	Black Mastic Tan Paper	Basement piping	50 LF	G	Black Mastic: PLM – None Detected TEM – None Detected Tan Paper: PLM – None Detected
14 A-C	**White Insulation**	**Basement piping and showroom pipe elbows**	**80 LF**	**G**	**PLM – Chrysotile 65%**
15 A-C	**Gray Insulation**	**Furnace in basement**	**100 SF**	**G**	**PLM – Chrysotile 20%**
16 A-C	White Glazing	Warehouse windows	280 LF	G	PLM – None Detected TEM – None Detected
17 A-C	Black Roofing Yellow Insulation	Roof of western portion of building	3,600 SF	G	Black Roofing: PLM – None Detected TEM – None Detected Yellow Insulation: PLM – None Detected

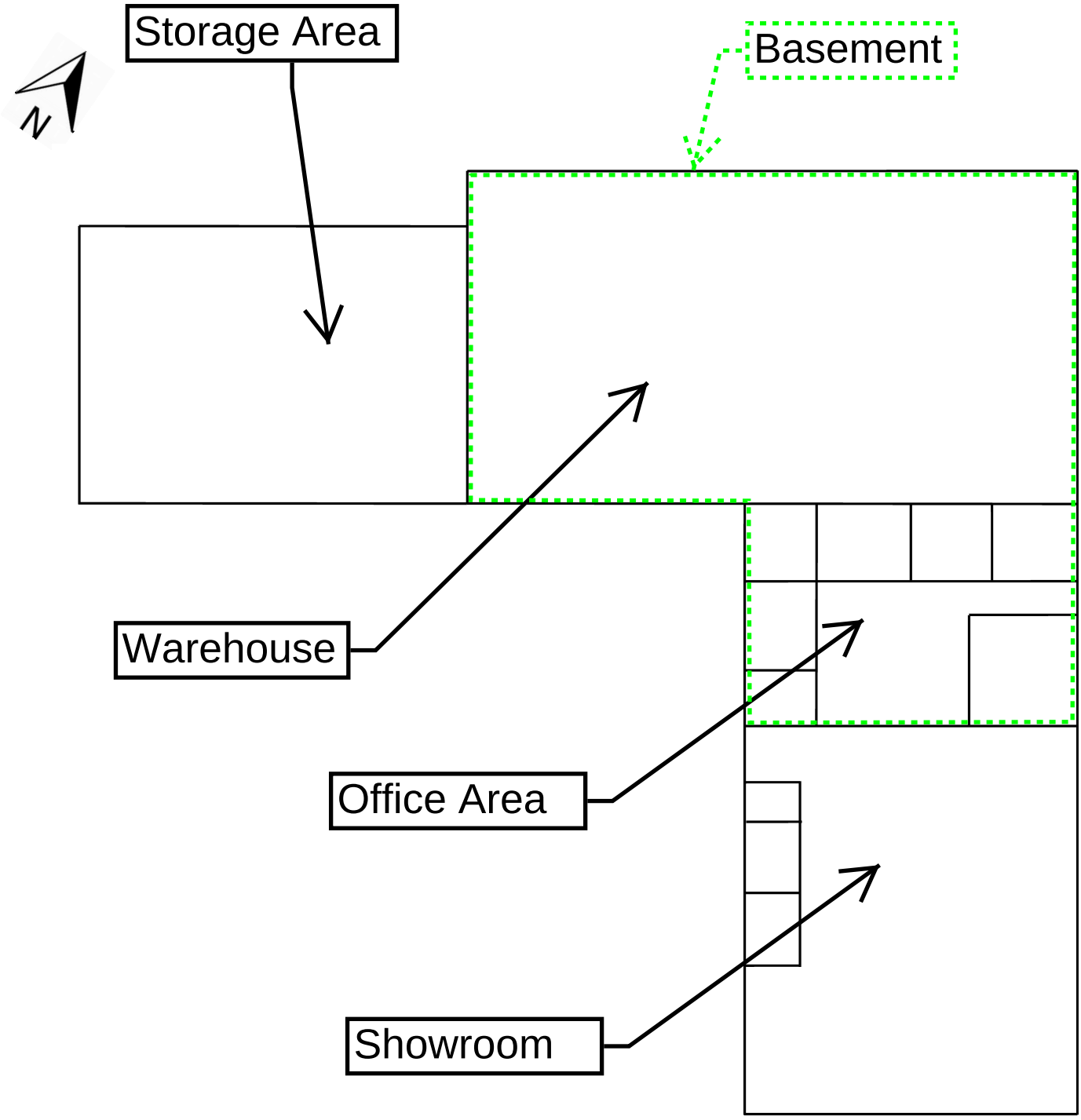
SF – Square feet
G – Good
LF – Linear Feet
D- Damaged
Chry – Chrysotile Asbestos
SD – Significantly Damaged

Table 2: Confirmed ACMs						
Sample ID:	**Material Desc.**	**Location**	**Quantity***	**Condition**	**Friable / Non-Friable**	**% Asbestos**
4 A-C	**White Floor Tile**	**Showroom bathrooms**	**80 SF**	**G**	**Non-Friable**	**White Floor Tile: PLM – Chrysotile 7%**
4 A-C	**Black Mastic**	**Showroom bathrooms**	**80 SF**	**G**	**Non-Friable**	**Black Mastic: PLM – Chrysotile 2%**
7 A-C	**Brown Mastic**	**Select office area rooms**	**500 SF**	**G**	**Non-Friable**	**PLM – Chrysotile 2%**
14 A-C	**White Insulation**	**Basement piping and showroom pipe elbows**	**80 LF**	**G**	**Friable**	**PLM – Chrysotile 65%**
15 A-C	**Gray Insulation**	**Furnace in Basement**	**100 SF**	**G**	**Friable**	**PLM – Chrysotile 20%**
Presumed	**Fire Brick**	**Furnace**	**30 SF**	**G**	**Non-Friable**	**Presumed**

SF – Square feet
LF – Linear Feet
Chry – Chrysotile Asbestos
G – Good
D- Damaged
SD – Significantly Damaged

* Quantity reflects a gross estimate of ACM present. Further review is recommended to identify the exact quantity of ACM present.

APPENDIX A
Figures



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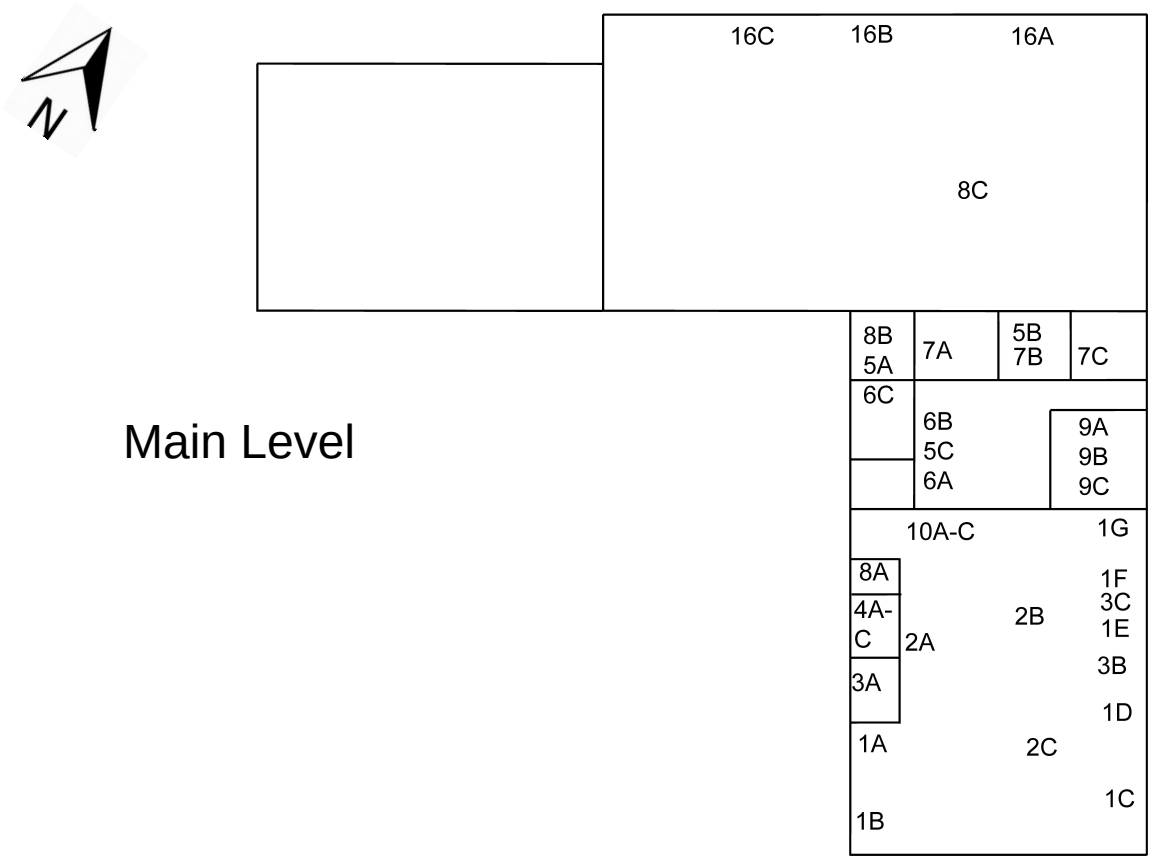
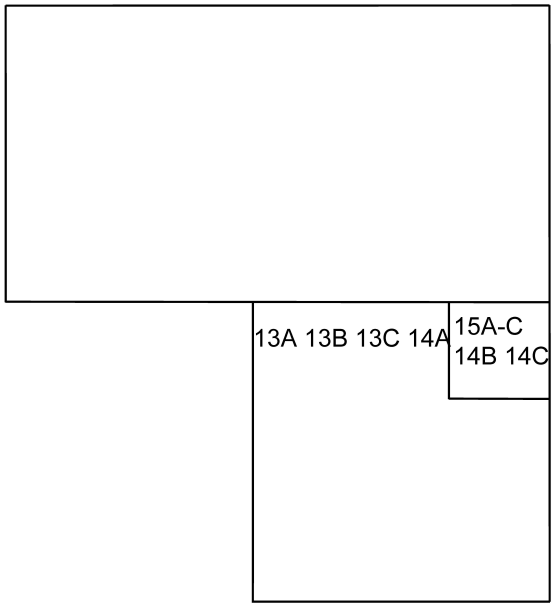
CHECKED: DRM	JOB No: J23-20575-01			
APPROVED: DRM				



Main Level



Basement

DRAWN: BPD	DATE: 08/03/2023	BUNNELL LAMMONS ENGINEERING 6004 Ponders Court, Greenville, SC 29615 Phone: (864) 288-1265	**Asbestos Sample Locations: Interior** 200 Oregon Avenue Greenwood, SC	**FIGURE** 2
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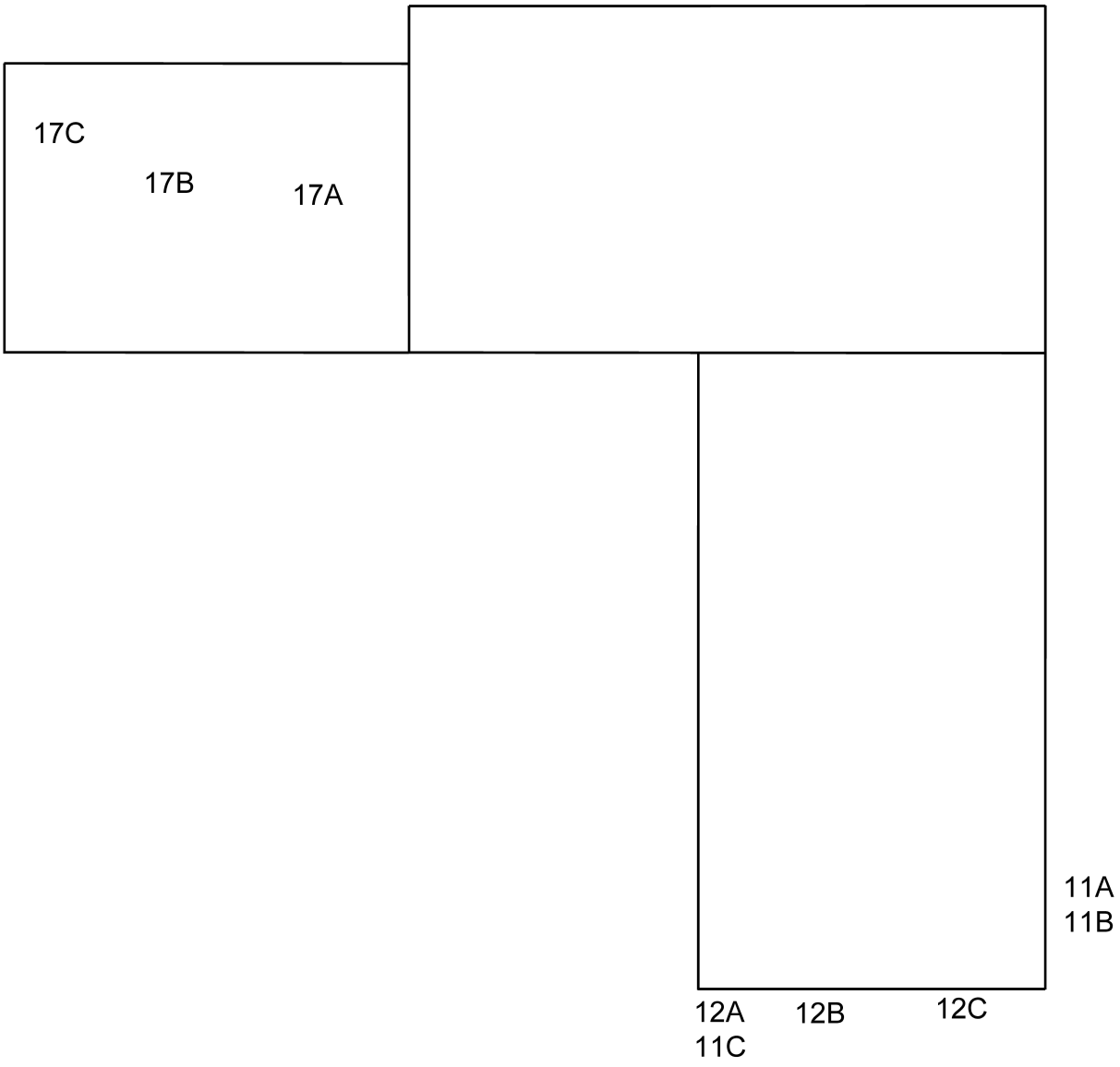
APPROVED: DRM				



DRAWN: BPD	DATE: 08/03/2023	BUNNELL LAMMONS ENGINEERING 6004 Ponders Court, Greenville, SC 29615 Phone: (864) 288-1265	**Asbestos Sample Locations: Exterior** 200 Oregon Avenue Greenwood, SC	**FIGURE** 3
CHECKED: DRM	JOB No: J23-20575-01			
APPROVED: DRM				

APPENDIX B
Photographs

Photo 1: View of the southwestern side of the Site building.

