



CENTRALBIDDING
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Bid 52-26-02: Additions and Alterations to Pineville Jr. High School
Rapides Parish School Board

Project documents obtained from www.CentralBidding.com

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PROJECT MANUAL

2025-04 ADDITIONS & ALTERATIONS TO PINEVILLE JUNIOR HIGH SCHOOL PINEVILLE, LOUISIANA RPSB BID #52-26-02

RAPIDES PARISH SCHOOL BOARD - OWNER

STEVE BERRY – PRESIDENT

MARK DRYDEN – VICE PRESIDENT

JEFF POWELL – SUPERINTENDENT

YEAGER, WATSON & ASSOCIATES, LLC
Architects
118 S. Trenton Street, Ruston, LA 71270-4432
Telephone (318) 202-5708; FAX (318) 202-5722

FERGUS ENGINEERING, INC.
Consulting Structural Engineer
1058 Inca Drive, Laramie, WY 82072
Telephone (970) 817-4600

M & E CONSULTING, INC.
Consulting Mechanical & Electrical Engineers
1304 Bertrand Drive, Suite F7, Lafayette, LA 70506
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NOVEMBER 2025

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ADVERTISEMENT FOR BIDS

**RAPIDES PARISH SCHOOL BOARD
#2025-04 ADDITIONS & ALTERATIONS TO
PINEVILLE JUNIOR HIGH SCHOOL
RPSB Bid # 52-26-02**

Separate sealed bids for #2025-04 Additions & Alterations to Pineville Junior High School (RPSB Bid #52-26-02) will be received by the RAPIDES PARISH SCHOOL BOARD in the Purchasing Dept. (2nd Floor of the School Board Central Office - 619 Sixth Street, Alexandria, Louisiana 71301), until 2:00 P.M. (Central time), Tuesday, December 16, 2025. Sealed bids will then be publicly opened and read aloud in the Board Room of the Central Office. Any bid received after the specified time and date will not be considered.

The Instructions to Bidders, Bid Form, Agreement Between Owner and Contractor, Forms of Bid Bond, Performance Bond and Payment Bond, Drawings and Specifications, and other Contract Documents may be obtained from Yeager, Watson & Associates, LLC, 118 S. Trenton St., Ruston, LA 71270-4432, (318) 202-5708, upon receipt of deposit of \$200.00 for each set of documents. Electronic bid documents are also available for a purchase price of \$20 from the architect's office or by membership to following Plan Rooms: LAGC, ConstructConnect, Dodge, or ISqFt.

Bidding documents may be obtained from CentralAuctionHouse.com (fees may be associated with this site).

Pursuant to Louisiana Revised Statutes 38:2212.E(I) Bidders have the option to submit their bids and bid bonds electronically. To view bids, download and receive plans and specifications, and bid notices by email, Bidders will need to register with Central Bidding at www.CentralAuctionHouse.com. If you need help registering, or need help with completing an e-bid, please call Central Bidding at 225-8100-4814 or Toll Free at 866-570-9620 seven days a week, 24 hours a day. Fees may be associated with the use of this site.

A non-mandatory Pre-bid Conference will be held at 10:00 A.M. on Tuesday December 2, 2025 at Pineville Junior High School: 501 Edgewood Drive, Pineville, Louisiana 71360. Bidders must check in at the office.

The OWNER reserves the right to reject any or all bids for just cause; such actions will be in accordance with Title 38 of the Louisiana Revised Statutes.

In accordance with R.S. 38:2212(8)(1), the provisions and requirements stated in the bidding documents shall not be considered as informalities and shall not be waived.

The successful Bidder shall be required to furnish a Performance Bond and Payment Bond, in an amount equal to 100% of the Contract amount, written by a surety or insurance company meeting the requirements noted in R.S. 38:2219.A.(1)(a), (b) and (c).

Each Bidder must deposit with his/her bid, security in the amount of at least five percent (5%) of the total bid price, provided on the specified form and subject to the conditions provided in the Information for Bidders.

Sureties used for obtaining bonds must appear as acceptable on the U.S. Department of the Treasury Circular 570.

Bidder shall show the Contractor's license number and name of the project on the Bid envelope as required by Louisiana Revised Statutes 37:2163.A.(1).

In accordance with in R.S. 38:2215. A., no Bidder may withdraw his bid within forty-five (45) days after the actual date of the opening.

Any person with disabilities requiring special accommodations must contact the Owner no later than seven (7) days prior to bid opening.

**RAPIDES PARISH SCHOOL BOARD
PURCHASING DEPARTMENT
619 SIXTH STREET
ALEXANDRIA, LOUISIANA 71301**

PLEASE PUBLISH THREE (3) TIMES:

November 12, 2025

November 19, 2025

November 26, 2025

INSTRUCTIONS TO BIDDERS

ARTICLE 1 DEFINITIONS AND INTRODUCTION

- 1.1 The Bidding Documents include the following:
Advertisement for Bids, Instructions to Bidders, LDR Form R-85012-T, LA Uniform Public Work Bid Form, Attestation Clause, Form of Affidavit, Affidavit-Verification of Employees, AIA A201-2017 General Conditions of the Contract for Construction, Supplementary Conditions of the Contract for Construction, Specifications Divisions 1 through 33, Drawings, and Addenda.
- 1.2 The Owner of the proposed work is:
Rapides Parish School Board, 619 Sixth Street, Alexandria, LA 71301 **(318) 487-0888**.
- 1.3 The title of work or project is as indicated in the Bid Documents.
- 1.4 All definitions set forth in AIA Document A201-2017, General Conditions of the Contract for Construction, as modified, or in other Bidding Documents that are hereby made a part of the Instructions to Bidders.
- 1.5 **Addenda** are written or graphic instruments issued by the Engineer / Architect prior to the opening of bids which modify or interpret the Bidding Documents by additions, deletions, clarifications, corrections and prior approvals.
- 1.6 A **Bid** is a complete and properly signed proposal to do the Work or designated portion thereof for the sums stipulated therein, submitted in accordance with the Bidding Documents.
- 1.7 The **Base Bid** is the sum stated in the Bid for which the Bidder offers to perform the Work described as the Base Bid, to which Work may be added the sums stated in Alternate Bids, if any.
- 1.8 An **Alternate Bid** (or Alternate) is an amount stated in the Bid to be added to or subtracted from the amount of the Base Bid if the corresponding change in the Work or change in materials or methods of construction described in the Bidding Documents is accepted.
- 1.9 A Unit **Price** is an amount proposed by Bidder and stated on the Bid Form as a price per unit of measurement for materials and/or services that shall be added or deducted from the contract sum by Change Order in the event the estimated quantities of work required by the Contract Documents are increased or decreased.
- 1.10 A **Bidder** is a person or entity who submits a Bid.
- 1.11 A **Sub-bidder** is a person or entity who submits a bid to a Bidder for materials, equipment or labor for a portion of the Work.
- 1.12 **Architects and Engineers:** The Architect of record or his authorized representative, and the consulting Engineer(s) whose seal(s) appear on the Bidding Documents will administer the construction contract.
- 1.13 Bid Forms can be found immediately following these Instructions to Bidders.
- 1.14 Rapides Parish School Board is tax exempt. A tax-exempt certificate will be issued to the awarded contractor only (at their request). Sub-contractors will not be issued tax exempt certificates.

**ARTICLE 2
BIDDER'S REPRESENTATION**

- 2.1 The Bidder by making his Bid represents that:
- 2.2 The Bidder has read and understands the Bidding Documents and his Bid is made in accordance therewith, and, the Bidder has visited the site(s) and has familiarized himself with all of the local conditions under which the Work is to be performed, and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents, and,
- 2.3 The Bid is based upon the materials, systems, and equipment described in the Bidding Documents and as modified by Addenda, without exception, and,
- 2.4 The Bidder is fully qualified under all Louisiana State Laws, and all local licensing laws for Contractors in effect at the time and at the location(s) of the Work before submitting his Bid, and that all of his Sub-bidders or prospective Sub-contractors are duly licensed in accordance with all laws, (if required),
- 2.5 His bid is not based on any verbal instructions contrary to the Contract Documents and addenda.

**ARTICLE 3
BIDDING DOCUMENTS**

3.1 COPIES

- 3.1.1 The Owner will receive bids from General Contractors who are licensed In the State of Louisiana and who hold certificates with the Louisiana state Licensing Board for Contractors.

Registration by Bidders and Plan Holders with the Architect is mandatory through acquisition of Bidding Documents as described below. Additional instructions and clarifications of Bid Documents will be made through written instructions and issued by Addenda to only registered Bidders and Plan Holders.

- 3.1.2 Bidding Documents may be obtained directly from CentralBidding.com. Plan Holders are responsible for their own reproduction cost. Bid Documents furnished electronically are copyrighted for the express use by bidders in preparation and submittal of bids. They may be reproduced.
- 3.1.3 The Architect will not call to warn bidders when Bidding Documents are due.
- 3.1.4 Bidders shall use complete sets of Bidding Documents in preparing bids; neither the owner nor the Architect assumes responsibility for errors, omissions and misinterpretations resulting from the use of incomplete sets of Bidding Documents. Prior to bidding, verify all specification page numbers and Drawing sheet numbers with the specified index to insure receipt of all documents.
- 3.1.5 The Owner or Architect in making copies of the Bidding Documents available on the above terms, do so only for the purpose of obtaining bids on the Work and do not confer a license or grant permission for any other use of the Bidding Documents.

3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

- 3.2.1 The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work of separate contractors to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and all local conditions, and shall at once report to the Architect all ambiguities, inconsistencies, or errors discovered in the Bidding Documents or errors relating to the Project site.
- 3.2.2 Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request to reach the Architect at least seven (7) days prior to the date for receipt of Bids.
- 3.2.3 Interpretations, corrections, or changes of the Bidding Documents will be made by written Addendum. Interpretations, corrections, or changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon them.

3.3 SUBSTITUTIONS- (PRIOR APPROVAL REQUIRED)

- 3.3.1 The materials, products, and equipment described In the Bidding Documents establish a standard of required function, dimension, and appearance to be used on the Project and do not restrict bidders to the specific brand, make, manufacturer, or specification named. Bidders may propose substitute materials, products, and/or equipment. All proposed substitutions must be submitted to the Architect for approval in accordance with Article 3.3 and its subparts.
- 3.3.2 No substitution will be considered prior to receipt of Bids unless a complete written request for approval has been submitted by the proposer and has been received by the Architect at least seven (7) days prior to the date for receipt of Bids.
- 3.3.3 All requests shall include the name of the material or equipment for which it is to be substituted, the location, and a complete description of the proposed substitute including model numbers, colors, textures, drawings, cuts, performance and test data and all other detailed information necessary for a complete evaluation.

A written statement setting forth all changes in other materials, equipment, or other portions of the Work including changes in the work of other contracts that incorporation of the proposed substitution would require shall be included.

- 3.3.4 The burden of proof of the merit of the proposed substitution is upon the proposer. Incomplete product submittals that fail to demonstrate that the proposed substitution will meet the specified standards, colors, textures, actual samples, sufficient dimensions, quality, and strength of materials, and other standards specified will not be reviewed and will not be added to the list of prior approvals specified by addendum.
- 3.3.5 The Architect's decision of approval or disapproval of a proposed substitution shall be final.
- 3.3.6 The Architect reserves the right to reject products for which incomplete test data, samples, telephone numbers of users of products and information has been submitted. All test data and information shall meet or exceed standards specified. Manufacturers are responsible for submitting all information and all additional information requested by the Architect prior to the date specified in Article 3.3.2, above. Substitutions which require substantial revision of the Contract Documents will not be considered. The Architect reserves the right to reject materials and equipment proposed for this Project.