Photo 2: View of the southeastern (front) side of the Site building.

Photo 3: View of the eastern side of the Site building.

Photo 4: View of the northern side (back) of the Site building.

Photo 5: View of the western side of the Site building.

Photo 6: Typical view of the showroom.

Photo 7: Typical view of the office area.

Photo 8: Typical view of the warehouse.

Photo 9: Typical view of the warehouse.

Photo 10: Typical view of the basement.

Photo 11: View of the white plaster skim coat, tan plaster base coat, and black tar located along perimeter walls in showroom and portion of office.

Photo 12: View of the brown mastic in the showroom.

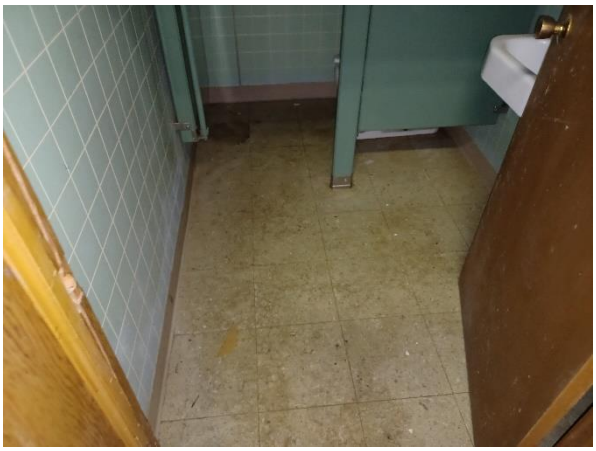


Photo 13: View of the **asbestos containing white floor tile and underlying black mastic** in the showroom bathrooms.

Photo 14: View of the white, tan ceiling tile in the office area.

Photo 15: View of the red carpet backing in a portion of the office area.

Photo 16: View of the tan floor tile and underlying **asbestos containing brown mastic** in select office area rooms.

Photo 17: View of the black tarpaper underneath the hardwood floors in the showroom, office area, and warehouse.

Photo 18: View of the black mastic pucks in one room in the office area.

Photo 19: View of the white plaster skim coat and gray plaster base coat on the southeastern exterior of the building.

Photo 20: View of the white caulk on the southeastern exterior of the building.

Photo 21: View of the tan tarpaper with underlying black mastic in the basement.

Photo 22: View of the **asbestos containing white insulation on the basement piping and showroom pipe elbows.**

Photo 23: View of the **asbestos containing gray insulation** on the furnace in the basement.

Photo 24: View of the **presumed asbestos containing fire brick** located within the furnace.

Photo 25: View of the white glazing on the warehouse windows.

Photo 26: View of the yellow insulation and black roofing on the western roof.

APPENDIX C
Laboratory Analytical Report(s)

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August 11, 2023

Bunnell-Lammons Engineering, Inc (BLE)
6004 Ponders Court
Greenville, SC 29615

CLIENT PROJECT: 200 Oregon Ave; J23-20575-01
CEI LAB CODE: SA231489v2

Dear Customer:

Enclosed are asbestos analysis results for PLM Bulk samples received at our laboratory on August 3, 2023. The samples were analyzed for asbestos using polarizing light microscopy (PLM) per the EPA 600 Method.

Sample results containing >1% asbestos are considered asbestos-containing materials (ACMs) per EPA regulatory requirements. The detection limit for the EPA 600 Method is <1% asbestos by weight as determined by visual estimation.

Thank you for your business and we look forward to continuing good relations.

Kind Regards,

Tianbao Bai, Ph.D., CIH
Laboratory Director

NVLAP TESTING
NVLAP LAB CODE: 600323-0

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ASBESTOS ANALYTICAL REPORT
By: Polarized Light Microscopy

Prepared for

Bunnell-Lammons Engineering, Inc (BLE)

CLIENT PROJECT: 200 Oregon Ave; J23-20575-01

LAB CODE: SA231489v2

TEST METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

REPORT DATE: 08/11/23

TOTAL SAMPLES ANALYZED: 40

SAMPLES >1% ASBESTOS: 5

TOTAL LAYERS ANALYZED: 56

2752 Pleasant Rd Suite 100A • Fort Mill, SC 29708 • 803.526.5146

Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

PROJECT: 200 Oregon Ave; J23-20575-01 **LAB CODE: SA231489v2**

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
1A	Layer 1	SA231489.01	White	Plaster Skim Coat	None Detected
	Layer 2	SA231489.01	Tan	Plaster Base Coat	None Detected
1B	Layer 1	SA231489.02	White	Plaster Skim Coat	None Detected
	Layer 2	SA231489.02	Tan	Plaster Base Coat	None Detected
1C	Layer 1	SA231489.03	White	Plaster Skim Coat	None Detected
	Layer 2	SA231489.03	Tan	Plaster Base Coat	None Detected
1D	Layer 1	SA231489.04	White	Plaster Skim Coat	None Detected
	Layer 2	SA231489.04	Tan	Plaster Base Coat	None Detected
1E	Layer 1	SA231489.05	White	Plaster Skim Coat	None Detected
	Layer 2	SA231489.05	Tan	Plaster Base Coat	None Detected
1F	Layer 1	SA231489.06	White	Plaster Skim Coat	None Detected
	Layer 2	SA231489.06	Tan	Plaster Base Coat	None Detected
1G	Layer 1	SA231489.07	White	Plaster Skim Coat	None Detected
	Layer 2	SA231489.07	Tan	Plaster Base Coat	None Detected
2A		SA231489.08	Brown	Mastic	None Detected
2B		SA231489.09	Brown	Mastic	None Detected
2C		SA231489.10		Sample Submitted for TEM Analysis	
3A		SA231489.11	Black	Tar	None Detected
3B		SA231489.12	Black	Tar	None Detected
3C		SA231489.13		Sample Submitted for TEM Analysis	
4A		SA231489.14A	White	Floor Tile	Chrysotile 7%
		SA231489.14B	Black	Mastic	Chrysotile 2%
4B		SA231489.15A		Sample Not Analyzed per COC	
		SA231489.15B		Sample Not Analyzed per COC	
4C		SA231489.16A		Sample Not Analyzed per COC	
		SA231489.16B		Sample Not Analyzed per COC	
5A		SA231489.17	White,Tan	Ceiling Tile	None Detected
5B		SA231489.18	White,Tan	Ceiling Tile	None Detected
5C		SA231489.19	White,Tan	Ceiling Tile	None Detected
6A		SA231489.20	Red	Carpet Backing	None Detected

Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

PROJECT: 200 Oregon Ave; J23-20575-01 **LAB CODE: SA231489v2**

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
6B		SA231489.21	Red	Carpet Backing	None Detected
6C		SA231489.22		Sample Submitted for TEM Analysis	
7A		SA231489.23A	Tan	Floor Tile	None Detected
		SA231489.23B	Brown	Mastic	Chrysotile 2%
7B		SA231489.24A	Tan	Floor Tile	None Detected
		SA231489.24B		Sample Not Analyzed per COC	
7C		SA231489.25A		Sample Submitted for TEM Analysis	
		SA231489.25B		Sample Not Analyzed per COC	
8A		SA231489.26	Black	Tarpaper	None Detected
8B		SA231489.27	Black	Tarpaper	None Detected
8C		SA231489.28		Sample Submitted for TEM Analysis	
9A*		SA231489.29	Black	Mastic	None Detected
9B*		SA231489.30	Black	Mastic	None Detected
9C		SA231489.31		Sample Submitted for TEM Analysis	
10A		SA231489.32	Brown	Mastic	None Detected
10B		SA231489.33	Brown	Mastic	None Detected
10C		SA231489.34		Sample Submitted for TEM Analysis	
11A	Layer 1	SA231489.35	White	Plaster Skim Coat	Chrysotile <1%
	Layer 2	SA231489.35	Gray	Plaster Base Coat	None Detected
11B	Layer 1	SA231489.36	White	Plaster Skim Coat	Chrysotile <1%
	Layer 2	SA231489.36	Gray	Plaster Base Coat	None Detected
11C	Layer 1	SA231489.37	White	Plaster Skim Coat	Chrysotile <1%
	Layer 2	SA231489.37	Gray	Plaster Base Coat	None Detected
12A		SA231489.38	White	Caulking	None Detected
12B		SA231489.39	White	Caulking	None Detected
12C		SA231489.40		Sample Submitted for TEM Analysis	
13A	Layer 1	SA231489.41	Black	Mastic	None Detected

Asbestos Report Summary

By: POLARIZING LIGHT MICROSCOPY

PROJECT: 200 Oregon Ave; J23-20575-01 **LAB CODE: SA231489v2**

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

Client ID	Layer	Lab ID	Color	Sample Description	ASBESTOS %
	Layer 2	SA231489.41	Tan	Paper	None Detected
13B	Layer 1	SA231489.42	Black	Mastic	None Detected
	Layer 2	SA231489.42	Tan	Paper	None Detected
13C	Layer 1	SA231489.43		Sample Submitted for TEM Analysis	
	Layer 2	SA231489.43	Tan	Paper	None Detected
14A		SA231489.44	White	Insulation	Chrysotile 65%
14B		SA231489.45		Sample Not Analyzed per COC	
14C		SA231489.46		Sample Not Analyzed per COC	
15A		SA231489.47	Gray	Insulation	Chrysotile 20%
15B		SA231489.48		Sample Not Analyzed per COC	
15C		SA231489.49		Sample Not Analyzed per COC	
16A		SA231489.50	White	Glazing	None Detected
16B		SA231489.51	White	Glazing	None Detected
16C		SA231489.52		Sample Submitted for TEM Analysis	
17A	Layer 1	SA231489.53	Black	Roofing	None Detected
	Layer 2	SA231489.53	Yellow	Insulation	None Detected
17B	Layer 1	SA231489.54	Black	Roofing	None Detected
	Layer 2	SA231489.54	Yellow	Insulation	None Detected
17C	Layer 1	SA231489.55		Sample Submitted for TEM Analysis	
	Layer 2	SA231489.55	Yellow	Insulation	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: Bunnell-Lammons Engineering, Inc (BLE)
6004 Ponders Court
Greenville, SC 29615

Lab Code: SA231489v2
Date Received: 08-03-23
Date Analyzed: 08-10-23
Date Reported: 08-10-23

Project: 200 Oregon Ave; J23-20575-01

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous	Non-Fibrous	ASBESTOS %
1A	Plaster Skim Coat	Homogeneous	65%	Binder	None Detected
Layer 1		White	35%	Silicates	
SA231489.01		Non-fibrous			
		Bound			
Layer 2	Plaster Base Coat	Homogeneous	65%	Silicates	None Detected
SA231489.01		Tan	35%	Binder	
		Non-fibrous			
		Bound			
1B	Plaster Skim Coat	Homogeneous	65%	Binder	None Detected
Layer 1		White	35%	Silicates	
SA231489.02		Non-fibrous			
		Bound			
Layer 2	Plaster Base Coat	Homogeneous	65%	Silicates	None Detected
SA231489.02		Tan	35%	Binder	
		Non-fibrous			
		Bound			
1C	Plaster Skim Coat	Homogeneous	65%	Binder	None Detected
Layer 1		White	35%	Silicates	
SA231489.03		Non-fibrous			
		Bound			
Layer 2	Plaster Base Coat	Homogeneous	65%	Silicates	None Detected
SA231489.03		Tan	35%	Binder	
		Non-fibrous			
		Bound			
1D	Plaster Skim Coat	Homogeneous	65%	Binder	None Detected
Layer 1		White	35%	Silicates	
SA231489.04		Non-fibrous			
		Bound			

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: Bunnell-Lammons Engineering, Inc (BLE)
6004 Ponders Court
Greenville, SC 29615

Lab Code: SA231489v2
Date Received: 08-03-23
Date Analyzed: 08-10-23
Date Reported: 08-10-23

Project: 200 Oregon Ave; J23-20575-01

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous	Non-Fibrous	ASBESTOS %
Layer 2 SA231489.04	Plaster Base Coat	Homogeneous Tan Non-fibrous Bound	65% 35%	Silicates Binder	None Detected
1E Layer 1 SA231489.05	Plaster Skim Coat	Homogeneous White Non-fibrous Bound	65% 35%	Binder Silicates	None Detected
Layer 2 SA231489.05	Plaster Base Coat	Homogeneous Tan Non-fibrous Bound	65% 35%	Silicates Binder	None Detected
1F Layer 1 SA231489.06	Plaster Skim Coat	Homogeneous White Non-fibrous Bound	65% 35%	Binder Silicates	None Detected
Layer 2 SA231489.06	Plaster Base Coat	Homogeneous Tan Non-fibrous Bound	65% 35%	Silicates Binder	None Detected
1G Layer 1 SA231489.07	Plaster Skim Coat	Homogeneous White Non-fibrous Bound	65% 35%	Binder Silicates	None Detected
Layer 2 SA231489.07	Plaster Base Coat	Homogeneous Tan Non-fibrous Bound	65% 35%	Silicates Binder	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: Bunnell-Lammons Engineering, Inc (BLE)
6004 Ponders Court
Greenville, SC 29615

Lab Code: SA231489v2
Date Received: 08-03-23
Date Analyzed: 08-10-23
Date Reported: 08-10-23

Project: 200 Oregon Ave; J23-20575-01

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous	Non-Fibrous		ASBESTOS %
2A SA231489.08	Mastic	Homogeneous Brown Non-fibrous Bound		100%	Mastic	None Detected
2B SA231489.09	Mastic	Homogeneous Brown Non-fibrous Bound		100%	Mastic	None Detected
2C SA231489.10	Sample Submitted for TEM Analysis					
3A SA231489.11	Tar	Homogeneous Black Non-fibrous Bound		100%	Tar	None Detected
Sample appears to be tar. No paint present.						
3B SA231489.12	Tar	Homogeneous Black Non-fibrous Bound		100%	Tar	None Detected
Sample appears to be tar. No paint present.						
3C SA231489.13	Sample Submitted for TEM Analysis					
4A SA231489.14A	Floor Tile	Homogeneous White Non-fibrous Bound		93%	Vinyl	**7% Chrysotile**
SA231489.14B	Mastic	Homogeneous Black Non-fibrous Bound		98%	Tar	**2% Chrysotile**

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: Bunnell-Lammons Engineering, Inc (BLE)
6004 Ponders Court
Greenville, SC 29615

Lab Code: SA231489v2
Date Received: 08-03-23
Date Analyzed: 08-10-23
Date Reported: 08-10-23

Project: 200 Oregon Ave; J23-20575-01

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
4B SA231489.15A	Sample Not Analyzed per COC						
SA231489.15B	Sample Not Analyzed per COC						
4C SA231489.16A	Sample Not Analyzed per COC						
SA231489.16B	Sample Not Analyzed per COC						
5A SA231489.17	Ceiling Tile	Heterogeneous White,Tan Fibrous Loosely Bound	95%	Cellulose	5%	Paint	None Detected
5B SA231489.18	Ceiling Tile	Heterogeneous White,Tan Fibrous Loosely Bound	95%	Cellulose	5%	Paint	None Detected
5C SA231489.19	Ceiling Tile	Heterogeneous White,Tan Fibrous Loosely Bound	95%	Cellulose	5%	Paint	None Detected
6A SA231489.20	Carpet Backing	Homogeneous Red Non-fibrous Bound			100%	Caulk	None Detected
6B SA231489.21	Carpet Backing	Homogeneous Red Non-fibrous Bound			100%	Caulk	None Detected
6C SA231489.22	Sample Submitted for TEM Analysis						

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: Bunnell-Lammons Engineering, Inc (BLE)
6004 Ponders Court
Greenville, SC 29615

Lab Code: SA231489v2
Date Received: 08-03-23
Date Analyzed: 08-10-23
Date Reported: 08-10-23

Project: 200 Oregon Ave; J23-20575-01

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
7A SA231489.23A	Floor Tile	Homogeneous Tan Non-fibrous Bound			100%	Vinyl	None Detected
SA231489.23B	Mastic	Homogeneous Brown Non-fibrous Bound			98%	Mastic	**2% Chrysotile**
7B SA231489.24A	Floor Tile	Homogeneous Tan Non-fibrous Bound			100%	Vinyl	None Detected
SA231489.24B	Sample Not Analyzed per COC						
7C SA231489.25A	Sample Submitted for TEM Analysis						
SA231489.25B	Sample Not Analyzed per COC						
8A SA231489.26	Tarpaper	Homogeneous Black Fibrous Bound	70%	Cellulose	30%	Tar	None Detected
8B SA231489.27	Tarpaper	Homogeneous Black Fibrous Bound	70%	Cellulose	30%	Tar	None Detected
8C SA231489.28	Sample Submitted for TEM Analysis						

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: Bunnell-Lammons Engineering, Inc (BLE)
6004 Ponders Court
Greenville, SC 29615

Lab Code: SA231489v2
Date Received: 08-03-23
Date Analyzed: 08-10-23
Date Reported: 08-10-23

Project: 200 Oregon Ave; J23-20575-01

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous	Non-Fibrous	ASBESTOS %
9A* SA231489.29	Mastic	Homogeneous Black Non-fibrous Bound	100%	Caulk	None Detected
Sample appears to be caulking.					
9B* SA231489.30	Mastic	Homogeneous Black Non-fibrous Bound	100%	Caulk	None Detected
Sample appears to be caulking.					
9C SA231489.31	Sample Submitted for TEM Analysis				
10A SA231489.32	Mastic	Homogeneous Brown Non-fibrous Bound	100%	Mastic	None Detected
10B SA231489.33	Mastic	Homogeneous Brown Non-fibrous Bound	100%	Mastic	None Detected
10C SA231489.34	Sample Submitted for TEM Analysis				
11A Layer 1 SA231489.35	Plaster Skim Coat	Homogeneous White Non-fibrous Bound	65% 35%	Binder Silicates	<1% Chrysotile
Layer 2 SA231489.35	Plaster Base Coat	Homogeneous Gray Non-fibrous Bound	65% 35%	Silicates Binder	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: Bunnell-Lammons Engineering, Inc (BLE)
6004 Ponders Court
Greenville, SC 29615

Lab Code: SA231489v2
Date Received: 08-03-23
Date Analyzed: 08-10-23
Date Reported: 08-10-23

Project: 200 Oregon Ave; J23-20575-01

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
11B Layer 1 SA231489.36	Plaster Skim Coat	Homogeneous White Non-fibrous Bound			65% 35%	Binder Silicates	<1% Chrysotile
Layer 2 SA231489.36	Plaster Base Coat	Homogeneous Gray Non-fibrous Bound			65% 35%	Silicates Binder	None Detected
11C Layer 1 SA231489.37	Plaster Skim Coat	Homogeneous White Non-fibrous Bound			65% 35%	Binder Silicates	<1% Chrysotile
Layer 2 SA231489.37	Plaster Base Coat	Homogeneous Gray Non-fibrous Bound			65% 35%	Silicates Binder	None Detected
12A SA231489.38	Caulking	Homogeneous White Non-fibrous Bound			100%	Caulk	None Detected
12B SA231489.39	Caulking	Homogeneous White Non-fibrous Bound			100%	Caulk	None Detected
12C SA231489.40	Sample Submitted for TEM Analysis						
13A Layer 1 SA231489.41	Mastic	Homogeneous Black Non-fibrous Bound	10%	Fiberglass	90%	Tar	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: Bunnell-Lammons Engineering, Inc (BLE)
6004 Ponders Court
Greenville, SC 29615

Lab Code: SA231489v2
Date Received: 08-03-23
Date Analyzed: 08-10-23
Date Reported: 08-10-23

Project: 200 Oregon Ave; J23-20575-01

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
Layer 2 SA231489.41	Paper	Heterogeneous Tan Fibrous Bound	90%	Cellulose	10%	Metal Foil	None Detected
13B Layer 1 SA231489.42	Mastic	Homogeneous Black Non-fibrous Bound	10%	Fiberglass	90%	Tar	None Detected
Layer 2 SA231489.42	Paper	Heterogeneous Tan Fibrous Bound	90%	Cellulose	10%	Metal Foil	None Detected
13C Layer 1 SA231489.43	Sample Submitted for TEM Analysis						
Layer 2 SA231489.43	Paper	Heterogeneous Tan Fibrous Bound	90%	Cellulose	10%	Metal Foil	None Detected
14A SA231489.44	Insulation	Homogeneous White Fibrous Bound	15%	Cellulose	20%	Binder	**65% Chrysotile**
14B SA231489.45	Sample Not Analyzed per COC						
14C SA231489.46	Sample Not Analyzed per COC						

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: Bunnell-Lammons Engineering, Inc (BLE)
6004 Ponders Court
Greenville, SC 29615

Lab Code: SA231489v2
Date Received: 08-03-23
Date Analyzed: 08-10-23
Date Reported: 08-10-23

Project: 200 Oregon Ave; J23-20575-01

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous		Non-Fibrous		ASBESTOS %
15A SA231489.47	Insulation	Homogeneous Gray Fibrous Loosely Bound			80%	Binder	**20% Chrysotile**
15B SA231489.48	Sample Not Analyzed per COC						
15C SA231489.49	Sample Not Analyzed per COC						
16A SA231489.50	Glazing	Homogeneous White Non-fibrous Loosely Bound			85% 15%	Binder Calc Carb	None Detected
16B SA231489.51	Glazing	Homogeneous White Non-fibrous Loosely Bound			85% 15%	Binder Calc Carb	None Detected
16C SA231489.52	Sample Submitted for TEM Analysis						
17A Layer 1 SA231489.53	Roofing	Homogeneous Black Fibrous Bound	50%	Cellulose	50%	Tar	None Detected
Layer 2 SA231489.53	Insulation	Homogeneous Yellow Non-fibrous Bound			100%	Foam	None Detected
17B Layer 1 SA231489.54	Roofing	Homogeneous Black Fibrous Bound	50%	Cellulose	50%	Tar	None Detected

ASBESTOS BULK ANALYSIS

By: POLARIZING LIGHT MICROSCOPY

Client: Bunnell-Lammons Engineering, Inc (BLE)
6004 Ponders Court
Greenville, SC 29615

Lab Code: SA231489v2
Date Received: 08-03-23
Date Analyzed: 08-10-23
Date Reported: 08-10-23

Project: 200 Oregon Ave; J23-20575-01

ASBESTOS BULK PLM, EPA 600 METHOD

Client ID / Lab ID	Lab Description	Lab Attributes	NON-ASBESTOS COMPONENTS Fibrous	Non-Fibrous		ASBESTOS %
Layer 2 SA231489.54	Insulation	Homogeneous Yellow Non-fibrous Bound		100%	Foam	None Detected
17C Layer 1 SA231489.55	Sample Submitted for TEM Analysis					
Layer 2 SA231489.55	Insulation	Homogeneous Yellow Non-fibrous Bound		100%	Foam	None Detected

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LEGEND: Non-Anth = Non-Asbestiform Anthophyllite
Non-Trem = Non-Asbestiform Tremolite
Calc Carb = Calcium Carbonate

METHOD: EPA 600 / R93 / 116 and EPA 600 / M4-82 / 020

REPORTING LIMIT: <1% by visual estimation

REPORTING LIMIT FOR POINT COUNTS: 0.25% by 400 Points or 0.1% by 1,000 Points

REGULATORY LIMIT: >1% by weight

Due to the limitations of the EPA 600 method, nonfriable organically bound materials (NOBs) such as vinyl floor tiles can be difficult to analyze via polarized light microscopy (PLM). EPA recommends that all NOBs analyzed by PLM, and found not to contain asbestos, be further analyzed by Transmission Electron Microscopy (TEM). Please note that PLM analysis of dust and soil samples for asbestos is not covered under NVLAP accreditation. *Estimated measurement of uncertainty is available on request.*

This report relates only to the samples tested or analyzed and may not be reproduced, except in full, without written approval by Eurofins CEI. Eurofins CEI makes no warranty representation regarding the accuracy of client submitted information in preparing and presenting analytical results. Interpretation of the analytical results is the sole responsibility of the client. Samples were received in acceptable condition unless otherwise noted. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. Government.

Information provided by customer includes customer sample ID and sample description.

ANALYST: Raegan Brown
Raegan Brown

APPROVED BY: Tianbao Bai
Tianbao Bai, Ph.D., CIH
Laboratory Director

NVLAP® TESTING
NVLAP LAB CODE: 600323-0

A version indicated by 'v' after the Lab ID# with a value greater than 1 indicates an amendment has occurred. The revised sample/description/ID is indicated by an *

55

ASBESTOS CHAIN OF CUSTODY

CEI LABS
730 SE Maynard Road, Cary, NC 27511
Tel: 866-481-1412; Fax: 919-481-1442

LAB USE ONLY:
CEI Lab Code: SA231489 / ST230758
CEI Lab I.D. Range:

COMPANY INFORMATION	PROJECT INFORMATION
CEI CLIENT #:	Job Contact:
Company: BLE	Email / Tel:
Address: 6004 Fonders Ct Greenville, SC	Project Name: 200 Oregon Ave
Email: Brian.Davis@BLECorp.com	Project ID#: 323-20575-01
Tel: 864-288-1265 Fax:	PO #:
	STATE SAMPLES COLLECTED IN: SC

IF TAT IS NOT MARKED STANDARD 3 DAY TAT APPLIES.

ASBESTOS	METHOD	TURN AROUND TIME					
		4 HR	8 HR	24 HR	2 DAY	3 DAY	5 DAY
PLM BULK	EPA 600	☐	☐	☐	☐	☐	☑
PLM POINT COUNT (400)	EPA 600	☐	☐	☐	☐	☐	☐
PLM POINT COUNT (1000)	EPA 600	☐	☐	☐	☐	☐	☐
PLM GRAV w POINT COUNT	EPA 600		☐	☐	☐	☐	☐
PLM BULK	CARB 435		☐	☐	☐	☐	☐
PCM AIR	NIOSH 7400	☐	☐	☐	☐	☐	☐
TEM AIR	EPA AHERA	☐	☐	☐	☐	☐	☐
TEM AIR	NIOSH 7402	☐	☐	☐	☐	☐	☐
TEM AIR	ISO 10312	☐	☐	☐	☐	☐	☐
TEM AIR	ASTM 6281-09	☐	☐	☐	☐	☐	☐
TEM BULK	CHATFIELD		☐	☐	☐	☐	☑
TEM DUST WIPE	ASTM D6480-05 (2010)	☐	☐	☐	☐	☐	☐
TEM DUST MICROVAC	ASTM D5755-09 (2014)	☐	☐	☐	☐	☐	☐
TEM SOIL	ASTM D7521-13			☐	☐	☐	☐
TEM VERMICULITE	CINCINNATI METHOD			☐	☐	☐	☐
OTHER:		☐	☐	☐	☐	☐	☐

REMARKS / SPECIAL INSTRUCTIONS: Run TEM on negative PLM NOB. Positive STOP

☑ Accept Samples
☐ Reject Samples

Relinquished By:	Date/Time	Received By:	Date/Time
		CW	8/3 10:20am

Samples will be disposed of 30 days after analysis

Field Data Form – Asbestos Survey

	Sample ID:	Material Desc.	Location	Type of Material	Quantity	Condition
	1A-C	plaster skim & Base	front area wall & ceil		71,000	
	2A-C	Brown mastic	front area		2000	
0.10	3A-C	Black paint (don't analyze plaster)	Behind plaster		1,200 SF	
	4A-C	FT & mastic	Bathrooms (front		80SF	
	5A-C	ceiling tile	office area		1,000 SF	
0.19	6A-C	carpet backing (don't analyze carpet)	office area		1,500 SF	
	7A-C	FT & mastic	portions of office		500 SF	
0.25	8A-C	Tar paper	under hardwood		13,000 SF	
	9A-C	Black mastic	one room pucks		220 4-inch pucks	
	10A-C	mastic	portion of front		70 SF	
0.34	11A-C	plaster Base & skim	portion of front		950 SF	
	12A-C	white caulk (only white caulk)	front wood panels		W	

Field Data Form – Asbestos Survey

Sample ID:	Material Desc.	Location	Type of Material	Quantity	Condition
13A-C	Black mastic and paper	fiberglass wrap in BASE	M	50 LF	
14A-C	white insulation	~~furnace~~ adjoining pipes, elbows in upper level corner		~~300~~ 150 SF	
15A-C	fire brick presumed	furnace		30 SF	
16A-C	white insulation	furnace		150 SF	
17A-C	Glazing	warehouse windows		280 LF	
	roofing	one roof			

August 17, 2023

Bunnell-Lammons Engineering, Inc (BLE)
6004 Ponders Court
Greenville, SC 29615

CLIENT PROJECT: 200 Oregon Ave; J23-20575-01
LAB CODE: ST230758

Dear Customer:

Enclosed are asbestos analysis results for TEM bulk samples received at our laboratory on August 10, 2023. The samples were analyzed for asbestos using transmission electron microscopy (TEM) per Chatfield/EPA 600/R-93/116 Sec. 2.5.5.1 method.