- 3.3.7 The Contractor shall have the option to use prior approved substitutions. No extra payment by Change Order will be approved for additional Work, materials, and equipment required to incorporate prior approved substitutions.
- 3.3.8 If the Architect approves a proposed substitution prior to receipt of Bids, such approval will be set forth in a written Addendum. Bidders shall not rely upon approvals made in any other manner.
- 3.3.9 The Architect reserves the right to reject materials and equipment at a later date after opening of bids if it is detected by the Architect that incomplete or false information was submitted prior to bidding.
- 3.4 ADDENDA
 - 3.4.1 Addenda will be transmitted to all known Bidders who have received a complete set of the Bidding Documents. In the event any Addendum modifying plans and specifications are issued within a period of seven (7) days prior to the time for the opening of the Bids or the time extended for opening of Bids, excluding Saturdays, Sundays and any legal holidays, then such Addendum shall be transmitted by a copy of the Addendum to all prime Bidders who have previously requested and received the Bidding Documents by one of the following methods: (1) facsimile transmission; (2) email; (3) other electronic means; or (4) hand delivery.
 - 3.4.2 All bidders who have received or who have reviewed Bidding Documents shall be responsible for verifying whether or not they have received all Addenda. Do not rely solely on mail delivery, printed journals, published reports, or other delivery or information systems to verify receiving all Addenda.
 - 3.4.3 All bidders shall be responsible for calling the Architect's Office within 72 hours prior to the date and time of opening of Bids to verify receipt of all Addenda issued by the Architect
 - 3.4.4 Copies of Addenda will be attempted to be made available for inspection wherever Bidding Documents are on file for that purpose, however, call the Architect to verify Addenda receipt
 - 3.4.5 Addenda shall not be issued within a period of seventy-two (72) hours prior to the time for the opening bids except an Addendum withdrawing the specified request for Bids, or one which includes postponement of the date for receipt of Bids. If it is necessary to issue an addendum within the seventy-two (72) hour period prior to date and time for receipt of bids, the receipt of such bids shall be extended a minimum of exactly seven (7) working days, but not more than twenty-one working days without the requirement of re- advertising. The Owner shall be consulted prior to issuance of such an addendum, and shall approve such issuance.
 - 3.4.6 All Bidders shall ascertain prior to submitting Bids that they have received all Addenda issued by the Architect, and all Bidders shall acknowledge said receipt in the space indicated on the Bid Form.
 - 3.4.7 Failure to acknowledge receipt of all Addenda issued for this Project in the space(s) specified on the Bid Form will render the proposal informal and will cause its rejection.
 - 3.4.8 All addenda shall become part of the Bidding Documents. All Bidders shall be bound by all Addenda whether or not received by said Bidders.
 - 3.4.9 The Owner shall have the right to extend the bid date by up to (30) days. Any such extensions shall be made by addendum issued by the Architect.

**ARTICLE 4
BIDDING PROCEDURE**

4.1 FORM AND STYLE OF BIDS

- 4.1.1 Bids shall be submitted on forms identical to the Bid Form included with the Bidding Documents, or as modified by Addenda. Legible copies of the Bid Form are acceptable.
- 4.1.2 All blanks on the Bid Form shall be filled in by typewriter or manually in ink.
- 4.1.3 Unit Pricing is not utilized for this project. Do not complete or include the Unit Price Bid Form as part of the Bid Submittal Package.
- 4.1.4 Where so indicated by the makeup of the Bid Form, sums shall be expressed in both words and figures, and in case of discrepancy between the two, the written words shall govern.
- 4.1.5 Interlineations, alterations, and erasures of the filled in information shall be initialed by the signer of the Bid, or his duly authorized representative.
- 4.1.6 Bidders are cautioned to complete all alternates should such be required in the Bid Form. Failure to submit alternate prices will render the Proposal informal and will cause its rejection. If no change in the Base Bid is required by the Alternate, enter "No Change" for the Alternate(s), (if any).
- 4.1.7 The Bidder shall make no additional stipulations on the Bid Form nor qualify his Bid in any other manner.
- 4.1.8 The Bid Form shall include the legal name of Bidder. The Bid Form shall be signed by the person or persons legally authorized to bind the Bidder to the specified Contract. If someone other than a corporate officer signs for the Bidder/Contractor, a copy of a corporate resolution or other signature authorization shall be required for submission of bid. Failure to include a copy of the appropriate signature authorization, if required, may result in the rejection of the bid unless Bidder has complied with La. R.S. 38:2212(A)(1)(c) or R.S. 38:2212(0).
- 4.1.9 On any bid in excess of fifty thousand dollars (\$50,000.00), the Contractor shall certify that he is licensed under R. S. 37:2150-2163 and indicate his Louisiana Contractor's license number on the Bid Form and on the outside of the bid envelope.

.2 BID SECURITY

- 4.2.1 No Bid will be considered or accepted unless the bid is accompanied by a bid security in an amount of not less than five percent (5%) of the Base Bid and all additive alternates. The bid security shall be in the form of a certified check or cashier's check drawn on a bank insured by the Federal Deposit Insurance Corporation, or a bid bond (such as AIA Document A310-1970) written by a surety company licensed to do business in Louisiana, countersigned by a person who is under contract with the surety company or bond issuer as a licensed agent in Louisiana who is residing in Louisiana and accompanied by appropriate power of attorney and in favor of the Owner. The surety company shall be licensed to do business in the State of Louisiana listed in the Department of the Treasury Circular 570, latest revision. The Surety Company shall have an A.M. Best Company minimum rating with a minimum financial size in accordance with the General Conditions. No company, regardless of the size or financial rating, will be allowed to write its own bond.

- 4.2.2 Bid security furnished by the Bidder/Contractor shall guarantee that the Contractor shall, if awarded the Work according to the terms of his proposal, enter into the Contract and furnish the Performance and Payment Bond(s) and insurance as required by the Contract Documents, within ten (10) working days of notice of award of the contract and the contract is ready for his signature.
- 4.2.3 Should the Bidder refuse to enter into such Contract or fail to furnish such bonds or insurance, the amount of the bid security shall be forfeited to the Owner as liquidated damages not as penalty.
- 4.2.4 The Owner will have the right to retain the bid security of Bidders until either (a) the Contract has been executed and bonds and insurance have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn, or (c) all Bids have been rejected.
- 4.2.5 If the Bid Security attached to the bid form is a Bid Bond, then said Bid Bond shall be prepared as specified herein.
- 4.2.1 SUBMISSION OF BIDS
- 4.2.1 The Bid Form, bid security and, if applicable, signature authorization shall be enclosed and sealed in a bid envelope.
- 4.2.2 The bid envelope shall be addressed to the Owner, using the Owner's address specified on the Bid Form, and shall be identified on the outside of the bid envelope with the name of the Project, the name and address of the Bidder, and Louisiana Contractor's license number of the Bidder.
- 4.2.3 Sealed Bids will be received by RPSB until the time and date, and at the location specified.
- 4.2.4 Bidders submitting bids to the Owner's bid receipt location shall assume full responsibility for the timely delivery and Owner's receipt of bids at the specified location prior to the time and date specified for receipt of Bids.
- 4.2.5 Bids mailed and delivered by United States Mail, Express Mail, Priority Mail, UPS, Federal Express, and all other similar types of carrier delivery, shall have the specified sealed bid envelope, (with all of the required information enclosed on the inside and all of the required information written on the outside), enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" and the "Project Name" and "Bid Number" on the face thereof, with the Owner's name and mailing address as specified on the Bid Form.
- 4.2.6 Owner's receipt of a bid for any reason after the date and time stipulated, including but not limited to late delivery by carrier service, late mail, late hand delivery by anyone, leaving bid(s) with someone not specifically designated by the Owner to receive bid(s) prior to bid receipt, incorrect addresses, misunderstood information, misunderstood directions, or all other types of late delivery, and excuses shall disqualify the bid.
- 4.2.7 Thoroughly review Bid Form early to insure having all of the required information on time.
- 4.2.8 Bids received after the time and date specified for the receipt of bids will be returned unopened.
- 4.2.9 Oral, telephonic, "faxed", or electronic Bids or modifications to bids are invalid and will not receive consideration. The Owner will not consider notations written on the outside of the Bid Envelope which have the effect of the Bidder trying to amend the Bid.

- 4.2.10 If someone other than a corporate officer signs for the Bidder/Contractor, a copy of a Corporate Resolution or other signature authorization shall be required for submission of the Bid. Failure to include a copy of the appropriate signature authorization, if required may result in the rejection of the Bid unless the Bidder has complied with La. R.S. 38:2212(A)(1)(c) or R.S. 38:2212(0).
- 4.3.1 MODIFICATION OR WITHDRAWAL OF BID
- 4.2.1 A bid may not be modified, withdrawn or cancelled by the Bidder after the time and bid date designated for the receipt of bids, and the Bidder so agrees in submitting his Bid, except in accordance with I a. R.S. 2214(C) which states, in part, "Bids containing patently obvious, unintentional and substantial mechanical, clerical, or mathematical errors, or errors of unintentional omission of a substantial quantity of work, labor, materials or services made directly in the compilation of the bid, may be withdrawn by the Contractor If clear and convincing sworn, written evidence of such errors is furnished to the Owner within forty-eight (48) hours of the bid opening excluding Saturdays, Sundays and legal holidays".
- 4.2.2 Prior to the time and date designated for receipt of Bids, Bids submitted early may be modified or withdrawn only by notice to the party receiving Bids at the place and prior to the time designated for receipt of Bids.
- 4.2.3 Withdrawn bids prior to the time and date designated for receipt of bids may be changed, re-sealed, and resubmitted up to the time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders and all of the Bidding Documents.
- 4.2.4 Bid Security shall be in an amount sufficient for the Bid as modified or re-submitted.

ARTICLE 5 CONSIDERATION OF BIDS

5.1 RECEIPT OF BIDS

- 5.1.1 All properly identified Bids received on time will be opened publicly and will be read aloud at the following location: **Rapides Parish School Board, 619 Sixth Street, Alexandria, LA 71301, (318) 487-0888**
- 5.1.2 Bids without Louisiana Contractor's license numbers on the bid envelopes may be opened and may be read aloud if it is thought that the proposed Project may be under \$50,000.00. Said Bids may be acceptable if the Bids are under \$50,000.00 and they meet all requirements of the Contract Documents.

5.2 REJECTION OF BIDS

- 5.2.1 The owner will have the right to reject any or all Bids for just cause and in particular to reject a Bid not accompanied by a required bid security or data or information required by the Bid Form or reject a Bid which is in any way incomplete, irregular, or not in compliance with the Bidding Documents.

5.3 ACCEPTANCE OF BID {AWARD}

- 5.3.1 The Owner will have the right to waive all informalities or irregularities in all Bid(s) received, and to accept the Bid(s) which, in the Owner's judgment, is in the Owner's own best interest. Determination of the low Bidder shall be on the basis of the sum of the Base Bid, and the Alternates accepted by the Owner, (if any).

- 5.3.2 The Owner reserves the right to accept or reject alternates which, in the Owners judgment, is in the Owner's own best interest.
- 5.3.3 If the Owner decides to accept one (1) or more Alternates. (if any), and if accepting certain Alternates determines a low bidder, Alternate(s) will be accepted in numerical order.
- 5.3.4 If the Owner decides to accept one (1) or more Alternates, (if any), and if accepting certain Alternates does not determine a low bidder, Alternate(s) may be accepted out of numerical order.
- 5.3.5 The Owner shall act within forty-five (45) calendar days of opening of the bids to award the contract. However, the deadline may be extended.
- 5.3.6 The apparent low bidder shall submit within ten (10) working days any requested items such as insurance certificates, non-collusion affidavit and other requested Items.

ARTICLE 6 POST-BID INFORMATION

- 6.1 CONTRACTOR'S QUALIFICATION STATEMENT
 - 6.1.1 Upon request by the Architect or the Owner, the apparent low bidder may be required to submit properly executed AIA Document A 305, Contractor's Qualification Statements. In addition, any bidder may be required, at the discretion of the Owner, to furnish evidence satisfactory to the Owner that his proposed subcontractors have sufficient means and experience in the types of work called for to assure completion of the contract in a satisfactory manner.
- 6.2 At the Pre-Construction Conference, the contractor shall submit the following information to the Architect.
 - 6.2.1 A designation of the work to be performed by the Contractor with his own forces.
 - 6.2.2 A breakdown of the contract cost attributable to each item listed in the Schedule of Values Form. No payments will be made to the Contractor until this is received.
 - 6.2.3 A list of names and business domiciles of all Subcontractors, manufacturers, suppliers or other persons or organizations (including those who are to furnish materials or equipment fabricated to a special design). proposed for the principal portions of the work. It is the preference of the Owner that, to the greatest extent possible or practical, the Contractor utilize Louisiana Subcontractors, manufacturers, suppliers and labor.
- 6.3 The apparent low bidder shall furnish a Non-Collusion Affidavit executed before a Notary Public in the form provided in the Bidding Documents to the effect that he has not colluded with and person, firm or corporation with regard to the bid submitted.

ARTICLE 7 PERFORMANCE AND PAYMENT BONDS

- 7.1 BOND REQUIREMENTS
 - 7.1.1 The Contractor awarded the contract shall furnish and pay for a performance and payment bond written by a company licensed to do business in Louisiana, and shall be countersigned by a

person who is contracted with the surety company or bond issuer as an agent of the company or issuer, in an amount equal to the 100% of the Contract amount to guarantee delivery of completed work under contract and payment for labor and materials. These bonds shall be written on AIA Document A312-2010. No company, regardless of size or financial rating, will be allowed to write its own bonds. The Surety Company shall have an A.M. Best Company minimum rating with a minimum financial size in accordance with the General Conditions. Bonds must be accompanied by letter stating bonding company's current rating for verification prior to acceptance by the Owner and execution of the formal Owner/Contractor agreement

7.2 TIME OF DELIVERY

- 7.2.1 The successful Bidder shall hand deliver the specified required bond(s) to the Owner prior to the Owner's signing of the Contract. The Bidder shall be responsible for picking up a copy of the Contract from the Architect and delivering same to the bonding agency, securing the required, signed bond(s) and delivering same to the Architect and Owner in a very timely manner.
- 7.2.2 The bond(s) shall be dated on the date of commencement of Work indicated In the Contract
- 7.2.3 The Bidder shall require the Attorney-in-Fact who executes the required bond(s) on behalf of the surety to affix thereto a certified and current copy of his power of Attorney.
- 7.2.4 Original insurance certificates, signed In ink, indicating amounts of insurance required, Louisiana Workmen's Compensation and all other specified insurance shall be presented to the Owner with the bond(s). Copies of originals and "faxed" copies of certificates of insurance are not acceptable.
- 7.2.5 No actual physical on-site work shall begin prior to securing specified insurance and bonds.

ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

8.1 FORM TO BE USED

- 8.1.1 Unless otherwise specified, the form of the Contract to be used shall be AIA Document A101-2007, Standard Form of Agreement between Owner and Contractor, where the basis of payment is a Stipulated Sum as modified. The agreement form will be prepared by the Program Manager for the Owner and issued to the Contractor for execution and returned to the Owner for signature. Executed bonds and Insurance certificates must be submitted to the Owner by the Contractor within ten (10) days of the date of the Notice of Award.

8.2 AWARD

- 8.2.1 If awarded, the Contract will be let to the lowest responsible bidder whose base bid and any accepted alternates is within the project budget and is able to furnish satisfactory surety company bonds. Alternates, if accepted, shall be accepted in the order in which they are listed on the Bid Form. Should all bids exceed the project budget, award may be made at option of the Owner to the lowest responsible bidder whose base bid is within funds available.

ARTICLE 9 COMPLETION TIME AND LIQUIDATED DAMAGES

- 9.1 COMPLETION TIME: Time is of Essence and Completion of the Work shall be within the completion time stated below. The Bidder hereby fully agrees to commence the Work under this Contract on the date of the notice to proceed and to complete the Project no later than 510 calendar days from the date specified in the notice to proceed. The completion time includes all alternates should the Owner decide to accept alternates.

- 9.2 LIQUIDATED DAMAGES: The Bidder hereby further agrees to pay as Liquidated Damages the sum of seven hundred fifty dollars and no cents (\$750.00) per day for each consecutive calendar day which the Work is not complete beginning with the first day beyond the Completion Time stated above. Time is of the essence and completion of the Work shall be within the completion time stated above. The Owner will suffer financial loss and other losses if the Project is not Substantially Completed in the time set forth herein. The Contractor and his Surety shall be liable and shall pay to the Owner the sum specified herein as fixed, agreed, and liquidated damages for each consecutive calendar day, (Saturdays, Sundays, and all holidays included), of delay until the Work is Substantially Completed in accordance with the definition specified In the General Conditions of the Contract for Construction. In addition, the bidder agrees to pay as additional liquidated damages a sum equal to the liquidated damages stated above for each consecutive calendar day in which the work indicated in the "punch list" is not completed beginning with the forty sixth day following the date, approved by the owner, as the date of substantial completion.

ARTICLE 10 ENVIRONMENTAL CONSIDERATIONS

- 10.1 Inspection and Testing for Asbestos Content of Building Materials:

NOTICE!

Building materials which are scheduled to be incorporated into the work under the agreement shall first either be certified by the Manufacturer to be asbestos free or be inspected and tested by accredited parties and certified to be free of asbestos content in accordance with by EPA, AHERA, and 1982 School Rules.

"Asbestos" means the Asbestiform varieties of: Chrysotile (Serpentine), Crocidolite (Riebecrite), Amosite (cummingtonitegrunerite), Anthophyllite, Tremolite and Actinolite.

Materials shall not be incorporated into the work prior to the receipt of **either** manufacturer certification or accredited laboratory test results indicating the building material is asbestos free. Copies of the test reports shall be furnished to the Owner and the Architect

The Owner reserves the right to inspect and take samples at random at the job site. Materials containing asbestos shall be removed immediately at the Contractor's expense using current EPA protocol for the removal of asbestos containing materials.

ARTICLE 11 INSURANCE REQUIREMENTS

Insurance Requirements for Vendor/Contractors: Vendor/contractor shall procure and maintain for the duration of the contract insurance against claims for injuries to persons or damages to property, which may arise from/or in connection with the performance of the work hereunder by the Vendor/Contractor, his agents, representatives or employees. Certificates of Coverage shall be received and approved by RPSB before work commences.

Minimum Scope of Insurance: Coverage shall be at least as broad as:

- a. Insurance Services Office form number GL 0002 (Ed. 1/73) covering Comprehensive General Liability and Insurance Services Office form number GL 0404 covering Broad Form Comprehensive General Liability; or Insurance Services Office Commercial General Liability coverage ("occurrence" form CG 0001). "Claims Made" form is unacceptable. The "occurrence form" shall not have a "sunset clause".

- b. Insurance Services Office form number CA 0001 (Ed. 1/78) covering Automobile Liability, code 1 "any auto" and endorsement CA 0025, or current CA 0001 12/90, code 1 "any auto".
- c. Workers' Compensation insurance as required by the Labor Code of the State of Louisiana, including Employers Liability insurance.

Minimum Limits of Insurance: Vendor/contractor shall maintain limits no less than:

- a. Commercial General Liability: \$1,000,000 for projects up to \$1,000,000 and \$3,000,000 for projects over \$1,000,000 combined single limit per occurrence for bodily injury and property damage. The aggregate loss limit applies to each project, or a copy of ISO form CG 2503 (Edition 1185) shall be submitted.
- b. Automobile Liability: \$300,000 combined single limit per accident, for bodily injury and property damage.
- c. Workers' Compensation and Employers Liability: Workers' Compensation limits as required by the Labor Code of the State of Louisiana and Statutory Employers Liability limits. Exception: Employers' liability limit is to be \$1,000,000 when work is to be over water and involves maritime exposure.
- d. Deductibles and Self-Insured Retentions: Any deductibles or self-insured retentions must be declared to and approved by RPSB. At the option of RPSB, either: the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the Board, its officers, officials, employees and volunteers; or the vendor/contractor shall procure a bond guaranteeing payment: of losses and related investigating, claim administration and defense expenses.

Other Insurance Provisions: The policies are to contain, or be endorsed to contain, the following provisions:

General Liability and Automobile Liability Coverage

- a. The Public Entity, its officers, officials, employees, Boards and Commissions and volunteers are to be added as "additional insureds" as respects liability arising out of activities performed by or on behalf of the vendor/contractor; products and completed operations of the vendor/contractor, premises owned, occupied or used by the vendor/contractor, only to the extent of damages directly caused by the negligence of the vendor/contractor. It is understood that the business auto policy under "Who is an Insured" automatically provides liability coverage in favor of the Board.
- b. The vendor/contractor insurance coverage shall be primary insurance as respects the Board, its officers, officials, employees and volunteers. Any insurance or self-insurance maintained by the Board, its officers, officials, employees or volunteers with respect to liability arising out of operations performed for them by or on behalf of the vendor/contractor, but only to the extent of damage directly caused by the negligence of the vendor/contractor, shall be excess of the vendor/contractor's insurance and shall not contribute with it.
- c. Any failure to comply with reporting provisions of the policy shall not affect coverage provided to the Public Entity, its officers, officials, employees, Boards and Commissions or volunteers.
- d. The vendor/contractor's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability.

Workers' Compensation and Employers Liability Coverage: The insurer shall agree to waive all rights of subrogation against the Board, its officers, officials, employees and volunteers for losses arising from work performed by the contractor for the Board.

All Coverage: Each insurance policy required by this clause shall be endorsed to state that coverage shall not be suspended, voided, canceled by either party, reduced in coverage or in limits except after thirty (30) days prior written notice by certified mail, return receipt requested, has been given to the RPSB.

Acceptability of Insurers: Insurance is to be placed with insurers with a Best's rating of no less than "A". This requirement will be waived for workers' compensation coverage only for those vendor/contractors whose workers' compensation coverage is placed with companies who participate in the State of Louisiana Workers' Compensation Assigned Risk Pool or the Louisiana Workers Compensation Corporation.

Verification of Coverage: Vendor/Contractor shall furnish RPSB with Certificates of Insurance affecting coverage required by this clause. The certificates for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf. The certificates are to be on forms as specified herein

and are to be received and approved by RPSB before work commences. The Agency reserves the right to require complete, certified copies of all required insurance policies, at any time.

Subcontractors Insurance: Shall be named as additional insured on primary vendor/contractors Certificate of Insurance or provide same as required of general vendor/contractor naming RPSB as additional insured.