Sample results containing > 1% asbestos are considered asbestos-containing materials (ACMs) per the EPA regulatory requirements. The detection limit for the TEM Chatfield/EPA 600/R-93/116 Sec. 2.5.5.1 method is <1% depending on the processed weight and constituents of the sample.

Thank you for your business and we look forward to continuing good relations.

Kind Regards,

Tianbao Bai, Ph.D., CIH
Laboratory Director

eurofins | CEI

ASBESTOS ANALYTICAL REPORT
By: Transmission Electron Microscopy

Prepared for

Bunnell-Lammons Engineering, Inc (BLE)

CLIENT PROJECT: 200 Oregon Ave; J23-20575-01

LAB CODE: ST230758

TEST METHOD: Bulk Chatfield
EPA 600 / R93 / 116 Sec. 2.5.5.1

REPORT DATE: 08/17/23

2752 Pleasant Rd Suite 100A • Fort Mill, SC 29708 • 803.526.5146

ASBESTOS BULK ANALYSIS

By: TRANSMISSION ELECTRON MICROSCOPY

Client: Bunnell-Lammons Engineering, Inc (BLE)
6004 Ponders Court
Greenville, SC 29615

Lab Code: ST230758
Date Received: 08-10-23
Date Analyzed: 08-17-23
Date Reported: 08-17-23

Project: 200 Oregon Ave; J23-20575-01

TEM BULK CHATFIELD / EPA 600 / R93 / 116 Sec. 2.5.5.1

Client ID Lab ID	Material Description	Sample Weight (g)	Organic Material %	Acid Soluble Material %	Acid Insoluble Material %	Asbestos %
2C ST07466	Brown Mastic	0.2956	43.2	1.9	54.9	**None Detected**
3C ST07467	Black Tar	0.1433	39.2	49.7	11.1	**None Detected**
6C ST07468	Red Carpet Backing	0.1998	4.7	92	3.3	**None Detected**
7C ST07469	Tan Floor Tile	0.2572	41.9	29.4	28.7	**None Detected**
8C ST07470	Black Tarpaper	0.1858	96.1	.3	3.6	**None Detected**
9C ST07471	Black Mastic	0.1451	64.6	4.1	31.3	**None Detected**
10C ST07472	Brown Mastic	0.1266	29.5	61.3	9.2	**None Detected**
12C ST07473	White Caulking	0.3666	51.9	6.6	41.5	**None Detected**
13C ST07474	Black Mastic	0.0545	41.5	56.1	2.4	**None Detected**
16C ST07475	White Glazing	0.5139	4.9	91.6	3.5	**None Detected**
17C ST07476	Black Roofing	0.2072	94.2	4.8	1	**None Detected**

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LEGEND: None

METHOD: CHATFIELD & EPA/600/R-93/116 Sec. 2.5.5.1

LIMIT OF DETECTION: Varies with the weight and constituents of the sample (<1%)

REGULATORY LIMIT: >1% by weight

This report relates only to the samples tested or analyzed and may not be reproduced, except in full, without written approval by Eurofins CEI (ECEI). ECEI makes no warranty representation regarding the accuracy of client submitted information in preparing and presenting analytical results. Interpretation of the analytical results is the sole responsibility of the client. *Estimated measurement of uncertainty is available on request and in compliance with regulatory requirements.* Samples were received in acceptable condition unless otherwise noted.

Information provided by customer includes customer sample ID, location, volume and area as well as date and time of sampling.
ECEI recommends between 0.20 and 0.50 grams of sample material for TEM bulk analysis.
Any weight below 0.10 grams is considered below protocol guidelines.
***Indicates sample weight below 0.05 grams and is considered insufficient for quantitative analysis.*

ANALYST: Adrian Meyer

APPROVED BY: Tianbao Bai, Ph.D., CIH
Laboratory Director

55

ASBESTOS CHAIN OF CUSTODY

CEI LABS
730 SE Maynard Road, Cary, NC 27511
Tel: 866-481-1412; Fax: 919-481-1442

LAB USE ONLY:
CEI Lab Code: SA231489 / ST230758
CEI Lab I.D. Range:

COMPANY INFORMATION	PROJECT INFORMATION
CEI CLIENT #:	Job Contact:
Company: BLE	Email / Tel:
Address: 6004 Fonders Ct Greenville, SC	Project Name: 200 Oregon Ave
Email: Brian.Davis@BLECorp.com	Project ID#: 323-20575-01
Tel: 864-288-1265 Fax:	PO #:
	STATE SAMPLES COLLECTED IN: SC

IF TAT IS NOT MARKED STANDARD 3 DAY TAT APPLIES.

ASBESTOS	METHOD	TURN AROUND TIME					
		4 HR	8 HR	24 HR	2 DAY	3 DAY	5 DAY
PLM BULK	EPA 600	☐	☐	☐	☐	☐	☑
PLM POINT COUNT (400)	EPA 600	☐	☐	☐	☐	☐	☐
PLM POINT COUNT (1000)	EPA 600	☐	☐	☐	☐	☐	☐
PLM GRAV w POINT COUNT	EPA 600		☐	☐	☐	☐	☐
PLM BULK	CARB 435		☐	☐	☐	☐	☐
PCM AIR	NIOSH 7400	☐	☐	☐	☐	☐	☐
TEM AIR	EPA AHERA	☐	☐	☐	☐	☐	☐
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TEM VERMICULITE	CINCINNATI METHOD			☐	☐	☐	☐
OTHER:		☐	☐	☐	☐	☐	☐

REMARKS / SPECIAL INSTRUCTIONS: Run TEM on negative PLM NOB. Positive STOP

☑ Accept Samples
☐ Reject Samples

Relinquished By:	Date/Time	Received By:	Date/Time
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Field Data Form – Asbestos Survey

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	4A-C	FT & mastic	Bathrooms (front		80SF	
	5A-C	ceiling tile	office area		1,000 SF	
0.19	6A-C	carpet backing (contaminated carpet)	office area		1,500 SF	
0.25	7A-C	FT & mastic	portions of office		500 SF	
	8A-C	Tar paper	under hardwood		13,000 SF	
	9A-C	Black mastic	one room pucks		220 4-inch pucks	
0.34	10A-C	mastic	Portion of front		70 SF	
	11A-C	plaster Base & skim	portion of front		950 SF	
	12A-C	white caulk (only white caulk)	front wood panels		W	

Field Data Form – Asbestos Survey

Sample ID:	Material Desc.	Location	Type of Material	Quantity	Condition
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16A-C	white insulation	furnace		150 SF	
17A-C	Glazing	warehouse windows		280 LF	
	roofing	one roof			

APPENDIX D
Professional Qualifications

SCDHEC ISSUED

Asbestos ID Card

Brian Paul Davis

CONSULTBI **BI-01648**

Expiration Date:
08/09/23

SCDHEC ISSUED

Asbestos ID Card

Daniel Robert Matz

CONSULTBI **BI-01646**

Expiration Date:
08/09/23

APPENDIX B

REPORT OF GEOTECHNICAL EXPLORATION

PROPOSED MIXED-USE DEVELOPMENT
DIXIE HARDWARE BUILDING
200 OREGON AVENUE
GREENWOOD, SOUTH CAROLINA

Prepared For:
Greenwood Development, LLC
104 Maxwell Avenue
Greenwood, South Carolina 29646

BLE Project Number J23-20575-03

September 13, 2023

BUNNELL LAMMONS ENGINEERING
6004 Ponders Court | Greenville, SC 29615
864.288.1265 864.288.4330 info@blecorp.com
BLECORP.COM

BUNNELL LAMMONS ENGINEERING

September 13, 2023

Greenwood Development, LLC
104 Maxwell Avenue
Greenwood, South Carolina 29646

Attention: Ms. Lesley Lane
llane@greenwoodcr.com

Subject: **Report of Geotechnical Exploration**
Proposed Mixed-Use Development
Dixie Hardware Building
200 Oregon Avenue
Greenwood, South Carolina 29646
BLE Project No. J23-20228-01

Dear Ms. Lesley Lane:

Bunnell-Lammons Engineering, Incorporated (BLE) is pleased to present this report of geotechnical exploration for the proposed Mixed-Use Development at the existing Dixie Hardware Building located in Greenwood, South Carolina. This exploration was performed generally as described in Bunnell-Lammons Engineering (BLE) Proposal No. P23-1194 dated July 18, 2023. The exploration was authorized on July 21, 2023 by the signature of Ms. Lesley Lane on our Proposal Acceptance Sheet.

Sincerely,

BUNNELL-LAMMONS ENGINEERING, INC.

Sarah V. Interlicchia, E.I.T
Engineering Associate

Genevieve F. Sollenberger, P.E.
Senior Engineer
Registered, South Carolina #34936

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER
No. 34936
9/13/2023
GENEVIEVE F. SOLLENBERGER

SOUTH CAROLINA
BUNNELL-LAMMONS ENGINEERING, INC.
No. C01452
CERTIFICATE OF AUTHORIZATION

TABLE OF CONTENTS

Appendix

1.0 AUTHORIZATION

A geotechnical exploration for the Mixed-Use development at the existing Dixie Hardware Building located in Greenwood, South Carolina was performed generally as described in Bunnell-Lammons Engineering (BLE) Proposal No. P23-1194 dated July 9, 2023. The exploration was authorized on July 21, 2023 by the signature of Ms. Lesley Lane on our Proposal Acceptance Sheet.

2.0 SCOPE OF EXPLORATION

This report presents the findings of the geotechnical exploration performed for the proposed mixed-use development at the existing Dixie Hardware Building located in Greenwood, South Carolina (reference Figure 1 in Appendix A). The intent of this exploration was to evaluate the subsurface soil and groundwater conditions at the site and provide geotechnical recommendations for design of the foundations, and associated project elements. We have also included a discussion of secondary design considerations and provided geotechnical related construction recommendations.

3.0 PROJECT INFORMATION

The following project information was provided in a request for proposal (RFP) from Mr. George Schafer of Boudreaux to our Mr. Prescott May. Included with the RFP was a preliminary site sketch of the proposed development with requested boring locations.

From the provided information, we understand that it is proposed to renovate and construct new additions to the existing Dixie Hardware Building located at 200 Oregon Avenue in Greenwood, South Carolina. From the preliminary site sketch, we understand that the renovation is proposed to include new tenant space and a breezeway in the existing structure. West of the structure is a proposed performance space and entertainment area with two anchor stores, a water fountain, firepits, swings, and covered seating. We assume the new proposed buildings will be supported by conventional shallow foundations with a concrete slab on grade. Parking areas are proposed for the area east of the existing building.

The site currently consists of the existing Dixie Hardware Building with associated parking and drive areas in the western portion of the property and a maintained grass area with sections of small to large trees with underbrush in the eastern portion of the property.

Structural information was not provided as of the date of this report. Based on our experience with similar projects, we anticipate maximum individual column loads and continuous wall loads of approximately 200 kips and 5 kips per linear foot, respectively. We assume minimal site grading (less than 10 feet of earthwork cut and fill) will be required for construction.

4.0 FIELD EXPLORATION

The site was explored by drilling the five requested soil test borings (ASTM D1586) and two hand auger borings with dynamic cone penetrometer (DCP) testing inside the existing building under the grade slab. The grade slab was cored by Dixie Concrete Cutting for BLE. The approximate test locations are shown on the attached Boring Location Plan (reference Figure 2 in Appendix A). The Boring Logs and Hand Auger Boring Logs are presented as Appendix C. The soil test borings and hand auger borings were located in the field by our Ms. Sarah Interlicchia by referencing the provided site plan and identifiable landmarks.

The boring locations shown in Appendix A should be considered approximate. A description of our field procedures is also included as Appendix B.

5.0 SITE GEOLOGY

The project site is located in the Piedmont Physiographic Province, an area underlain by ancient igneous and metamorphic rocks. The virgin soils encountered in this area are the residual product of in-place chemical weathering of the rock. In areas not altered by erosion, previous construction or other human activities, the typical residual soil profile consists of clayey soils near the surface where soil weathering is more advanced. The near surface clayey soils are typically underlain by sandy silts and silty sands.

The boundary between soil and rock is not sharply defined. This transitional zone is termed partially weathered rock (PWR) and is normally found overlying the parent bedrock. For engineering purposes, partially weathered rock is defined as residual material with a standard penetration resistance of at least 100 blows per foot. Weathering is facilitated by fractures, joints, and the presence of less resistant rock types. As a result, the profile of the partially weathered rock and hard rock is quite irregular and erratic, even over short horizontal distances. Also, it is not unusual to find lenses and boulders of hard rock and zones of partially weathered rock within the soil mantle, well above the general bedrock level.