Indemnification and Limit of Liability

Neither party shall be liable for any delay or failure in the performance beyond its control resulting from acts of God or force majeure. The parties shall use reasonable efforts to eliminate or minimize the effect of such events upon performance of their respective duties under this agreement.

Vendor/Contractor shall be fully liable for the actions of its agents, employees, partners or subcontractors and shall fully indemnify and hold harmless RPSB from suits, actions, damages and costs of every name and description relating to personal injury and damage to real or personal tangible property caused by Vendor/Contractor, its agents, employees, partners or subcontractors in the performance of this contract, without limitation; provided, however that the Vendor/Contractor shall not indemnify for that portion of any claim, loss or damage arising hereunder due to the negligent act or failure to act of RPSB.

Vendor/Contractor will indemnify, defend and hold RPSB harmless, without limitation, from and against any and all damages, expenses (including reasonable attorney's fees), claims, judgments, liabilities and costs which may be finally assessed against RPSB in any action for infringement of a United States Letter Patent with respects to the products, materials or services furnished, or of any copyright, trademark, trade secret or intellectual property right, provided that RPSB shall give the Vendor/Contractor: (1.) prompt written notice of any action, claim or threat of infringement suit, or other suit, (2.) the opportunity to take over, settle or defend such action, claim or suit at Vendor/Contractor's sole expense, and (3.) assistance in the defense of any such action at the expense of the Vendor/Contractor. Where a dispute or claim arises relative to a real or anticipated infringement, RPSB may require Vendor/Contractor, at its sole expense, to submit such information and documentation, including formal patent attorney opinions.

In addition to the foregoing, if the use of any item(s) or part(s) thereof shall be enjoined for any reason or if Vendor/Contractor believes that it may be enjoined, Vendor/Contractor shall have the right, at its own expense and sole discretion as RPSB's exclusive remedy to take action in the following order of precedence: (1.) to procure for RPSB the right to continue using the item(s) or part(s) thereof, as applicable; (2.) to modify the component so that it becomes non-infringing equipment of at least equal quality and performance; (3.) to replace said item(s) or part(s) thereof, as applicable, with non-infringing components of at least equal quality and performance, or (4.) if none of the foregoing is commercially reasonable, then provide monetary compensation to RPSB up to the dollar amount of the Contract.

For all other claims against the Vendor/Contractor where liability is not otherwise set forth in the agreement as being "without limitation", and regardless of the basis on which the claim is made, Vendor/Contractor's liability for direct damages, shall be the greater of \$100,000, the dollar amount of the Contract, or two (2) times the charge for products, materials, or services rendered by the Vendor/Contractor under the Contract. Unless otherwise specifically enumerated herein mutually agreed between parties, neither party shall be liable to the other for special, indirect or consequential damages, including lost data or records (unless the Vendor/Contractor is required to back-up the data or records as part of the work plan), even if the party shall be liable for lost profits, lost revenue or lost institutional operating savings.

RPSB may, in addition to other remedies available to them at law or equity and upon notice to the Vendor/Contractor, retain such monies from amounts due Vendor/Contractor, or may proceed against the performance and payment bond, if any, as may be necessary to satisfy any claim for damages, penalties, costs and the like.



Public Projects Contractor/Subcontractor
Sales Tax Certification and Exemption Application
Louisiana Revised Statute 47:305.7(A)(1)(b)

For questions about this form, please contact:
 Louisiana Department of Revenue
 Taxpayer Compliance - SES Division
 Phone: (855) 307-3893
 Email: LDRSales.ExemptionApplications@la.gov

This form is for use by contractors and subcontractors when applying for certification and exemption from the collection of sales tax in accordance with La. R.S. 47:305.7(A)(1)(b).

Please complete the application below and return it via email to LDRSales.ExemptionApplications@la.gov along with a copy of the executed contract.

Applicant Information			
Contractor Legal Name		LDR Sales Tax Account Number	
Contractor Trade Name			
Physical Address	City	State	ZIP
Mailing Address	City	State	ZIP
Contact Person	Contact Number		
Email Address			

Public Entity Information	
Public Entity	LDR Sales Tax Account Number <i>(if applicable)</i>

Contract Information		
Contract Number	Contract Beginning Date <i>(mm/dd/yyyy)</i>	Contract End Date <i>(mm/dd/yyyy)</i>
Contract Description		

Please select the legal status of the public entity listed above:

- | | |
|--|---|
| <input type="checkbox"/> State agency, board, or commission | <input type="checkbox"/> Parish school board or public school |
| <input type="checkbox"/> Municipal government or instrumentality thereof | <input type="checkbox"/> Law enforcement district |
| <input type="checkbox"/> Public charter school (La. R.S. 17:3971-4001) | <input type="checkbox"/> Waterworks district |
| <input type="checkbox"/> Hospital service district | <input type="checkbox"/> Parish and municipal libraries |
| <input type="checkbox"/> Public housing authority | <input type="checkbox"/> Other _____ |
| <input type="checkbox"/> Parish government or instrumentality thereof | |

Under the penalty of perjury, I declare that I am authorized to sign this application on behalf of the above named contractor, and that I have examined this application, and to the best of my knowledge, it is true, correct, and complete.

Name <i>(Please print)</i>	Title
Signature	Date <i>(mm/dd/yyyy)</i>

A copy of the contract with all parties' signatures must be attached to the application. Failure to provide a copy of the contract will result in delays in the evaluation process.



Geotechnical Testing Laboratory, Inc.

Engineering and Construction Materials Testing Services

July 24, 2025

Yeager, Watson & Associates, Inc.
118 South Trenton Street
Ruston, Louisiana 71270

Attention: Ms. Stephanie Seal Morse, AIA

**RE: Geotechnical Investigation Services
Improvements to Pineville Junior High School
Pineville, Rapides Parish, Louisiana
YWA Job Number 2025-04
Report No. 07-25-066**

Dear Ms. Morse:

Geotechnical Testing Laboratory, Inc. is pleased to submit this report of subsurface exploration for the above referenced project. Included in the report are the results of the exploration and recommendations concerning the design and construction of the foundations as well as general site development.

We appreciate the opportunity to have provided you with our geotechnical engineering services. If you have any questions concerning this report, or if we may be of further service, please contact our office.

Respectfully submitted,
Geotechnical Testing Laboratory, Inc.

7/24/25

Samuel "Heath" Carroll, P.E.
Louisiana Registration No. 43348

Ken Gorsha
President

Distribution: Yeager, Watson & Associates, Inc.

SHC/krq

Geotechnical Investigation Services
Improvements to Pineville Junior High School
Pineville, Rapides Parish, Louisiana
YWA Job Number 2025-04
Report No. 07-25-066

Prepared For:

Yeager, Watson & Associates, Inc.
118 South Trenton Street
Ruston, Louisiana 71270

Prepared By:

Geotechnical Testing Laboratory, Inc.
226 Parkwood Drive
Alexandria, Louisiana 71301

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APPENDICES

Appendix A – Field and Laboratory Procedures
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Geotechnical Investigation Services
Improvements to Pineville Junior High School
Pineville, Rapides Parish, Louisiana
YWA Job Number 2025-04
Report No. 07-25-066

Introduction:

This report transmits the findings of a geotechnical investigation performed for the above-referenced project. The purpose of this investigation was to define and evaluate the general subsurface conditions in the immediate vicinity of the proposed improvements. Specifically, the study was planned to determine the following:

- Subsurface stratigraphy within the limits of our exploratory borings.
- Classification, strength, and compressibility characteristics of the foundation strata.
- Suitable foundation systems and allowable soil bearing pressures.
- Construction requirements for the placement of select earth fills.

The purpose of this report is to provide the architect, structural engineer, civil engineer, and other design team professionals with recommendations for the design and construction of the proposed project. This report should not be used by the contractor in lieu of project plans or specifications.

Project Authorization:

Formal authorization to perform the work was provided by Mr. Perry Watson, Jr. with Yeager, Watson & Associates, LLC (Client), by accepting our June 26, 2025 written proposal. Authorization to proceed was provided on June 27, 2025. Field procedures were conducted on July 8 and July 15, 2025. To accomplish the intended purposes, a three-phase study program was conducted which included:

- a field investigation consisting of four (4) exploratory test borings with samples obtained at selected intervals;
- a lab testing program designed to evaluate the expansive and strength characteristics of the subsurface soils; and,
- an engineering analysis of the field and laboratory test data for foundation design recommendations.

No additional analysis was requested. A brief description of the field and laboratory test procedures are provided in the Appendix.

Project Description:

We understand that the project will consist of:

Borings B-1 and B-2 - A one (1) story, slab on grade, lobby addition with a stepped floor finish. The upper lobby will be approximately 2.5 feet higher in elevation than the lower lobby. Information provided to this office indicates that maximum column loads will not exceed approximately 40 kips (1 kip = 1,000 pounds), and that maximum continuous wall loads will be approximately 1.5 kips per linear foot. The site will reportedly receive minor cuts and maximum fills of 12 to 24 inches to reach design grades.

Borings B-3 and B-4 - Settlement is occurring on the west side of the existing gymnasium which will require underpinning of the existing slab with drilled cast-in-place concrete shafts.

If any of this information should change significantly or be in error, it should be brought to our attention so that we may review recommendations made in this report.

Site Conditions:

The project site is situated within the campus of Pineville Junior High School located at physical address 501 Edgewood Drive in Pineville, Rapides Parish, Louisiana. The site was noted to be relatively level with estimated maximum elevation differences of less than two (2) feet. The site was vegetated with weeds and grass at the time of drilling. Nearby trees were noted in the vicinity of boring B-3 at the gymnasium. The drilling rig experienced moderate difficulty moving about the site.

Subsurface Stratigraphy:

The subsurface conditions at the proposed building site were explored by drilling a total of four (4) borings to a depth of approximately 25 feet. The borings were located in the field by the drilling crew as shown on the Plan of Borings included in the Appendix of this report.

The stratification of the soils encountered during field drilling operations is presented on the boring logs in the Appendix. The stratification of the subsurface materials shown on the boring logs represents the subsurface conditions encountered at the actual boring locations and variations may occur across the site. The lines of demarcation represent the approximate boundary between the soil types, but the actual transition may be gradual. The following subsurface descriptions are of a generalized nature to highlight the major stratification features. The boring logs should be reviewed for more detailed information.

In order of increasing depth, the borings generally encountered the following soil strata beneath the surface: lean clay (CL)s w/sand and fat clay (CH).

Groundwater Conditions:

Groundwater seepage was not observed during advancement of the test borings and, after short time lapses, the borings remained dry and un-caved. Groundwater is not expected to impact shallow excavations during construction, but the subsurface water regime is always subject to change with variations in climatic conditions and will likely coincide with seasonal fluctuations. Future construction activities may also alter the surface and/or subsurface drainage patterns of this site. Therefore, groundwater conditions should be explored at the start of construction by others due to short-term observations by our field crew.

Perched water may be briefly encountered in low quantities during earthwork and is typically due to storage of recent rainfall or by a barrier to capillary evaporation. Where perched water is encountered the contractor should expect to excavate gravity drainage ditches to divert it away from the construction area. The depth of the ditches should be at least two (2) to three (3) feet deeper than the lowest exterior footing elevation. Additionally, soft, wet and pumpable soils can be expected below perched water tables. In structural areas, these should be removed to firm ground and replaced with select fill soils compacted to project specifications as defined later in this report.

Foundation Recommendations:

Potential Vertical Rise (PVR) values were estimated to vary between approximately 1.5 and 1.75 inches for this site. One (1) inch of PVR is generally accepted as the maximum allowable value for design and construction in the geographical area. The surficial soils encountered by the borings are considered to be highly expansive. In order to limit the PVR to a value of one (1) inch or less, this will require the placement of a minimum of six (6) feet of select fill beneath all areas of the floor slab. Generally, when the clay removal reaches a depth of five (5) to six (6)

feet, drilled shafts can become more economical. Recommendations for both drilled shafts and a shallow foundation are discussed separately herein. We feel that the most economical foundation would consist of a system of drilled, underreamed concrete shafts with structurally-suspended floor slabs and grade beams.

Option 1 – Drilled Shafts:

To prepare for foundation construction, we recommend that all topsoil, vegetation, roots, and any soft soils in the building area be stripped from the site and either properly disposed or stockpiled for later use in landscaping. Utilities should be located and rerouted as necessary.

To remediate the variable soil conditions in the surficial zone and provide a consistent subgrade for slab support, GTL recommends that a uniform layer of density-approved select fill be provided beneath the floor slab. After stripping the site, the building pad should be cut to an elevation which allows the placement of at least 24 inches of density-approved select fill below the final subgrade elevation for the floor slab. The select fill building pad should extend at least five (5) feet beyond the edge of the building.

After stripping and undercutting, as required herein, the building area should be proof-rolled with a heavy, loaded pneumatic-tired vehicle such as a 20 to 25 ton loaded dump truck. It is recommended that all areas beneath the floor slab be proof-rolled to identify loose or soft soils. All proof-rolling and undercutting activities should be witnessed by GTL or authorized representative and should be performed during a period of dry weather. Any weak areas which yield under the proof-roll, or any areas with a tendency to pump should be mitigated. Such mitigation may include over-excavation and backfilling, reprocessing to remove moisture, modification with lime or cement admixture, or using geotextiles. In the event such mitigation is required, the geotechnical engineer should be contacted to design an appropriate procedure.

After stripping, excavating where required, and proof-rolling but prior to placing fill, the exposed soils should be scarified and then processed to a moisture content between one (1) percentage point below and three (3) percentage points above the Standard Proctor optimum. The subgrade soils should be re-compacted to a density of at least 95 percent of the Standard Proctor (ASTM D-698) maximum dry density for a depth of at least eight (8) inches below the surface.

Select Fill:

After the subgrade has been prepared and inspected, fill placement may begin. Select fill material should be free of organic or other deleterious materials, homogeneous mixture, have a maximum particle size of three (3) inches, have a liquid limit less than 40 and plasticity index between 8 and 20, and consist of silty-clayey sands (SM-SC), low plasticity sandy clays (CL), or clayey sands (SC) as defined by the Unified Soil Classification System. In addition to the above requirements, the material should have a minimum of 30 percent retained on the No. 200 sieve. If a fine-grained material is used for fill, very close moisture content control will be required to achieve the recommended degree of compaction.

Fill should be placed in maximum lifts of eight (8) inches of loose materials and should be compacted within the range of one (1) percentage point below to three (3) percentage points above the optimum moisture content value and a minimum of 95 percent of the maximum density as determined by the Standard Proctor (ASTM D-698) test. If water must be added, it should be uniformly applied and thoroughly mixed into the soil by diskings or scarifying.

The building pad should extend at least five (5) feet beyond the edge of the structure prior to sloping. Each lift of compacted soil should be tested and inspected by the soils engineer or his representative prior to placement of subsequent lifts. As a guideline, it is recommended that field density tests be taken at a frequency of not less than one (1) test per 2,500 square feet of surface area per lift or a minimum of four (4) per lift for each tested area for the building.

The fill can be used to elevate the building pad so that positive drainage is provided away from the building. Where feasible, elevating the building pad with fill is generally desirable because this aids in providing positive drainage away from the floor slab and foundations and helps prevent water from collecting in the filled area.

Drilled Shafts:

Loads for the new lobby and gymnasium may be supported on drilled, underreamed, cast-in-place concrete shafts. The underreamed shafts should have a minimum bell diameter to shaft diameter ratio of 2.0 to resist uplift forces associated with shrinking and swelling of the site soils that may be created by soil-to-shaft adhesion in the zone of expansive clays. A maximum bell diameter to shaft diameter ratio of 3.0 is also recommended.

Shafts should be founded at a minimum depth of 15 feet and should not extend below a depth of 25 feet below the existing ground surface. Such shafts may be proportioned using a maximum allowable net end bearing pressure of 5,200 pounds per square foot, plus an average unit allowable skin friction pressure of 315 pounds per square foot based on dead load plus live load considerations. Skin friction values for downward capacity should be ignored for the surficial five (5) feet and the bottom portion of the shaft equal to one-half the base diameter above the top of the underream.

The factor of safety for these calculations is 2.0. The above estimated values are based on field and empirical values. Therefore, we recommend that consideration be given to a shaft testing program to confirm the above estimated values. Groundwater will be encountered in the drilled shafts. Casing for installing drilled shafts is a possibility at this site. It is prudent for contract documents to include this option.

Drilled Shaft Considerations:

It is recommended that the design and construction of drilled shafts should generally follow methods outlined in the manual titled Drilled Shafts: Construction Procedures and Design Methods (Publication No: FHWA-IF-99-025, August 1999).

We emphasize that close engineering supervision is essential during installation of the drilled shaft foundations in order to assure that construction is performed in accordance with the plans and specifications. Also, to ensure proper construction of the drilled shafts at this site, close coordination between the drilling and concreting operations is considered to be of great importance. Detailed inspection of drilled shaft construction should be made to verify that the shafts are vertical and founded in the proper bearing stratum and to verify that all loose materials have been removed prior to concrete placement.

Floor Slab and Grade Beams – Drilled Shafts:

It is recommended that the floor slabs and grade beams utilized with the drilled shaft foundation consist of a structurally suspended slab. Structurally supported slab and grade beams should be isolated from the subgrade soils by providing a minimum six (6) inch positive void beneath the slab and the grade beams. Using cardboard carton forms specially manufactured for this purpose can produce these voids. Care should be exercised so that the forms are not crushed, damaged, or

saturated prior to placement of the concrete. In addition, barriers that will not rapidly decay should be placed or constructed along the sides of the cardboard carton forms to prevent soil intrusion into the void after the carton forms decay.

Option 2: Shallow Foundation:

To provide a consistent subgrade for slab support and reduce the potential for active soils to affect the foundation, GTL recommends that a uniform layer of density-approved select fill be provided beneath the floor slab. After stripping the site, the building pad should be cut to an elevation which allows the placement of at least six (6) feet of density-approved select fill below the final subgrade elevation for the floor slab. The slab cushion material should not be considered as a portion of the select fill thickness. The select fill building pad should extend at least five (5) feet beyond the edge of the building. A portion of the fat clay subgrade should be stockpiled for use as a natural moisture barrier below landscaped areas and areas exposed to rainfall or runoff.

After stripping and excavating where required, but prior to placing fill, the exposed soils should be scarified and then processed to a moisture content between one (1) percentage point below and three (3) percentage points above the Standard Proctor optimum. The subgrade soils should be re-compacted to a dry density of at least 95 percent of the Standard Proctor (ASTM D-698) maximum dry density for a depth of at least eight (8) inches below the surface.

Select Fill:

The select fill should meet the requirements stated previously in this report. Fill should be placed in maximum lifts of eight (8) inches of loose materials and should be compacted within the range of one (1) percentage point below to three (3) percentage points above the optimum moisture content value and a minimum of 95 percent of the maximum density as determined by the Standard Proctor (ASTM D-698) test. If water must be added, it should be uniformly applied and thoroughly mixed into the soil by disking or scarifying.

Each lift of compacted soil should be tested and inspected by the soils engineer or his representative prior to placement of subsequent lifts. As a guideline, it is recommended that field density tests be taken at a frequency of not less than one (1) test per 2,500 square feet of surface area per lift or a minimum of four per lift for each tested area for the building.

The plans should include a section illustrating the placement and compaction of at least 12 inches of the stockpiled fat clay below all landscaped areas and areas exposed to direct rainfall or runoff. The fat clay should act as a horizontal moisture barrier to inhibit moisture from infiltrating and saturating the select fill pad and thereby increasing the potential for swelling of the underlying fat clays. The fat clay layer should be placed and compacted to within six (6) inches of finished grade to allow the placement of a topsoil layer. The fat clay layer should extend at least five (5) feet beyond the perimeter of the structure.

If shrubs or bushes are placed next to the structure, an impervious membrane should be used to separate the slab from the shrubs to limit any infiltration of water under the slab. The minimum distance between a tree and the slab should be about one-half the expected mature height of the tree.

Shallow Footings:

Perimeter footings should bear at a minimum nominal depth of 24 inches below the planned finished floor elevation or 18 inches below exterior adjacent grade, whichever is deeper. Spread footings for columns and strip footings for walls may be designed for a maximum net allowable soil bearing pressure of 2,000 psf and 1,500 psf, respectively, based on dead load

plus design live load. Minimum foundation widths for column and strip footings should be 24 inches and 14 inches, respectively, even if the bearing pressures are less than the recommended values.

The factor of safety for the above bearing values is 3.0. Total settlement is estimated to be on the order of one (1) inch or less for foundation units designed in accordance with recommendations provided herein. Differential settlements are estimated to be on the order of ½ inch or less. Approximately half of this settlement is expected to occur during construction. The remaining long-term settlement of ½ inch (¼ occurring differentially) should be tolerable.

All foundation excavations should be inspected by GTL or an authorized representative prior to steel and concrete placement to assess whether the foundation materials appear consistent with the recommendations. Soft or loose soil zones encountered at the bottom of the footing excavations should be removed and the cavity should be backfilled with compacted select fill, flowable grout fill, crushed stone flexible base, concrete, or other approved material and placement control.

Floor Slab and Grade Beams – Shallow Foundation:

Construction of select fill as specified herein beneath the building should result in the development of a modulus of subgrade reaction (k_s) to range between 125 and 150 pounds per cubic inch based upon empirical equations that estimate the results of a plate load test.

A permeable dry subgrade, with a smooth, low friction surface should be provided beneath the slab. The slab should not be constructed on a saturated subgrade or a subgrade with standing water. A few inches of sand may be useful as a level-up course under the slab to facilitate fine grading. If crushed stone is used as a subgrade material, the upper surface of the crushed stone should be choked off with sand or a smaller crushed stone material to provide a smooth surface that will allow the slab on grade to shrink with minimum restraint. The subgrade should be free of frost before concreting begins.

Utilities which project through the slab on grade should be designed with either some degree of flexibility or with sleeves. Such design features will help reduce damage to utility lines if vertical movements occur.

The floor slab may be placed monolithically with the grade beams, or designed and constructed as a floating slab where an isolation joint separates the floor slab from all grade beams and columns. In the former case, a crack or hinge joint may develop in the slab parallel to the exterior grade beams. The floor system type should be selected and designed by the structural engineer after considering the advantages and disadvantages of each.

Membrane Under Slab:

The decision as to whether a synthetic membrane (polyethylene or HDPE sheeting, etc.) is required below the slab should be made by the architect and structural engineer based on planned floor coverings, proximity of groundwater, planned site grading and drainage patterns, tolerance for curling, local custom, weather conditions at the time of construction, and other pertinent considerations.

Underpin the Existing Gymnasium:

As previously discussed in this report, the existing gymnasium has experienced settlement and the plan for this is to underpin the affected areas using drilled shafts. The drilled shafts should also be underreamed and may be designed using the parameters previously presented for the new gymnasium.