6.0 SUBSURFACE CONDITIONS

Beneath a thin layer of approximately 3 inches of asphalt and 2 inches of gravel in borings B-1 and B-3, 4 inches of asphalt in Boring B-2, 3 to 2 inches of topsoil in borings B-4 and B-5, and 6.5 to 7 inches of concrete and 2 to 3 inches of gravel in the hand auger borings HA-1 and HA-2, the borings drilled for this exploration encountered fill/possible fill and residual soils. Fill/possible fill soils were encountered in borings B-4, B-5, HA-1, and HA-2 extending to depths varying from 1 to 6 feet below the surficial layer of top soil or gravel. The fill soils consisted of stiff sandy lean clay (CL), firm clayey sand (SC), and firm silty sand (SM).

Residual soils were encountered beneath the fill in the borings listed above and beneath the surficial layer of gravel or asphalt in the remaining borings. The residual soils were noted to consist of stiff to hard sandy lean clay (CL), stiff to very stiff sandy elastic silt (MH), stiff sandy silt (ML), firm to dense clayey sand (SC), and firm silty sand (SM). The letters in parentheses represent a visual classification of the soils in accordance with the Unified Soil Classification System. A key to symbols and classification is included as Appendix D.

Groundwater was encountered at Boring B-2 at a depth of 17 feet at the time of drilling. Groundwater was not encountered in the remaining borings at the time of drilling. It should be noted that groundwater levels may fluctuate several feet with seasonal and rainfall variations and with changes in the water level in adjacent drainage features. Normally, the highest groundwater levels occur in late winter and spring and the lowest levels occur in late summer and fall.

The above descriptions provide a generalized summary of the subsurface conditions encountered. The Boring Logs and Hand Auger Logs included in Appendix C contain detailed information recorded at each boring location. The Boring Logs represent our interpretation of the field logs based on engineering examination of the field samples. The lines designating the interfaces between various strata represent approximate boundaries and the transition between strata may be gradual. It should be noted that the soil conditions will vary between boring locations.

7.0 ANALYSIS AND DESIGN RECOMMENDATIONS

7.1 Foundations

Based on the boring data and our experience with similar soil conditions, the encountered fill and residual soils are suitable for shallow foundation support of the proposed construction. Satisfactory performance of the shallow foundations is subject to the criteria and site preparation recommendations contained in this report.

Foundations bearing in the existing fill and residual soils may be sized for an allowable bearing pressure of 3,000 pounds per square foot (psf). Foundations bearing on new engineered fill that is placed on approved soil and compacted to at least 95 percent of the standard Proctor maximum dry density (ASTM D698), as recommended later in this report, may also be sized for an allowable bearing pressure of 3,000 psf. Loose disturbed soils that may exist near the existing building should be evaluated at the time of construction. These loose soils should be replaced with engineered fill as recommended in Section 8.5 of this report.

We recommend that the minimum widths for individual column and continuous wall footings be 24 inches and 18 inches, respectfully. The minimum widths will provide a margin of safety against a local or punching shear failure of the foundation soils. Footings should bear at least 18 inches below final grade to provide frost protection and protective embedment. We recommend that walls be provided with movement joints to accommodate some possible differential settlement.

Exposure to the environment may weaken the soils at the foundation bearing level if the foundation excavations remain open for long periods of time. Therefore, we recommend that once each foundation excavation is extended to final grade, the foundation be constructed as soon as possible to minimize the potential damage to bearing soils. The foundation bearing area should be level or benched and free of loose soil, ponded water and debris. Foundation concrete should not be placed on soils that have been disturbed by seepage. If the bearing soils are softened by surface water intrusion or exposure, the softened soils must be removed from the foundation excavation bottom prior to placement of concrete. If the excavation must remain open overnight or if rainfall becomes imminent while the bearing soils are exposed, we recommend that a 2 to 4-inch thick "mud-mat" of "lean" (2,000 psi) concrete be placed on the bearing soils for protection before the placement of reinforcing steel.

To verify that the soils encountered in footing excavations are similar to those encountered by the soil test borings, we recommend that foundation excavations be examined. Part of this examination should include checking the foundation bearing soils with a dynamic cone penetrometer performed by an experienced engineering technician working under the direction of the geotechnical engineer. Disturbed soils that are not suitable for foundation support may exist in the vicinity of the original location of the residential structure.

7.2 Settlement

We conducted settlement estimates assuming conventional shallow foundations were used to support the structures. The settlement estimates are based on the maximum estimated column load of 200 kips and a sustained load of 160 kips (80 percent of the total load). Assuming foundations are designed and constructed in accordance with the recommendations presented in this report, we estimate the total foundation settlement to be approximately 1 inch or less. Maximum differential settlement between adjacent similarly loaded foundations is estimated to be approximately ¾ inch or less.

7.3 Lateral Earth Pressure

Retaining walls must be capable of resisting the lateral earth pressures that will be imposed on them. Walls which will be permitted to rotate at the top, such as cantilever retaining walls, may be designed to resist the active earth pressure. The active earth pressure coefficient is designated as Ka. Typically, a top rotation of about 1 inch per 10 feet height of wall is sufficient to develop active pressure conditions in soils similar to those encountered at the site. We recommend a Ka value of 0.33 for the soils encountered at this site when placed in accordance with the requirements for engineered fill.

Walls which will be prevented from rotating such as laterally braced retaining walls should be designed to resist the at-rest lateral earth pressure. The at-rest earth pressure coefficient is designated as Ko. We recommend a Ko value of 0.5 for the soils encountered at this site when placed in accordance with the requirements for engineered fill.

The passive earth pressure may be considered as the pressure exerted on the side of a foundation which aids in resisting sliding of the foundation. The passive earth pressure coefficient is designated as Kp. Friction resistance along the base of the foundation may also be used to resist sliding. The coefficient of frictional resistance is designated as fs. We recommend a fs value of 0.4 and a Kp value of 3.0 for the soils encountered at this site. Consideration should be given to dividing the passive earth pressure coefficient by a safety factor of 2 to limit the amount of lateral deformation required to mobilize the passive resistance. Published documentation[1] indicates that very little horizontal compression (approximately 0.5% relative to wall height) is required to develop one-half of the available passive resistance, hence the suggested safety factor of 2. However, depending on soil type and relative density it may take 2 to 15% horizontal compression to develop the full passive resistance.

The values presented above assume that the ground surface is level. Sloping backfill (or sloping soil surfaces in front of a footing when considering passive resistance) will dramatically influence the earth pressure coefficients. Bunnell-Lammons Engineering should be consulted concerning applicable earth pressure coefficients where sloping soil surfaces may be present.

The compacted mass unit weight of the backfill soil, which we estimate to be approximately 125 pcf, should be used with the earth pressure coefficients to calculate lateral earth pressures. Lateral pressure arising from surcharge loading, earthquake loading, and groundwater should be added to the above soil earth pressures to determine the total lateral pressures which the walls must resist. Where practical, we recommend that retaining walls and other below grade walls incorporate filtered gravity drainage systems to prevent the buildup of excess hydrostatic pressures behind the walls. In addition, transient loads imposed on the walls by construction equipment during backfilling should be taken into consideration during design and construction. Excessively heavy grading equipment should not be allowed within about 5 feet horizontally of the walls.

7.4 Grade Slabs

The grade slabs may be soil supported assuming that the site is prepared in accordance with the recommendations in this report. The grade slab should be jointed around columns and along footing supported walls so that the slab and foundations can settle differentially without damage. This jointing is not required when slabs and foundations are cast as a monolithic unit (i.e. thickened edge foundations). If slab thickness

[1] *Soil Mechanics* by T. William Lambe and Robert V. Whitman; Massachusetts Institute of Technology; 1969; p.165.

permits, joints containing dowels or keys may be used in the slab to permit movement between parts of the slab without cracking or sharp vertical displacements.

Floor slabs supported on grade which will be carpeted, tiled, painted or receive some other covering or sealant should incorporate a vapor barrier. The vapor barrier should be installed in accordance with the requirements of ACI 302 and per the manufacturer's recommendations.

7.5 Pavement

A site-specific pavement design requires detailed information about projected traffic frequency and intensity, acceptable service limits, life expectancy and other factors which are not currently available. It also requires site specific laboratory testing which was not part of the scope of this exploration. However, presented below are recommended pavement sections based on our experience on similar projects in this region. These pavement sections have demonstrated acceptable performance with subsurface conditions similar to this site. Assuming the site is prepared in accordance with the recommendations of this report, the pavement sections presented below could be expected to provide adequate performance considering a 15 to 20-year service life. For the purpose of this report, light duty pavement is considered to be subject to automobile traffic, such as a car parking lot. Medium duty pavement is considered to be subject to a heavy concentration of automobiles and occasional loaded trucks, such as drive lanes.

Pavement Type	Layers	Material	Thickness (Inches)	
			Light-Duty	Medium Duty
Flexible	a.	Asphaltic concrete surface course	2	3
	b.	Aggregate base course	6	8
Rigid	a.	Concrete	6	6

The asphaltic concrete should conform to the South Carolina Department of Transportation Supplemental Technical Specification for Hot-Mix Asphalt Material Properties (SCDOT Designation: SC-M-402) Type C HMA Surface Course. The stone base course should meet the requirements of Section 305 of SCDOT Standard Specifications for Macadam base. The base course should be compacted to 100 percent of the modified Proctor (ASTM D1557) maximum dry density.

The concrete for rigid pavement should be air-entrained and have a minimum flexural strength (third point loading) of 550 psi which could likely be achieved by a concrete mix having a compressive strength of at least 4,000 psi at 28 days. Recommended air contents from the Portland Cement Association (PCA) are as follows:

Maximum Aggregate Size	Percent Air
1½ inches	5 percent plus or minus 1½ percent
¾ to 1-inch	6 percent plus or minus 1½ percent

In addition, we recommend a maximum slump of 4 inches for plastic concrete.

Joint spacing for the recommended concrete thickness should be on the order of 12 to 15 feet. Control joints should be sawed as soon as the cut can be made, without raveling (aggregate pulling out of the concrete matrix) or cracks forming ahead of the saw blade. Joints should be sawed consecutively so that the joints commence working together. The American Association of State Highway and Transportation Officials

(AASHTO) suggests that transverse contraction joints should be one quarter of the slab thickness and longitudinal joints should be one third of the slab thickness. All joints should be filled with flexible joint filler.

Curing of the concrete slab should begin as soon as the slab has been finished and the joints sawed. Moist curing by fog spray nozzles or wet burlap is the most dependable curing procedure. Other methods of curing could consist of spray applied curing compounds or covering the slab with waterproof paper or heavy plastic. If paper or plastic is used for curing, the edges of the cover should be anchored and joints between sheets should be taped or sealed.

Related civil design factors such as subgrade drainage, shoulder support, cross-sectional configurations, surface elevations, and environmental factors which will significantly affect the service life must be included in the preparation of the construction drawings and specifications. Normal periodic maintenance will be required.

7.6 Secondary Design Considerations

The following items are presented for your consideration. These items are known to generally enhance performance of structural and pavement systems.

- Roof drainage should be collected by a system of gutters and downspouts and directed away from all structures.
- Site grading should result in positive drainage away from the structures. Water should not be allowed to pond around the structures or in such locations that would lead to saturation of subgrade materials.
- Backfill for utility lines should be placed in accordance with the requirements for engineered fill to minimize the potential for differential settlement.

8.0 CONSTRUCTION RECOMMENDATIONS

8.1 Clearing and Grubbing

All existing topsoil, vegetation, asphalt, gravel, concrete, existing construction, disturbed soils, unsuitable soils and surface soils containing organic matter or other deleterious materials should be stripped from within the proposed building and pavement areas. Topsoil and organic soils may be stockpiled for later use in areas to be landscaped. Other deleterious material should be disposed of offsite or in areas of the site that will not be developed.

8.2 Drainage

Groundwater was not encountered within the expected excavation depths. However, it should be noted that groundwater levels may fluctuate several feet with seasonal and rainfall variations and with changes in the water level in adjacent drainage features. Normally, the highest groundwater levels occur in late winter and spring and the lowest levels occur in late summer and fall. The contractor should be prepared to promptly remove any surface water or groundwater from the construction area. This has been done effectively on past jobs by means of gravity ditches and pumping from filtered sumps.

8.3 Proofrolling

After stripping and rough excavation grading, we recommend that areas to provide support for the foundations, floor slab, engineered fill and pavement be carefully inspected for soft surficial soils and proofrolled with a 25 to 35-ton, four-wheeled, rubber-tired roller or similar approved equipment. This will assist in identifying near surface soft soils within the building and pavement areas that may be present. The proofroller should make at least four passes over each location, with the last two passes perpendicular to the first two where practical.

Any areas which wave, rut, or deflect excessively and continue to do so after several passes of the proofroller should be excavated to firmer soils. The excavated areas should be backfilled in thin lifts with engineered fill. The proofrolling and excavating operations should be carefully monitored by an experienced engineering technician working under the direction of the geotechnical engineer. Proofrolling should not be performed when the ground is frozen or wet from recent precipitation.

8.4 Engineered Fill

All fill used for raising site grade or for replacement of material that is undercut should be uniformly compacted in thin lifts to at least 95 percent of the standard Proctor maximum dry density (ASTM D698). In addition, at least the upper 18 inches of subgrade fill beneath pavements and floor slabs should be compacted to at least 98 percent of the maximum dry density. We recommend that the fill be placed and compacted at a moisture content within three percent of the standard Proctor optimum moisture content.

Based on our visual examination and experience with similar soil types, the soils encountered by the borings appear suitable for use as engineered fill with proper moisture adjustment. Soils having a Plasticity Index (PI) greater than 30 (less than 15 is preferable) should not be used for fill. Soils used for engineered fill should be reasonably free from organics (less than 3% organics by weight) and should exhibit a standard Proctor maximum dry density greater than 90 pcf.

Before filling operations begin, representative samples of each proposed fill material should be collected and tested to determine the compaction and classification characteristics. The maximum dry density and optimum moisture content should be determined. Once compaction begins, a sufficient number of density tests should be performed by an experienced engineering technician working under the direction of the geotechnical engineer to measure the degree of compaction being obtained. Existing slopes steeper than 6:1 (horizontal:vertical) should be benched prior to placement of engineered fill such that the fill is placed in horizontal layers and keyed into the existing slopes.