Seismicity:

Based on Section 1613 of the IBC-2015, a Site Class of D has been estimated for this site due to the lack of subsurface information to a depth of 100 feet. According to the USGS website for Seismic Hazard Design Parameters, the project site has a mapped 0.2 second spectral response acceleration (S_s) of 0.111 g. The project also has a mapped 1.0 second spectral response acceleration (S_1) of 0.063. The design spectral response accelerations, S_{DS} and S_{DI} , were determined to be 0.119 g and 0.101 g, respectively. Based on Tables 1613.3.5(1) and 1613.3.5(2), the site has an assigned Seismic Design Category of B for structures classified as Risk Categories I, II, and III. For structures classified as Risk Category IV, site has an assigned Seismic Design Category of C.

Walls Below Grade:

The proposed site grading may result in the use of retaining walls to support the design grade differences. Walls below grade are subject to lateral pressures from soil and water. Active soils (those with plasticity sufficient to allow shrinkage and expansion, and having access to a source of varying moisture) also influence lateral earth pressures.

Stem walls should be designed for at-rest conditions, as these features will be restrained at the top and bottom. If retaining walls are used to support the exterior design grades, these walls should be designed for active conditions since the tops of these walls are free to rotate. The wall design should include adequate drainage behind the wall to preclude the build-up of hydrostatic forces. Also, surface water should be prevented from entering the free-draining backfill. A free-draining backfill is preferable to one that is relatively impervious.

EQUIVALENT HYDROSTATIC PRESSURE (Pounds per Square Foot per Foot of Wall Height)				
Backfill	Unit Weight (pcf)	Active (Drained)	Passive (Drained)	At-Rest (Drained)
On-Site Lean Clays (CL)	120	80	180	95
Silty Sand (SM)	115	35	375	55
Washed, Free-Draining Concrete Sand (ASTM 33) (SW or SP)	115	30	390	50
Compacted Select Fill (SC or CL)	120	75	180	65

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

The base of the retaining wall will most likely rest on clay and the ultimate shearing resistance against sliding should be based on the cohesion of the clay, which can be estimated to be approximately 650 psf. If the clay is stiff or hard, its surface should be roughened before the concrete base is placed.

Construction Considerations:

Excessive movement should not occur if customary measures are taken to minimize moisture variations beneath the structure to preclude loss of shear strength of foundation soils. Proper surface drainage should be maintained, and landscape irrigation systems should be located and operated in a manner to minimize wetting of building foundations. Positive drainage away from the building should be provided at all times, including during construction. If positive drainage is not provided, water will pond around or below the building and excessive total and differential movements may occur.

Secondary Design Considerations:

The following information has been assimilated after examination of numerous problems dealing with soil strata throughout Louisiana. It is presented here for implementation by others. If these features are not incorporated, then performance of the structure may be "**at-risk**".

1. Roof drainage should be **routed via pipe or a hard surface at least 5 feet from the structure.**
2. The **depth of frost penetration** in the vicinity of the project site is estimated to be approximately six inches.
3. Pavements, sidewalks, and the general ground surface should be sloped away from the structure on all sides. Water must not be allowed to pond within 5 feet of the building.
4. Backfill for utility lines should be compacted to at least 95 percent of the standard compaction test (ASTM D-698).
5. Surficial soils of the type encountered at this site are subject to erosion. Therefore, unpaved areas should be protected from erosion by the establishment of a good vegetation cover.
6. Clayey fill has been specified for select fill to reduce the potential migration of water beneath the proposed establishment. Drainage details must focus on routing water away from the structure. Excessive water intrusion can produce undesirable latent vertical movement.
7. Landscaping elements, including irrigation systems must not be allowed to introduce excess water to the structure subgrade. Monitor irrigation controls frequently and adjust to avoid over-watering of plants positioned in close proximity to the structure.

Safety Considerations:

Prior to the commencement of construction, the owner and the contractor should make themselves aware of and become familiar with applicable local, state, and federal safety regulations, including the current Occupational Safety and Health Association (OSHA) Excavation and Trench Safety Standards. Construction site safety generally is the sole responsibility of the contractor, who shall also be solely responsible for the means, methods, and sequencing of construction operations. We are providing this information solely as a service to our client. Under no circumstances should the information provided herein be construed that GTL is assuming responsibility for construction site safety of the contractor's activities. Such responsibility is not being implied and should not be inferred.

Worker Safety - Excavations and Slopes:

After excavating, footings should be inspected and concrete placed as quickly as possible to avoid exposure of the footing bottoms to wetting and drying. If it is required that footing excavations be left open for more than one (1) day, they should be protected to reduce evaporation or entry of moisture. Adequate protection against sloughing of soil should be provided for workers and inspectors entering the footing excavations and undercut areas.

The contractor should be aware that slope height, slope inclination, or excavation depths (including utility trench excavations) should in no case exceed those specified in local, state, or federal safety regulations, e.g., OSHA Standards for Excavations, Title 29, Part 1926, successor regulations as well as other building code requirements. Such regulations are strictly enforced and, if not followed, the owner, contractor, and earthwork and utility subcontractors could be liable for substantial penalties.

Drainage:

Water should not be allowed to collect near the foundations, floor slab or pavement areas of the project either during or after construction. Undercut or excavated areas should be sloped toward a sump area to facilitate removal of any collected groundwater or surface runoff. Proper drainage should be provided by sloping the ground surface away from the structure.

Weather Considerations:

The soils encountered in the surficial zone at this site are expected to be relatively sensitive to disturbances caused by construction traffic when wet. The contractor should be aware of the importance of proper maintenance of surface drainage. Depending on weather-related ground conditions, contractor's maintenance of drainage during construction, and other factors, some difficulty may be encountered by the contractor in achieving compaction on initial lifts of fill placed on loose or soft subgrade. This will be exacerbated by wet weather, particularly if the contractor allows surface drainage to enter and pond in the excavations.

Fine-grained soils are expected to be relatively sensitive to disturbances caused by construction traffic and to changes in moisture content. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support characteristics. In addition, soil which becomes wet may be slow to dry and thus significantly retard the progress of grading and compaction activities. It will, therefore, be advantageous to perform earthwork and foundation construction activities during dry weather. Earthwork activities performed during cooler, wetter months may certainly offer more difficulties than if performed during warmer, drier periods.

If construction is performed during wet conditions, work platforms can be created for earthwork by mixing fly ash, hydrated lime, cement, or combinations of these additives. Quick lime may also be used in areas where dusting is of concern, if proper worker safety considerations are observed. Pumping subgrades are possible at the site and it is recommended that bid documents incorporate this possibility into the bid schedule.

The use of geotextiles and geogrids may be warranted in situations where the subgrade is very wet and highly unstable, if such use is necessary to maintain a mandatory construction schedule during wet weather.

Groundwater Control:

Due to potential variations in groundwater levels, difficulty during excavation and construction of the proposed foundation is possible. Shallow groundwater was not encountered at this site. However, it is reasonable to anticipate that groundwater conditions may vary as noted previously. It is suggested that contract documents address the need for maintaining controls to preclude water from draining into excavations. Some dewatering through shaping of work areas to shed water, and construction of temporary ditches with sumps and pumping may be necessary to remove the loose soils and allow placement of imported select fill in a dry manner. Excavated soils intended for re-use as select fill may require special methods in order to dry the soil to a suitable moisture content prior to re-placing the soil as select fill.

Protection of Work:

Subgrade areas, base courses, and lifts of fill that have been successfully moisture conditioned, processed, and compacted in lifts to the required density, successfully proof-rolled, and approved must be protected from changes in moisture and other influences. Satisfactorily completed areas may be adversely affected by prolonged exposure to dry weather,

precipitation, equipment traffic, or by excavations and uncontrolled backfilling for utilities, and other disturbances rendering such areas unsatisfactory. Such areas should be reworked prior to continuing with subsequent construction.

Geotechnical Risk:

The concept of risk is an important aspect of the geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. The analytical tools which geotechnical engineers use are generally empirical and must be used in conjunction with engineering judgment and experience. Therefore, the solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free and, more importantly, are not a guarantee that the interaction between the soils and the proposed structure will perform as planned. The engineering recommendations presented in the preceding sections constitutes GTL's professional estimate of those measures that are necessary for the proposed structure to perform according to the proposed design based on the information generated and referenced during this evaluation, and GTL's experience in working with these conditions.

Limitations:

The exploration and analysis of the conditions reported herein are considered sufficient in detail and scope to form a reasonable basis for the foundation design. The recommendations submitted are based on the available soil information and preliminary design details furnished for the proposed project. Any revision of the plans for the proposed facility from those enumerated in this report should be brought to our attention so that we may determine if changes in the foundation recommendations are required. If deviations from the noted subsurface conditions are encountered during construction, GTL should be retained to determine if changes in foundation recommendations are required. If GTL is not retained to perform these functions, we will not be responsible for the performance of the structure.

The findings, recommendations, specifications, or professional advice contained herein have been made after being prepared in accordance with generally accepted professional engineering practice in the fields of foundation engineering, soil mechanics, and engineering geology. No other warranties are implied or expressed.

The scope of services did not include any environmental assessment for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, groundwater, or air, on or below or around this site. Any statements in this report or on the boring logs regarding odors, colors, or unusual or suspicious items or conditions are strictly for the information of the client. Prior to purchase or development of this site, an environmental assessment is advisable.

The scope of services did not include a geologic investigation to address any faults, large scale subsidence, or other macro geologic features not specifically addressed in this report or the agreement between GTL and the client.

After the plans and specifications are more complete, it is recommended that the soils and foundation engineer be provided the opportunity to review the final design and specifications in order that the earthwork and foundation recommendations may be properly interpreted and implemented. At that time, it may be necessary to submit supplementary recommendations.

This report has been prepared for the exclusive use of our client for the specific application to the referenced project. GTL cannot be responsible for interpretations, opinions, or recommendations made by others based on the data contained in this report.

This report was prepared for design purposes only and may not be sufficient for purposes of preparing an accurate bid for construction. Contractors reviewing this report are advised that the discussions and recommendations contained herein were provided exclusively to and for use by the project owner.

END OF REPORT TEXT

SEE FOLLOWING APPENDIX w/BORING LOGS & TEST RESULTS

APPENDIX A

FIELD AND LABORATORY PROCEDURES

Field and Laboratory Procedures
Improvements to Pineville Junior High School
Pineville, Rapides Parish, Louisiana
Report Number 07-25-066

I. Field Operations:

Subsurface conditions were evaluated by advancing four (4) intermittent sample borings on July 8 & 15, 2025 within the project area. The boring locations were selected by the Client, and staked in the field by representatives of Geotechnical Testing Laboratory, Inc. An illustration of the approximate boring locations is provided on the Plan of Borings herein. Descriptive terms and symbols used on the Summary of Tests are in accordance with the Unified Soil Classification System (USCS).

Hand auguring equipment was used to make Borings B-1 & B-2, while a truck-mounted rotary drilling rig was used to make the remaining test borings. Each boring was advanced in the dry using flight auger drilling techniques. Intermittent undisturbed samples were obtained in the following manner

Standard penetration tests were performed in accordance with ASTM D-1586 procedures. This test is conducted by recording the number of blows required for a 140-pound hammer falling 30 inches to drive a split-spoon sampler eighteen inches into the substrata. Depths at which split-spoon samples were taken are indicated by two crossed lines in the "Samples" column on the Log of Boring. The number of blows required to drive the sampler for each 6-inch increment were recorded. The penetration resistance is the number of blows required to drive the split-spoon sampler the final 12-inches of penetration. Information related to the penetration resistance is presented under the "Field Data" heading of the Log of Boring as the Standard Penetration (Blows/Foot). These samples were visually examined, logged, and packaged for transport to our laboratory.

Cohesive strata were sampled in accordance with ASTM D-1587 procedures by means of pushing a thin walled Shelby tube a distance of two feet into the substrata. Consistency of the sample was measured in the field by means of a calibrated hand penetrometer. Such values, in tons per square foot, are provided under the "Field Data" heading on the Log of Boring. Depths which these undisturbed samples were obtained are indicated by a shaded portion in the "Samples" column of the Log of Boring. All samples were prudently extruded in the field were sealed to maintain "in-situ" conditions, labeled, and packaged for transport to our laboratory.

The presence of ground water was monitored during drilling operations. Initial water seepage readings are provided under "Groundwater Information" in the right hand column of the Log of Boring. Upon boring completion, water levels were allowed to rise and stabilize for several minutes prior to final water readings. These readings are found under "Groundwater Information". Soil sloughing from the walls of the boring are also recorded here as depth of cave-in.

II. Laboratory Studies:

Upon return to the laboratory, all samples were visually examined and representative samples were selected for testing. Tests were performed on selected samples recovered from the test borings to verify classification and to determine pertinent engineering properties of the substrata. Individual test and ASTM designations are provided below:

Test	ASTM Designations
Atterberg Limits	ASTM D4318
Moisture Content	ASTM D2216
Percent Minus #200	ASTM D1140
Unconfined Compression (Soil)	ASTM D2166

Results for soil classifications are located on the Log of Boring in their respective columns under "Laboratory Data."

Samples obtained during our field studies and not consumed by laboratory testing procedures will be retained free of charge for a period of 30 days. Arrangements for storage beyond that period of time must be made in writing to ***Geotechnical Testing Laboratory, Inc.***

APPENDIX B

PLAN OF BORINGS



PLAN OF BORINGS

PROJECT

Improvements to Pineville Junior High School, Plneville, Rapides Parish, LA

SCALE

Not to Scale

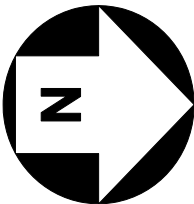
DATE

7/11/2025

FILENAME

07-25-066

Yeager, Watson & Associates, LLC



APPENDIX C

BORING LOGS AND SOIL CLASSIFICATION CHART

LOG OF BORING B- 1

SHEET 1 of 1



Geotechnical Testing Laboratory, Inc.
226 Parkwood Drive
Alexandria, LA 71301
Telephone: (318) 443-7429

CLIENT: Yeager, Watson & Associates, LLC
PROJECT: Improvements to Pineville Junior High School
LOCATION: Pineville, Rapides Parish, Louisiana
FILE NO.: 07-25-066

DRILL DATE: 7/15/25

DRILLING METHOD(S):
CME 45B, 4.5" I.D. Hollow Stem Auger

DRILLER: **K. Book** CHECKED BY: **K. Gorsha**

GROUNDWATER INFORMATION:
No Water Seepage Noted While Drilling
No Water Observed Upon Completion
Boring Walls Remained Open

SURFACE ELEVATION: **Not Determined**

DESCRIPTION OF STRATUM

Firm Yellowish Red LEAN CLAY (CL)s w/sand

- stiff, red & gray @ 2.5 feet

- firm, yellowish brown & gray @ 4.0 feet

5.0'

Firm Red FAT CLAY (CH)

- stiff @ 7.0 feet

- very stiff @ 19.0 feet

25.0'

Boring Terminated @ 25.0 Feet

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE

NOTES:
Boring Drilled for Gymnasium
See Plan of Borings for Location
Stratification Is Not Exact

GTL LOG - LOG A GNNL01.GDT - 7/18/25 07:57 - K:\GINT PROJECTS\2025 JOBS\07-25-066.GPJ

LOG OF BORING B- 2

SHEET 1 of 1



Geotechnical Testing Laboratory, Inc.
226 Parkwood Drive
Alexandria, LA 71301
Telephone: (318) 443-7429

CLIENT: Yeager, Watson & Associates, LLC
PROJECT: Improvements to Pineville Junior High School
LOCATION: Pineville, Rapides Parish, Louisiana
FILE NO.: 07-25-066

DRILL DATE: 7/15/25

DRILLING METHOD(S):
CME 45B, 4.5" I.D. Hollow Stem Auger

DRILLER: **K. Book** CHECKED BY: **K. Gorsha**

GROUNDWATER INFORMATION:
No Water Seepage Noted While Drilling
No Water Observed Upon Completion
Boring Walls Remained Open

SURFACE ELEVATION: **Not Determined**

DESCRIPTION OF STRATUM

Firm Yellowish Red Sandy LEAN CLAY (CL)s

- red & gray @ 3.5 feet

4.5'

Firm Red FAT CLAY (CH)

- stiff @ 7.0 feet

- very stiff @ 19.0 feet

- stiff @ 24.0 feet

25.0'

Boring Terminated @ 25.0 Feet

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE

NOTES:
Boring Drilled for Gymnasium
See Plan of Borings for Location
Stratification Is Not Exact

GTL LOG - LOG A GNNL01.GDT - 7/18/25 07:57 - K:\GINT PROJECTS\2025 JOBS\07-25-066.GPJ

LOG OF BORING B- 3

SHEET 1 of 1



Geotechnical Testing Laboratory, Inc.
226 Parkwood Drive
Alexandria, LA 71301
Telephone: (318) 443-7429

CLIENT: Yeager, Watson & Associates, LLC
PROJECT: Improvements to Pineville Junior High School
LOCATION: Pineville, Rapides Parish, Louisiana
FILE NO.: 07-25-066

DRILL DATE: 7/8/25

DRILLING METHOD(S):
CME 45B, 4.5" I.D. Hollow Stem Auger

DRILLER: **K. Book** CHECKED BY: **K. Gorsha**

GROUNDWATER INFORMATION:
No Water Seepage Noted While Drilling
No Water Observed Upon Completion
Boring Walls Remained Open

SURFACE ELEVATION: **Not Determined**

DESCRIPTION OF STRATUM

Stiff Yellowish Brown LEAN CLAY (CL)s w/sand

4.0'

Hard Red FAT CLAY (CH)

- very stiff @ 7.5 feet

- red & gray @ 19.0 feet

- stiff @ 24.0 feet

25.0'

Boring Terminated @ 25.0 Feet

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE

NOTES:
Boring Drilled for Gymnasium
See Plan of Borings for Location
Stratification Is Not Exact

GTL LOG - LOG A GNNL01.GDT - 7/18/25 07:57 - K:\GINT PROJECTS\2025 JOBS\07-25-066.GPJ

LOG OF BORING B- 4

SHEET 1 of 1



Geotechnical Testing Laboratory, Inc.
226 Parkwood Drive
Alexandria, LA 71301
Telephone: (318) 443-7429

CLIENT: Yeager, Watson & Associates, LLC
PROJECT: Improvements to Pineville Junior High School
LOCATION: Pineville, Rapides Parish, Louisiana
FILE NO.: 07-25-066

DRILL DATE: 7/8/25

DRILLING METHOD(S):
CME 45B, 4.5" I.D. Hollow Stem Auger

DRILLER: **K. Book** CHECKED BY: **K. Gorsha**

GROUNDWATER INFORMATION:
No Water Seepage Noted While Drilling
No Water Observed Upon Completion
Boring Walls Remained Open

SURFACE ELEVATION: **Not Determined**

DESCRIPTION OF STRATUM

Firm Yellowish Brown LEAN CLAY (CL)s w/sand

- stiff @ 2.0 feet

3.5'

Firm Red FAT CLAY (CH)

- stiff, red, w/calcareous nodules @ 5.5 feet

- very stiff @ 7.5 feet

- stiff @ 9.5 feet

- red & gray @ 14.0 feet

- very stiff @ 19.0 feet

- stiff @ 24.0 feet





















25.0'

Boring Terminated @ 25.0 Feet

N - STANDARD PENETRATION TEST RESISTANCE
P - POCKET PENETROMETER RESISTANCE

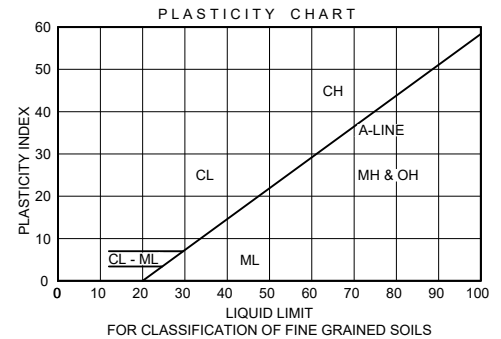
NOTES:
Boring Drilled for Gymnasium
See Plan of Borings for Location
Stratification Is Not Exact

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			SYMBOL & LETTER		DESCRIPTION	
COARSE-GRAINED SOILS More than half of material larger than No. 200 sieve size	GRAVELS More than half of coarse fraction larger than No.4 sieve size	Clean Gravels (Little or no fines)		GW	WELL GRADED GRAVEL, GRAVEL-SAND MIXTURE	
				GP	POORLY GRADED GRAVEL, GRAVEL-SAND MIXTURE	
		Gravels with fines (Appreciable amount of fines)		GM	SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURE	
				GC	CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURE	
	SANDS More than half of coarse fraction smaller than No.4 sieve size	Clean Sands (Little or no fines)		SW	WELL GRADED SAND, GRAVELLY SAND	
				SP	POORLY GRADED SAND, GRAVELLY SAND	
		Sands with fines (Appreciable amount of fines)		SM	SILTY SAND, SAND-SILT MIXTURE	
				SP-SM	SLIGHTLY SILTY SAND	
				SC	CLAYEY SAND, SAND-CLAY MIXTURE	
				ML	SILT WITH LITTLE OR NO PLASTICITY	
FINE-GRAINED SOILS More than half of material smaller than No. 200 sieve size	SILTS AND CLAYS Liquid limit less than 50			ML	CLAYEY SILT, SILT WITH SLIGHT TO MEDIUM PLASTICITY	
				ML	SANDY SILT	
				CL	SILTY CLAY, LOW TO MEDIUM PLASTICITY	
				CL	SANDY CLAY, LOW TO MEDIUM PLASTICITY (30% TO 50% SAND)	
				MH	SILT, FINE SANDY OR SILTY SOIL WITH HIGH PLASTICITY	
	SILTS AND CLAYS Liquid limit greater than 50			CH	CLAY, HIGH PLASTICITY	
				OH	ORGANIC CLAY OF MEDIUM TO HIGH PLASTICITY	
				PT	PEAT, HUMUS, SWAMP SOIL	
	HIGHLY ORGANIC SOILS				LS	LIMESTONE
	SEDEMENTARY ROCK TYPES:				MARL	MARL

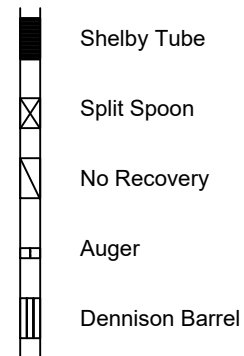
TERMS CHARACTERIZING SOIL STRUCTURE

Slickensided	- Clays with polished and striated planes created as a result of volume changes related to shrinking, swelling and/or changes in overburden pressure.
Fissured	- Clays with a blocky or jointed structure generally created by seasonal shrinking and swelling.
Laminated	- Composed of thin alternating layers of varying color and texture.
Calcareous	- Containing appreciable quantities of calcium carbonate.
Parting	- Paper thin (less than 1/8 inch).
Seam	- 1/8 inch to 3 inch thickness.
Layer	- Greater than 3 inches in thickness.