The surface of compacted subgrade soils can deteriorate and lose its support capabilities when exposed to environmental changes and construction activity. Deterioration can occur in the form of freezing, formation of erosion gullies, extreme drying, exposure for a long period of time or rutting by construction traffic. We recommend that the surfaces of floor slab and pavement subgrades that have deteriorated or softened be recompacted prior to construction of the floor slab or pavement. Additionally, any excavations through the subgrade soils (such as utility trenches) should be properly backfilled in compacted lifts. Recompaction of subgrade surfaces and compaction of backfill should be checked with a sufficient number of density tests to determine if adequate compaction is being achieved.

8.5 Slopes

Confined temporary excavations such as for utility installation or below-grade wall construction should conform to OSHA regulations. For permanent slopes which are not confined, our experience suggests that excavation side slopes through the existing soil overburden at the site should be laid back at a 2H:1V (horizontal to vertical) slope or flatter. Permanent fill slopes placed on a suitable foundation should be constructed at 2.5:1, or flatter. Fill slopes should be adequately compacted. Cut and fill slope surfaces should be protected from erosion by grassing or other means. Permanent slopes of 3:1 or flatter may be desirable for mowing.

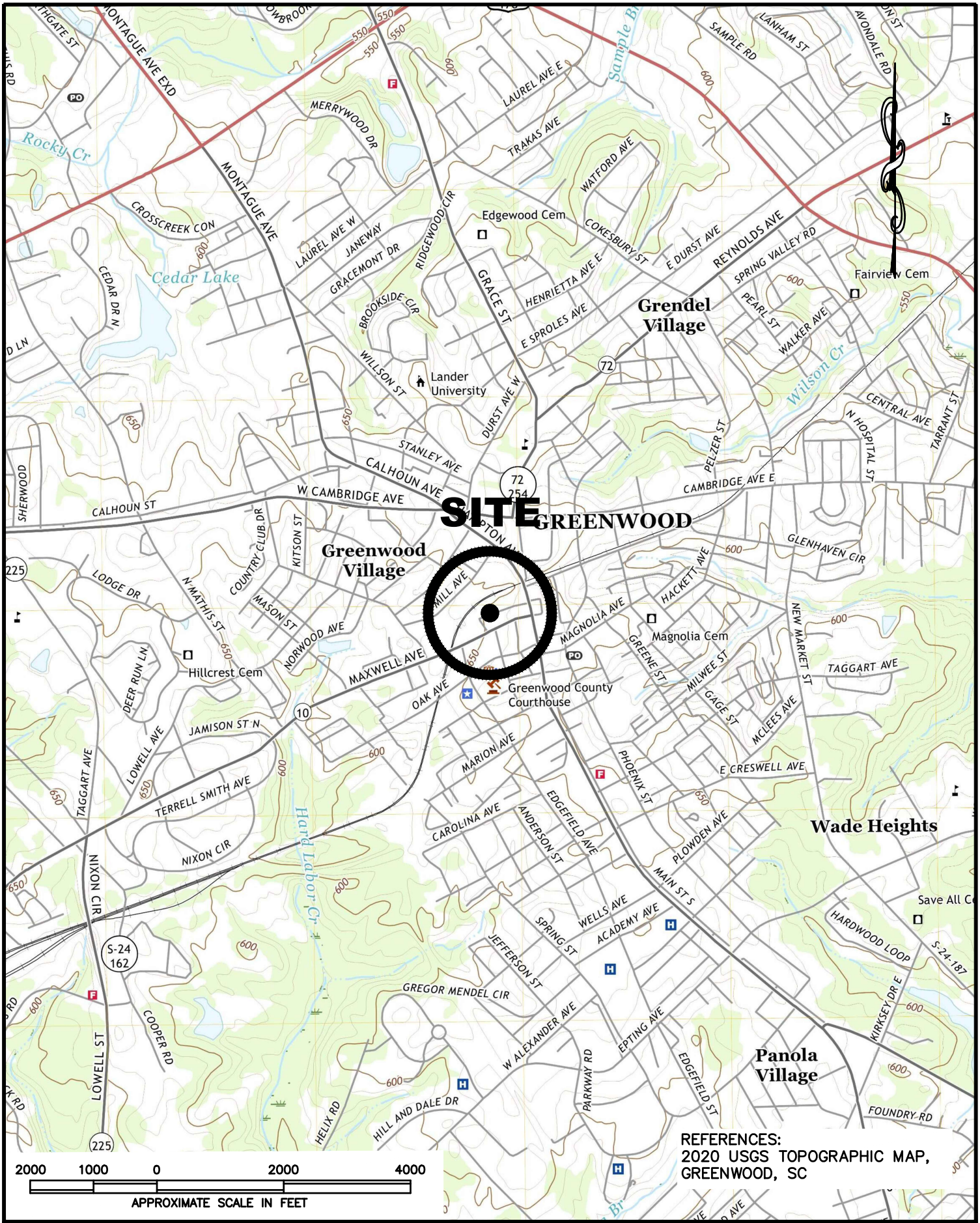
9.0 SPECIFICATIONS REVIEW

It is recommended that Bunnell-Lammons Engineering be retained to make a general review of the foundation and earthwork plans and specifications prepared from the recommendations presented in this report. We would then suggest any modifications so that our recommendations are properly interpreted and implemented.

10.0 BASIS OF RECOMMENDATIONS

Our evaluation of foundation support conditions has been based on our understanding of the project information and data obtained in our exploration as well as our experience on similar projects. The generalized subsurface conditions utilized in our foundation evaluation have been based on interpolation of the subsurface data between the widely spaced borings. Subsurface conditions between the borings may differ. If the project information is incorrect or the structure location (horizontal or vertical) and/or dimensions are changed, please contact us so that our recommendations can be reviewed. The discovery of any site or subsurface conditions during construction which deviate from the data obtained in this exploration should be reported to us for our evaluation. The assessment of site environmental conditions for presence of pollutants in the soil, rock and groundwater of the site was beyond the scope of this exploration. Soil cuttings used as backfill in boreholes will settle over time resulting in a depression at the surface. It is beyond the scope of our services to return to the site to repair boreholes that have exhibited settlement of the backfill soils.

APPENDIX A
Figures



REFERENCES:
2020 USGS TOPOGRAPHIC MAP, GREENWOOD, SC

2000 1000 0 2000 4000
APPROXIMATE SCALE IN FEET

DRAWN: JPS	DATE: 8-23-23	BUNNELL LAMMONS ENGINEERING	FIGURE
CHECKED: SVI	CAD: PROMUDEV-01SLM	6004 Ponders Court, Greenville, SC 29615 Phone: (864) 288-1265 Fax: (864) 288-4430	SITE LOCATION MAP PROPOSED MIXED USE DEVELOPMENT 200 OREGON AVENUE GREENWOOD, SOUTH CAROLINA
APPROVED: GFS	JOB NO: J23-20575-03		1

DRAWN: JPS	DATE: 8-23-23	BUNNELL LAMMONS ENGINEERING	FIGURE
CHECKED: SVI	CAD: PROMUDEV-01BLP	6004 Ponders Court, Greenville, SC 29615 Phone: (864) 288-1265 Fax: (864) 288-4430	BORING LOCATION PLAN PROPOSED MIXED USE DEVELOPMENT 200 OREGON AVENUE GREENWOOD, SOUTH CAROLINA
APPROVED: GFS	JOB NO: J23-20575-03		2

APPENDIX B
Field Exploration Procedures

BUNNELL LAMMONS ENGINEERING

Field Exploration Procedures

Soil Test Borings

The soil test borings were made by mechanically twisting a continuous flight steel auger into the soil. Soil sampling and penetration testing were performed in general accordance with ASTM D 1586. At assigned intervals, soil samples were obtained with a standard 1.4-inch I. D., 2-inch O. D., split-tube sampler. The sampler was first seated 6 inches to penetrate any loose cuttings, and then driven an additional 12 inches with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final 12 inches was recorded and is designated the "standard penetration resistance." The penetration resistance, when properly evaluated, is an index to the strength of the soil and foundation supporting capability.

Representative portions of the soil samples, thus obtained, were placed in glass jars and transported to the laboratory. In the laboratory, the samples were examined by a geotechnical engineer to verify the field classifications of the driller. Boring Logs are attached, showing the soil descriptions and penetration resistance.

Hand Auger Boring

The hand auger borings were advanced by manually twisting a sharpened steel auger into the ground. The soils encountered were identified in the field from cuttings brought to the surface by the augers. At regular intervals, the auger was removed and the soil consistency measured with a dynamic cone penetrometer. The conical point was first seated to penetrate any loose cuttings, then driven additional increments of 1¾ inches with blows from a 15-pound hammer falling 20 inches. The number of hammer blows required to achieve this penetration was recorded and is an index to the soil strength and bearing capacity. Soil descriptions and penetrometer test data are tabulated on the attached Hand Auger Records.

APPENDIX C
Boring Logs and
Hand Auger Boring Logs

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

BORING NO. B-1

PROJECT: Proposed Mixed Use Development — PROJECT NO.: J23-20575-03

CLIENT: Greenwood Development, LLC. — START: 8-14-23 END: 8-14-23

LOCATION: 200 Oregon Avenue, Greenwood SC — ELEVATION:

DRILLER: Metro Drill, Inc., R. Carver — LOGGED BY: S. Interlicchia

DRILLING METHOD: Soil Sentry 2 1/4" Hollow Stem Auger

DEPTH TO - WATER> INITIAL: _____ AFTER 24 HOURS: _____ CAVING> _____

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT
	3 inches of ASPHALT			
	2 inches of GRAVEL			
	Stiff, tan and brown, slightly micaceous, fine to medium sandy, lean CLAY - (residuum)		6 7 7	
5			6 6 7	
	Firm, tan and brown, slightly micaceous, clayey, fine to medium SAND		8 8 8	
	Very stiff to stiff, red and brown, micaceous, fine to medium sandy, elastic SILT		7 8 8	
10				
			8 8 8	
15				
			6 5 5	
20				
			5 5 7	
25	Boring terminated 25 feet below ground surface. No groundwater encountered at time of drilling.			
30				
35				

STANDARD PENETRATION RESULTS BLOWS/FOOT: 2 5 10 20 30 40 50 70 90

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

BORING NO. B-2

PROJECT: Proposed Mixed Use Development — PROJECT NO.: J23-20575-03

CLIENT: Greenwood Development, LLC. — START: 8-14-23 END: 8-14-23

LOCATION: 200 Oregon Avenue, Greenwood SC — ELEVATION:

DRILLER: Metro Drill, Inc., R. Carver — LOGGED BY: S. Interlicchia

DRILLING METHOD: Soil Sentry 2 1/4" Hollow Stem Auger

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ 17 CAVING> _____

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
	4 inches of ASPHALT			
	Dense, tan and brown, slightly micaceous, clayey, fine to medium SAND - (residuum)			10 14 17
	Hard, gray, tan and brown, slightly micaceous, fine to medium sandy, lean CLAY			10 14 17
5				
	Very stiff to stiff, red and brown, micaceous, fine to medium sandy, elestic SILT			8 8 8
				7 6 6
10				
				4 4 5
15				
				6 6 5
20				
	At 23 feet - dusky red and brown			7 7 7
25	Boring terminated at 25 feet below ground surface. Groundwater encountered at 17 feet at time of drilling.			
30				
35				

GEOT_NOWELL 20575-03.GPJ 9/7/23

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

BORING NO. B-3

PROJECT: Proposed Mixed Use Development — PROJECT NO.: J23-20575-03

CLIENT: Greenwood Development, LLC. — START: 8-14-23 END: 8-14-23

LOCATION: 200 Oregon Avenue, Greenwood SC — ELEVATION:

DRILLER: Metro Drill, Inc., R. Carver — LOGGED BY: S. Interlicchia

DRILLING METHOD: Soil Sentry 2 1/4" Hollow Stem Auger

DEPTH TO - WATER> INITIAL: _____ AFTER 24 HOURS: _____ CAVING> _____

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT
	3 inches of ASPHALT			
	2 inches of GRAVEL			
	Firm, tan and brown, slightly micaceous, clayey, fine to medium SAND - (residuum)			8 10 10
5				10 8 9
				9 9 9
	Very stiff to stiff, red and brown, micaceous, moist, fine to medium sandy, elastic SILT			10 12 10
10				
	At 13 feet - with quartz fragments			8 7 6
15				
	At 18 feet - absent quartz fragments			5 5 5
20				
				6 5 6
25	Boring terminated at 25 feet below ground surface. No groundwater encountered at time of drilling.			
30				
35				

STANDARD PENETRATION RESULTS BLOWS/FOOT: 2 5 10 20 30 40 50 70 90

GEOT_NOWELL 20575-03.GPJ 9/7/23

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

BORING NO. B-4

PROJECT: Proposed Mixed Use Development — PROJECT NO.: J23-20575-03

CLIENT: Greenwood Development, LLC. — START: 8-14-23 END: 8-14-23

LOCATION: 200 Oregon Avenue, Greenwood SC — ELEVATION:

DRILLER: Metro Drill, Inc., R. Carver — LOGGED BY: S. Interlicchia

DRILLING METHOD: Soil Sentry 2 1/4" Hollow Stem Auger

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> _____

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
	3 inches of TOPSOIL			
	Stiff, tan and brown, slightly micaceous, fine to medium sandy, lean CLAY with trace hair-like roots - (fill)			5 5 6
	Stiff, brown and tan, micaceous, fine to medium sandy, SILT with trace hair-like roots - (residuum)			4 5 6
5				
	Stiff to very stiff, white and tan, slightly micaceous, fine to medium sandy, elastic SILT			6 5 6
				6 6 7
10				
	At 13 feet - moist with trace hair-like roots and clay			6 7 8
15				
				10 8 8
20				
	At 23 feet - tan and brown			8 6 6
25	Boring terminated at 25 feet below ground surface. No groundwater encountered at time of drilling.			
30				
35				

GEOT_NOWELL 20575-03.GPJ 9/7/23

BLE INC.

BUNNELL-LAMMONS ENGINEERING, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

BORING NO. B-5

PROJECT: Proposed Mixed Use Development — PROJECT NO.: J23-20575-03

CLIENT: Greenwood Development, LLC. — START: 8-14-23 END: 8-14-23

LOCATION: 200 Oregon Avenue, Greenwood SC — ELEVATION:

DRILLER: Metro Drill, Inc., R. Carver — LOGGED BY: S. Interlicchia

DRILLING METHOD: Soil Sentry 2 1/4" Hollow Stem Auger

DEPTH TO - WATER> INITIAL: ▽ _____ AFTER 24 HOURS: ▼ _____ CAVING> _____

ELEVATION/ DEPTH (FT)	SOIL DESCRIPTION	SOIL TYPE	SAMPLES	STANDARD PENETRATION RESULTS BLOWS/FOOT (2 5 10 20 30 40 50 70 90)
	2 inches of TOPSOIL			
	Firm, dark brown, slightly micaceous, silty, fine to medium SAND with trace rock fragments - (fill)		6 7 7	
	Firm, tan and brown, slightly micaceous, clayey, fine to medium SAND - (possible fill)		7 6 6	
5				
	Very stiff to stiff, white and tan, slightly micaceous, fine to medium sandy, elastic SILT		10 10 10	
	At 8 feet - with trace hair-like roots		5 5 5	
10				
	Firm, tan and brown, slightly micaceous, clayey, fine to medium SAND		4 5 6	
15				
			6 7 8	
20				
	Stiff, green, tan and brown, micaceous, fine to medium sandy, elastic SILT		5 6 5	
25	Boring terminated at 25 feet below ground surface. No groundwater encountered at time of drilling			
30				
35				

BUNNELL LAMMONS ENGINEERING

REPORT DATE

8/15/2023

HAND AUGER BORINGS AND DCP LOGS

PROJECT:	Dixie Hardware Building Renovation
CLIENT:	Greenwood Development, LLC
BLE PROJECT NO.:	J23-20575-03

TEST LOCATION	DEPTH (feet)	BLOW COUNTS/ 1-3/4" Increment			AVG BLOWS	NOTES
HA-1	0	25+			25+	7 inches of Concrete, 2 inches of Gravel
	-1	25+			25+	Tan and gray, slightly micaceous, clayey, fine to course SAND (SC) - Possible Fill
	-2	25+			25+	Tan and gray, slightly micaceous, clayey, fine to course SAND (SC) - Residuum
	-3	19	19	25+	22	Tan and gray, slightly micaceous, clayey, fine to course SAND (SC) - Residuum
	-4	25+			25+	Gray and tan, slightly micaceous, fine to medium sandy, lean CLAY (CL)
	-5	25+			25+	Gray and tan, slightly micaceous, fine to medium sandy, lean CLAY (CL)
HA-2	0	3	6	11	9	6.5 inches of Concrete, 3 inches of Gravel
	-1	11	25+		25+	Red and tan, slightly micaceous, silty, fine to medium SAND with trace clay (SM) - Possible Fill
	-2	25+			25+	Tan and white, micaceous, silty, fine to medium SAND (SM) - Residuum
	-3	25+			25+	Red and brown, micaceous, silty, fine to medium SAND (SM)
	-4	25+			25+	Red and brown, micaceous, silty, fine to medium SAND (SM)
	-5	25+			25+	Red and brown, micaceous, silty, fine to medium SAND (SM)

Note: Stopped at 5 feet due to overhead clearance.

APPENDIX D
A Key to Soil Classification

KEY TO SOIL CLASSIFICATIONS AND CONSISTENCY DESCRIPTIONS

BUNNELL-LAMMONS ENGINEERING, INC.
GREENVILLE, SOUTH CAROLINA

Penetration Resistance* Blows per Foot	Relative Density
SANDS	
0 to 4	Very Loose
5 to 10	Loose
11 to 20	Firm
21 to 30	Very Firm
31 to 50	Dense
over 50	Very Dense

Penetration Resistance* Blows per Foot	Consistency
SILTS and CLAYS	
0 to 2	Very Soft
3 to 4	Soft
5 to 8	Firm
9 to 15	Stiff
16 to 30	Very Stiff
31 to 50	Hard
over 50	Very Hard

*ASTM D 1586

Particle Size Identification

Boulder: Greater than 300 mm
Cobble: 75 to 300 mm
Gravel:
Coarse - 19 to 75 mm
Fine - 4.75 to 19 mm
Sand:
Coarse - 2 to 4.75 mm
Medium - 0.425 to 2 mm
Fine - 0.075 to 0.425 mm
Silt & Clay: Less than 0.075 mm

KEY TO DRILLING SYMBOLS


Grab Sample


Split Spoon Sample


Undisturbed Sample

NR = No reaction to HCL

NA = Not applicable

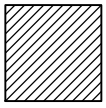
NS = No sample

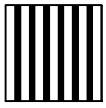

Groundwater Table at Time of Drilling

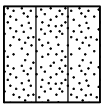

Groundwater Table 24 Hours after Completion of Drilling

KEY TO SOIL CLASSIFICATIONS

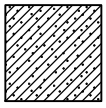

Well-graded Gravel
GW

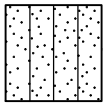

Low Plasticity Clay
CL

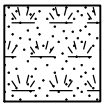

Clayey Silt
MH


Silty Sand
SM

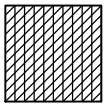

Poorly-graded Gravel
GP

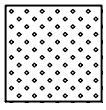

Sandy Clay
CLS

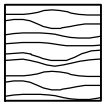

Sandy Silt
MLS


Topsoil
TOPSOIL

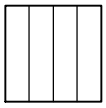

Partially Weathered Rock
BLDRCBBL

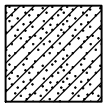

Silty Clay
CL-ML

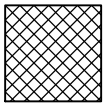

Sand
SW

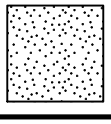

Liquid Sludge
SLUDGE

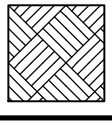

High Plasticity Clay
CH

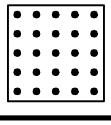

Silt
ML


Clayey Sand
SC


Fill
FILL


Poorly Graded Sand
SP


Bedrock
BEDROCK


Waste
WOOD

APPENDIX E
Important Information About This Geotechnical Report

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

APPENDIX C

BUNNELL LAMMONS ENGINEERING

August 24, 2023

Greenwood Development, LLC
C/o: Ms. Lesley Lane
104 Maxwell Avenue
Greenwood, South Carolina 29646

Subject: **Lead-Based Paint Assessment**
Vacant Commercial Building
200 Oregon Avenue
Greenwood, Greenwood County, South Carolina
BLE Project Number J23-20575-02

Dear Ms. Lane,

Bunnell-Lammons Engineering, Inc. (BLE) facilitated a Lead-Based Paint (LBP) Assessment at the above-referenced property, herein referred to as "Site." The LBP Assessment was performed in accordance with our Proposal No. P23-1162 dated July 14, 2023. This LBP Assessment was performed for Occupational Safety and Health Administration (OSHA) purposes prior to planned on-Site renovation and/or demolition activities.

On August 2, 2023, BLE representatives facilitated the performance of a LBP Assessment using an X-ray Fluorescence Spectrum Analyzer (XRF). Painted surfaces were selected based on color of topcoat, underlying layers, and substrate on which it was painted. Readings exceeding 0.7 milligrams per centimeter squared (mg/cm^2) are considered lead-based coatings as defined by the South Carolina Department of Health and Environmental Control (SCDHEC). Readings less than 0.7 mg/cm^2 are considered to have lead-containing substrates.

The complete *Lead-Based Paint Consulting Services* report is attached as part of this letter. Eight (8) areas of LBP, as follows, were identified during the assessment.

- Gray metal I-beams at exterior loading dock
- Gray wooden awning ceiling at exterior loading dock
- White brick walls at exterior loading dock
- White wooden corbels/soffit/fascia at exterior loading dock
- White metal sinks in the bathrooms
- White metal vertical pipe in the office with blue walls near the vault
- White wooden high ceiling in the basement area
- Gray metal fire door in the boiler room in the basement

The confirmed LBP materials identified during this assessment should not be sanded, torched, grinded on, or disturbed in a manner that will create a dust hazard. Additionally, OSHA contractor requirements exist and efforts should be made to prevent the potential spread and exposure of lead to the workers and the public during renovation or demolition activities. OSHA Lead Regulations do not recognize a threshold concentration of lead-paint for definition purposes. Rather, OSHA only recognizes the presence or absence of lead in defining lead containing materials. This OSHA regulation also establishes exposure levels to

employees of airborne lead. The current OSHA regulations recognize an airborne Action Level of 30 micrograms per cubic meter ($\mu g/m^3$) and a Permissible Exposure Level (PEL) of 50 $\mu g/m^3$ per 8-hour work day for employees. The full OSHA lead standard should be referenced for compliance.

It should also be noted that changes to state and federal regulations have changed disposal options for LBP "waste" and LBP "residue." LBP "waste" is defined as material that is coated with LBP. LBP "residue" is defined as residue that is generated from the removal of LBP. New regulations allow for LBP "waste" to be disposed of in Class 2 (construction and demolition debris) and Class 3 (municipal solid waste or industrial) landfills in South Carolina. The management of LBP "residue" is based on the source and lead concentration characterized by Toxic Characteristic Leaching Procedures (TCLP) to determine if the waste is classified as hazardous or non-hazardous.

BLE appreciates the opportunity to support your geotechnical, environmental, and construction materials testing needs. Please contact us (864) 288-1265 if you have any questions.

Sincerely,
BUNNELL-LAMMONS ENGINEERING INC.

Brian Davis
Environmental Scientist

Daniel R. Matz, P.E.
Senior Environmental Engineer

Attachment: *Lead-Based Paint Consulting Services – Vacant Commercial Building*, prepared by Apex Environmental Health and Safety, dated August 17, 2023

7 Winchester Court
Mauldin, SC 29662
864.404.3210 office
864.404.3213 fax

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Environmental Site Assessments

Hazard Communication

Apex Project Number 0723-148

August 17, 2023

Mr. Dan Matz
BLE Corp
6004 Ponders Court
Greenville, South Carolina 29615

Reference: Lead-Based Paint Consulting Services
Vacant Commercial Property
200 Oregon Avenue
Greenwood, South Carolina 29646

Dear Mr. Matz:

Apex Environmental Management, Inc. (Apex) is pleased to provide you with our Lead Based Paint (LBP) Sampling Report for the above-referenced project.

PROJECT INFORMATION

Apex was requested to perform a LBP inspection within the vacant commercial structure located at 200 Oregon Avenue in Greenwood, South Carolina in for Occupational Safety and Health Administration (OSHA) purposes due to potential renovation activities at the project site referenced above.

The vacant commercial building was originally constructed circa 1909 and is approximately 23,000 SF. The building itself and planned future use of the building does not appear to meet the criteria to be considered either "*target housing"* or a "*child occupied facility"* as defined by the Environmental Protection Agency's (EPA) Repair, Renovation and Painting (RRP) Program and the Department of Housing and Urban Development (HUD) guidelines. However, the LBP inspection was performed in accordance with the RRP Lead Program regulations and HUD guidelines and methodologies for representative surfaces sampling protocols. Included in this report is a summary of our field activities and the results obtained.

The objectives of the survey included the following:

- Identification of building components and surfaces that are coated, painted, stained, varnished, shellacked or otherwise coated throughout the interior and exterior areas of the building. Coated surfaces were evaluated based on the color of the topcoat, the underlying layers, age of construction and/or the substrate on which the paint is applied.

- The LBP inspection was performed by a SC/EPA lead licensed firm and SC/EPA licensed LBP risk assessor in accordance with the EPA's RRP Lead Program regulations and HUD guidelines and methodologies for representative surfaces sampling protocols.

- In situ analysis of suspected LBPs InnovX LBP-4000 X-ray Fluorescence analyzer (S/N 11921) was performed for intact surfaces and by collecting paint chip samples for analysis by flame atomic absorption for extensively damaged surfaces.

- No paint chips were collected during the inspection.

- Presenting the results in a report identifying confirmed LBPs.

METHODS

The LBP inspection was completed using an X-ray Fluorescence Spectrum Analyzer (XRF) (Serial No. 11921). Readings equal to or in excess of 0.7 milligrams per square centimeter (mg/cm^2) are considered to be LBP by South Carolina Department of Health and Environmental Control (SC DHEC). Readings less than 0.7 mg/cm^2 are considered to have lead-containing substrates. The screening was performed in accordance with the XRF's Performance Characteristic Sheet (PCS) specifications and NIST calibration standards. Calibration measurements were within the manufacturer's specifications.

The LBP inspection was performed by Mr. Tom Oliver (SC/EPA LBP Inspector License No. LBP-R-36342-2; Expiration Date 08/31/2023) with Apex (SC/EPA Lead Firm Certification No. LBP-F176049-3; Expiration Date 08/29/2026) on August 2, 2023. Lead painted surfaces were analyzed in place using XRF for intact surfaces. Surfaces that were coated, painted, stained, varnished and shellacked were selected based on estimated age of construction, color of topcoat, underlying layers and substrate on which it was painted.

RESULTS

Surfaces were analyzed by XRF throughout the interiors and exteriors of the structure for the presence of LBP. Currently SC DHEC defines XRF readings on substrates equal to or in excess of 0.7 mg/cm^2 to be LBP. Readings equal to or in excess of 1.0 mg/cm^2 via XRF and 0.5% weight or greater for paint chips are considered to be LBP by the EPA and HUD. Readings below the LBP thresholds are considered to have lead-containing substrates. LBP should not be sanded, torched, grinded on, or disturbed in a manner that will create a dust hazard. Similar precautions should be used on substrates with detectable levels of lead. *XRF LBP Data Tables* are included in Appendix I of this report and identifies materials coated with LBP. The following surfaces in the structure tested positive for lead in excess of the regulatory definition of 0.7 mg/cm^2:

Sample #	Location of LBP	Description of LBP	Photograph #
24	Exterior Loading Dock Area	Gray Metal I-Beams	5
25	Exterior Loading Dock Area	Gray Wooden Awning Ceiling	5
26	Exterior Loading Dock Area	White Brick Walls	6
27	Exterior Loading Dock Area	White Wooden Corbels/Soffit/Fascia	6
56	Bathrooms	White Metal Sinks	7

Sample #	Location of LBP	Description of LBP	Photograph #
78	Office with Blue Walls Next to Vault	White Metal Vertical Pipe	8
91	Area of Basement with Beer Kegs	White Wooden Ceiling (High Ceiling)	9,10
108	Boiler Room in Basement	Gray Metal Fire Door	11

RECOMMENDATIONS AND DISCUSSION

The structure located on the subject site is a vacant commercial property and it appears the future use of the building is not considered to be "*pre-1978 target housing"* or a "*child-occupied facility"* as defined by the EPA and HUD. Subsequently, the EPA's RRP Program regulations and HUD guidelines do not apply to this project. However, OSHA contractor requirements exist and efforts should be made to prevent the potential spread and exposure of lead to the workers and the public during renovation and demolition activities.

Although it is not required, it Apex's opinion that contractors performing HUD's lead hazard interim control and renovations, repairs or painting (RRP) activities to LBP should be trained according to the EPA's RRP Program that requires a firm performing work activities that may potentially disturb LBP to be certified as a lead-safe renovation firm, and an individual certified as a lead-safe renovator to provide on-the-job training for workers used on the project, perform or direct workers to follow the RRP rule's work practice standards, be at the job or available when work is being done and perform the post-renovation cleaning verification (40 CFR 745, subpart E). If abatement is being performed then the work should be conducted by a lead licensed abatement firm, managed by a licensed lead abatement supervisor and performed by lead licensed abatement workers.

Changes to state and federal regulations have changed the disposal options for LBP "waste" and LBP "residue." LBP "waste" is defined as material such as wood, brick, metal, etc. that is coated with LBP. LBP "residue" is defined as residue that is generated from the removal (scraped, chipped, sandblasted, chemical means, etc.) of LBP from a structure. The regulations allow LBP "waste" from residential and commercial structures to be disposed of in Class 2 (construction and demolition debris) and Class 3 (municipal solid waste or industrial) landfills in South Carolina. The management of LBP "residue" is based on the source and lead concentration characterized by Toxic Characteristic Leaching Procedures (TCLP) to determine if the waste is classified as hazardous or non-hazardous. LBP "residues" that have TCLP sample results less than 5 milligrams per liter (mg/L) lead may be disposed of in a Class 3 landfill and is considered to be non-hazardous. LBP residues that have TCLP sample results equal to or greater than 5 mg/L lead should be disposed of in a Subtitle C landfill and is considered to be hazardous. However, the landfills should be contacted to determine their specific disposal requirements.

Occupational Safety and Health Administration (OSHA) Lead Regulations apply to actions initiated on LBP and lead containing materials performed by workers as a course of their job duties. This regulation applies to LBP and detectable lead concentrations since OSHA does not recognize a threshold level of lead for definition purposes, only the presence or absence of lead. This regulation sets exposure levels on airborne lead and does not reference the percent lead in paint. Therefore, initial personal air monitoring should be conducted on workers performing work

on surfaces which have a detectable lead concentration to satisfy the OSHA requirements. The current OSHA regulations recognize an airborne action level of thirty micrograms per cubic meter (30 µg/m^3) during an eight-hour workday and a permissible exposure level of fifty micrograms per cubic meter (50 µg/m^3) for employees. If a baseline exposure lower than the OSHA Action Level of 30 µg/m^3 is established, personal air monitoring may be terminated. The full OSHA lead standard (29 CFR 1926.62) should be referenced for compliance.

LBP and materials containing LBP should not be sanded, torched, grinded on, or disturbed in a manner that will create a dust hazard. Additionally, LBP materials should be maintained and kept in good condition to prevent paint deterioration and potential dust exposure. Routine cleaning, proper disposal of visible paint chips and visual monitoring for non-intact LBP should be implemented. Similar precautions should be used on substrates with detectable levels of lead. Prohibited practices on LBP during activities that could disturb LBP or "lead containing" substrates include:

- Open flame burning or torching (includes propane-fueled heat grids).
- Machine sanding or grinding without HEPA local vacuum exhaust tool.
- Abrasive blasting or sandblasting without HEPA local vacuum exhaust tool.
- Heat guns operating above 1100° F or charring the paint.
- Dry scraping.
- Paint stripping in a poorly ventilated space using volatile stripper.

Please note that this document is not a specification for lead removal. It does not contain means and methods for lead abatement. If you are planning a lead-based paint abatement project, please contact Apex to discuss the requirements. Use of this document without the express written consent of Apex is at the sole risk of the user and/or user. **Contractors must verify material amounts prior to bidding or removal.**

The findings prepared by Apex are based upon testing performed in the identified structures. Additional LBP may exist (undetected) in other areas due to their inaccessibility or due to the limited nature of our testing. Our assessment procedures and recommendations are based on the guidelines presented in EPA, HUD, State of South Carolina or OSHA regulations.

Apex appreciates the opportunity to provide you with our consulting services and looks forward to our continued association. If you have any questions about this report or any other industrial hygiene concerns, please contact us at (864) 404-3210.

Sincerely,
Apex Environmental Management, Inc.

Tom Oliver
Vice President

Appendix I XRF LBP Data Tables
Appendix II Photographic Log
Appendix III SC/EPA LBP Risk Assessor License

Appendix I

XRF LBP Data Tables

FIELD DATA SHEET
XRF LBP ANALYSIS

Project Name: 200 Oregon Avenue LBP

Sampled By: Tom Oliver

Project Location: 200 Oregon Avenue, Greenwood, South Carolina

Project Manager: Tom Oliver

Project Number: 0723-148

Date: 08/02/2023

Sample No.	Room/Area	Component	Color	Substrate	Analytical Result (mg/cm2)
1	Standardization				183.00/PASS
2	Calibration				1.13
3	Calibration				1.29
4	Calibration				1.24
5	Exterior Front of Building (Side A)	Siding	White	Wood	0.00
6		Siding	White	Concrete	0.00
7		Awning ceiling	White	Concrete	0.00
8		Door	White	Metal	0.00
9		Door casing	White	Metal	0.00
10		Siding bottom trim	White	Metal	0.00
11		Window casing	White	Metal	0.00
12	**Exterior Loading Dock Area (Side B)**	Big column	White	Metal	0.05
13		Awning ceiling	White	Metal	0.01
14		Awning roof trim	Brown	Metal	0.00
15		Door	White	Metal	0.00
16		Door casing	White	Metal	0.02
17		Hand rail	Brown	Metal	0.07
18		Elevator door	Blue	Metal	0.03
19		Elevator door casing	Blue	Metal	0.01
20		Door	Blue	Metal	0.05
21		Door casing	Blue	Metal	0.05
22		Stairs	Brown	Wood	0.00
23		Small column	Gray	Metal	0.05
24		**I-Beam**	**Gray**	**Metal**	**2.98**
25		**Awning ceiling**	**Gray**	**Wood**	**2.54**

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Project Name: 200 Oregon Avenue LBP

Sampled By: Tom Oliver

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Project Manager: Tom Oliver

Project Number: 0723-148

Date: 08/02/2023

Sample No.	Room/Area	Component	Color	Substrate	Analytical Result (mg/cm2)
26	**Exterior Loading Dock Area (Side B)**	**Wall**	**White**	**Brick**	**1.88**
27		**Corbel/soffit/fascia**	**White**	**Wood**	**>5.00**
28		Gutter downspout	White	Metal	0.10
29		Gutter downspout	Brown	Metal	0.00
30		Pipe	Black	Metal	0.05
31		Roof cap	Brown	Ceramic	0.00
32	Exterior Right Side (Side D)	Wall	Brown	Brick	0.00
33		Lower window awning	Brown	Metal	0.22
34		Window	Brown	Metal	0.02
35		Roof access ladder	Black	Metal	0.00
36	Front Showroom Area	Crown molding	Brown	Wood	0.10
37		Crown molding	White	Wood	0.03
38		Wall	White	Plaster	0.00
39		Wall	Brown	Plaster	0.00
40		Column	Brown	Wood	0.00
41		I-Beam inside column	Brown	Metal	0.04
42		Wall panel	Brown	Wood	0.00
43		Peg board	White	Wood	0.00
44		Peg board	Tan	Wood	0.00
45		Raised floor	Tan	Wood	0.06
46		Floor	Tan	Wood	0.00
47		Wall	Gray	Wallpaper	0.01
48		Closet shelves	Brown	Wood	0.03
49		Door	Brown	Wood	0.05
50		Door casing	Brown	Wood	0.00

FIELD DATA SHEET
XRF LBP ANALYSIS

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Project Number: 0723-148

Date: 08/02/2023

Sample No.	Room/Area	Component	Color	Substrate	Analytical Result (mg/cm2)
51	Front Showroom Area	Ceiling	White	Plaster	0.00
52		Wall under plaster	Black	Concrete	0.01
53		Trane HVAC Unit	Gray	Metal	0.11
54		Bathroom wall	Gray	Ceramic tile	0.00
55		Toilet	White	Porcelain	0.00
56		**Sink**	**White**	**Metal**	**>5.00**
57		Exit door	Gray	Metal	0.01
58		Exit door casing	Gray	Metal	0.01
59		Bathroom stall	Gray	Metal	0.02
60	Office Area	Window casing	Brown	Wood	0.00
61		Door	Brown	Wood	0.00
62		Door casing	Brown	Wood	0.00
63		Wall panel	Brown	Wood	0.00
64		Ceiling	White	Plaster	0.00
65		Floor	Brown	Wood	0.00
66		Column	Brown	Wood	0.00
67		Column	White	Metal	0.00
68		Vault door	Gray	Metal	0.02
69		Vault door casing	Gray	Metal	0.02
70		Ceiling tiles	White	Wood	0.00
71		Wall	White	Concrete	0.00
72		Wall	Blue	Plaster	0.11
73		Crown molding	White	Wood	0.00
74		Window casing	Tan	Wood	0.02
75		Base board	Tan	Wood	0.03

FIELD DATA SHEET
XRF LBP ANALYSIS

Project Name: 200 Oregon Avenue LBP

Sampled By: Tom Oliver

Project Location: 200 Oregon Avenue, Greenwood, South Carolina

Project Manager: Tom Oliver

Project Number: 0723-148

Date: 08/02/2023

Sample No.	Room/Area	Component	Color	Substrate	Analytical Result (mg/cm2)
76	**Office Area**	Cabinets	Brown	Wood	0.00
77		Counter-top	White	Wood	0.00
78		**Pipe**	**White**	**Metal**	**>1.00**
79	Back Warehouse	Wall	White	Brick	0.01
80		Door	Brown	Wood	0.11
81		Door casing	Gray	Wood	0.02
82		Column	White	Metal	0.04
83		I-Beam	White	Metal	0.06
84		Ceiling	White	Wood	0.03
85		Window	Gray	Metal	0.11
86		Door	Gray	Metal	0.03
87		Door casing	Gray	Metal	0.06
88		HVAC ducts	White	Metal	0.03
89		Door lintel / angle iron	White	Metal	0.01
90	**Basement**	Hand rail	Black	Metal	0.11
91		**High ceiling (keg storage)**	**White**	**Wood**	**>5.00**
92		Pipe	White	Metal	0.01
93		Wall	White	Brick	0.00
94		Wall	Gray	Brick	0.00
95		Columns/Beams	Gray	Wood	0.04
96		Columns/Beams	White	Wood	0.03
97		Floor	Brown	Wood	0.07
98		Base board	Gray	Wood	0.03
99		Stair tread	Brown	Wood	0.00
100		Stair riser	White	Wood	0.04

FIELD DATA SHEET
XRF LBP ANALYSIS

Project Name: 200 Oregon Avenue LBP

Sampled By: Tom Oliver

Project Location: 200 Oregon Avenue, Greenwood, South Carolina

Project Manager: Tom Oliver

Project Number: 0723-148

Date: 08/02/2023

Sample No.	Room/Area	Component	Color	Substrate	Analytical Result (mg/cm2)
101	**Basement**	Column base	Gray	Wood	0.07
102		Doorway angle iron	Gray	Metal	0.02
103		I-Beam/Column	White	Metal	0.02
104		Low ceiling	White	Wood	0.02
105		Elevator door	Gray	Metal	0.00
106		Elevator door casing	Gray	Metal	0.00
107		Crawlspace door	White	Metal	0.02
108		**Boiler room fire door**	**Gray**	**Metal**	**2.76**
109		Boiler room I-Beam	Red	Metal	0.00
110	Calibration				1.09
111	Calibration				1.10
112	Calibration				1.15

Bold = LBP NA = Insufficient Testing Time Performed VFC = Vinyl Floor Covering FFM = Factory Finished Metal

XRF Inconclusive Range = 0.6 mg/cm2 to 1.1 mg/cm2 FFV = Factory Finished Vinyl

Appendix II

Photographic Log


Photo 1 – 200 Oregon Avenue in Greenwood, SC 29646


Photo 2 – Typical view of the front of the building (side A)


Photo 3 – Typical view of the loading dock side of the building (side B)


Photo 4 – Typical view of the right side of the building (side D)


Photo 5 – Gray wooden awning ceiling & gray metal I-Beams at the loading dock – LBP


Photo 6 – White brick walls & white wooden corbels, soffit & fascia in the loading dock area – LBP

Photo 7 – Typical view of a white metal sink found in the bathrooms – LBP

Photo 8 – Typical view of a white metal vertical pipe found in the room with blue walls next to the vault – LBP

Photo 9 – Typical view of the white wooden ceiling in the area of the basement storing kegs of beer – LBP

Photo 10 – Typical view of the white wooden ceiling in the area of the basement storing kegs of beer – LBP

Photo 11 – Typical view of the gray metal fire door in the boiler room within the basement – LBP

Photo 12 – Typical view of the front showroom area

Photo 13 – Typical view of the office area

Photo 14 – Typical view of the back warehouse area

Photo 15 – Typical view of the basement with no LBP ceilings

Photo 16 – Typical view of the basement with LBP ceilings

Appendix III

SC/EPA LBP Risk Assessor License

United States Environmental Protection Agency

This is to certify that

Thomas H Oliver

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Risk Assessor

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires August 31, 2023

LBP-R-36342-2

Certification #

August 10, 2020

Issued On

Adrienne Priselac, Manager, Toxics Office

Land Division