SAMPLE TYPES

(Shown in Sample Column)



DENSITY AND CONSISTENCY

COARSE-GRAINED SOILS		FINE-GRAINED SOILS		
PENETRATION RESISTANCE, N		PENETRATION RESISTANCE, N		
DENSITY	Blows per Foot	CONSISTENCY	COHESION Kips/Sq. Ft	Blows per Foot
Very loose	0 - 2	Very Soft	<0.25	0 - 2
Loose	4 - 10	Soft	0.25 - 0.50	2 - 4
Medium Dense	11 - 30	Firm	0.50 - 1.00	4 - 8
Dense	31 - 50	Stiff	1.00 - 2.00	8 - 15
Very Dense	>50	Very Stiff	2.00 - 4.00	15 - 30
		Hard	>4.00	>30

PARTICLE SIZE IDENTIFICATION

Cobbles	- Greater than 3 inches
Gravel	- Coarse - 3/4 inch to 3 inches Fine - 4.76 mm to 3/4 inch
Sand	- Coarse - 2 mm to 4.76 mm Medium - 0.42 mm to 2 mm Fine - 0.074 mm to 0.42 mm
Silt & Clay	- Less than 0.074 mm

RELATIVE COMPOSITION

Slightly	5 - 15%
With	16 - 29%
Sandy	30 - 50%
(or gravelly)	

CLASSIFICATION, SYMBOLS AND TERMS USED ON GRAPHICAL BORING LOGS

LOUISIANA UNIFORM PUBLIC WORK BID FORM

TO: MR. JEFF POWELL, SUPERINTENDENT
RAPIDES PARISH SCHOOL BOARD
P.O. BOX 7117 / 619 SIXTH ST.
ALEXANDRIA, LA 71306
(Owner to provide name and address of owner)

BID FOR: JOB #2025-04/RPSB BID #52-26-02 Additions
& Alterations to Pineville Junior High School,
501 Edgewood Drive
Pineville, Louisiana
(Owner to provide name of project and other identifying information)

The undersigned bidder hereby declares and represents that she/he; a) has carefully examined and understands the Bidding Documents, b) has not received, relied on, or based his bid on any verbal instructions contrary to the Bidding Documents or any addenda, c) has personally inspected and is familiar with the project site, and hereby proposes to provide all labor, materials, tools, appliances and facilities as required to perform, in a workmanlike manner, all work and services for the construction and completion of the referenced project, all in strict accordance with the Bidding Documents prepared by: Yeager, Watson & Associates, LLC and dated: November 2025.
(Owner to provide name of entity preparing bidding documents.)

Bidders must acknowledge all addenda. The Bidder acknowledges receipt of the following **ADDENDA:** (Enter the number the Designer has assigned to each of the addenda that the Bidder is acknowledging) _____.

TOTAL BASE BID: For all work required by the Bidding Documents (including any and all unit prices designated "Base Bid" * but not alternates) the sum of:

_____ Dollars (\$ _____)

ALTERNATES: For any and all work required by the Bidding Documents for Alternates including any and all unit prices designated as alternates in the unit price description.

Alternate No. 1 *(Metal Athletic Lockers in Gymnasium Locker Rooms)* for the lump sum of:

_____ Dollars (\$ _____)

Alternate No. 2 *(Millwork as Scheduled in Locker Room Spaces)* for the lump sum of:

_____ Dollars (\$ _____)

Alternate No. 3 *(Not Applicable.)* for the lump sum of:

_____ Dollars (\$ _____ Not Applicable)

NAME OF BIDDER: _____

ADDRESS OF BIDDER: _____

LOUISIANA CONTRACTOR'S LICENSE NUMBER: _____

NAME OF AUTHORIZED SIGNATORY OF BIDDER: _____

TITLE OF AUTHORIZED SIGNATORY OF BIDDER: _____

SIGNATURE OF AUTHORIZED SIGNATORY OF BIDDER **: _____

DATE: _____

THE FOLLOWING ITEMS ARE TO BE INCLUDED WITH THE SUBMISSION OF THIS LOUISIANA UNIFORM PUBLIC WORK BID FORM:

* The Unit Price Form shall be used if the contract includes unit prices. Otherwise, it is not required and need not be included with the form. The number of unit prices that may be included is not limited and additional sheets may be included if needed.

** **A CORPORATE RESOLUTION OR WRITTEN EVIDENCE** of the authority of the person signing the bid for the public work as prescribed by LA R.S. 38:2212(B)(5).

BID SECURITY in the form of a bid bond, certified check or cashier's check as prescribed by LA R.S. 38:2218(A) attached to and made a part of this bid.

ATTESTATION CLAUSE

In accordance with La. R.S. 38:2227, **low bidder** on this project must submit the completed Attestation Clause (Past Criminal Convictions of Bidders) form found with this bid package. The Attestation Clause form shall be RECEIVED by the Owner within 10 days after the bid opening. **The Attestation Clause form is Not to be included with the bid form** and is to be submitted in a separate envelope and should be identified on the envelope with the name of the bidder, the project on which he is bidding, and the words ATTESTATION CLAUSE. Forms may be sent via US Mail, express mail, or hand delivered to:

Rapides Parish School Board
P.O. Box 7117 /619 Sixth St.
Alexandria, LA 71306

**Name of Project: #2025-04 Additions & Alterations to Pineville Junior High School
RPSB Bid #52-26-02**

STATE OF _____

PARISH OF _____

ATTESTATIONS AFFIDAVIT

Before me, the undersigned notary public, duly commissioned and qualified in and for the parish and state aforesaid, personally came and appeared Affiant, who after being duly sworn, attested as follows:

LA. R.S. 38:2227 PAST CRIMINAL CONVICTIONS OF BIDDERS

A. No sole proprietor or individual partner, incorporator, director, manager, officer, organizer, or member who has a minimum of a ten percent (10%) ownership in the bidding entity named below has been convicted of, or has entered a plea of guilty or nolo contendere to any of the following state crimes or equivalent federal crimes:

- Public bribery (R.S. 14:118)
- Corrupt influencing (R.S. 14:120)
- (c) Extortion (R.S.14:66)
- (d) Money laundering (R.S. 14:23)

B. Within the past five years from the project bid date, no sole proprietor or individual partner, incorporator, director, manager, officer, organizer, or member who has a minimum of a ten percent (10%) ownership in the bidding entity named below has been convicted of, or has entered a plea of guilty or nolo contendere to any of the following state crimes or equivalent federal crimes, during the solicitation or execution of a contract or bid awarded pursuant to the provisions of Chapter 10 of Title 38 of the Louisiana Revised Statutes:

- (a) Theft (R.S. 14:67)
- (b) Identity Theft (R.S. 14:67.16)
- (c) Theft of a business record (R.S.14:67.20)
- (d) False accounting (R.S. 14:70)
- (e) Issuing worthless checks (R.S. 14:71)
- (f) Bank fraud (R.S. 14:71.1)
- (g) Forgery (R.S. 14:72)
- (h) Contractors; misapplication of payments (R.S.14:202)
- (i) Malfeasance in office (R.S.14:134)

LA. R.S. 38:2212.10 Verification of Employees

- A. At the time of bidding, Appearer is registered and participates in a status verification system to verify that all hires in the state of Louisiana are legal citizens of the United States or are legal aliens.
- B. If awarded the contract, Appearer shall continue, during the term of the contract, to utilize a status verification system to verify the legal status of all new employees in the state of Louisiana.
- C. If awarded the contract, Appearer shall require all subcontractors to submit to it a sworn affidavit verifying compliance with Paragraphs (A) and (B) of this Subsection.

LA. R.S. 23:1726(B) Certification Regarding Unpaid Workers Compensation Insurance

- A. R.S. 23:1726 prohibits any entity against whom an assessment under Part X of Chapter 11 of Title 23 of the Louisiana Revised Statutes of 1950 (Alternative Collection Procedures & Assessments) is in effect, and whose right to appeal that assessment is exhausted, from submitting a bid or proposal for or obtaining any contract pursuant to Chapter 10 of Title 38 of the Louisiana Revised Statutes of 1950 and Chapters 16 and 17 of Title 39 of the Louisiana Revised Statutes of 1950.
- B. By signing this bid /proposal, Affiant certifies that no such assessment is in effect against the bidding / proposing entity.

NAME OF BIDDER

NAME OF AUTHORIZED SIGNATORY OF BIDDER

DATE

TITLE OF AUTHORIZED SIGNATORY OF BIDDER

SIGNATURE OF AUTHORIZED SIGNATORY OF BIDDER

Sworn to and subscribed before me by Affiant on the _____ day of _____, 20 ____

Notary Public

NON-COLLUSION AFFIDAVIT OF PRIME BIDDER

STATE OF LOUISIANA

PARISH OF _____

_____ being first duly sworn, deposes and says that:

He/She is the _____ of _____,
the Bidder that has submitted the attached Bid;

He/She is fully informed respecting the preparation and contents of the attached Bid and of all
pertinent circumstances respecting such Bid;

Such Bid is genuine and is not a collusive or sham Bid;

Neither the said Bidder nor any of its officers, partners, owners, agents, representatives, employees or parties
in interest, including this affiant, has in any way colluded, conspired, connived or agreed, directly or indirectly with
another Bidder, firm or person to submit a collusive or sham Bid in connection with the Contract for which the attached
Bid has been submitted or to refrain from bidding in connection with such contract, or has in any manner, directly or
indirectly, sought by agreement or collusion or communication or conference with any other Bidder, firm or person to
fix the price or prices in the attached Bid or of any other Bidder, or to fix an overhead, profit or cost element of the Bid
price or the Bid price of any other Bidder, or to secure through any collusion, conspiracy, connivance or unlawful
agreement any advantage against the Rapides Parish School Board or any person interested in the proposed Contract;
and

The price or prices quoted in the attached Bid are fair and proper and are not tainted by any collusion,
conspiracy, connivance or unlawful agreement on the part of the Bidder or any of its agents, representatives, owners,
employees, or parties in interest, including this affiant.

(Signed) _____

(Title) _____

SUBSCRIBED AND SWORN to me this the _____ day of _____, 20____,

by _____

NOTARY PUBLIC

Printed Name: _____

My Commission Expires: _____

AFFIDAVIT - CONTRACTOR

STATE OF _____

PARISH OF _____

This _____ day of _____, 20____, personally came and appeared before me, the undersigned Notary Public, duly commissioned and qualified within and for the Parish of _____, State of _____, represented herein by _____, who after being by me duly sworn did depose and say that he/she has been selected as Contractor for the Additions & Alterations to Pineville Junior High School, for the Rapides Parish School Board and that he does hereby certify in compliance with L.R.S. 38:2224, that he has employed no person, corporation, firm, association or other organization, either directly or indirectly, to secure the contract for the above mentioned public project, other than persons regularly employed by him whose services in connection with the construction of said public project or in securing the contract for same were in the regular course of their duties for him; and, that no part of the contract price received, or to be received by him, was paid or will be paid to any person, corporation, firm, association or other organization for soliciting the contract, other than the payment of their normal compensation to persons regularly employed by him whose services in connection with the construction of said public project were in the regular course of their duties for him.

APPEARER FURTHER DECLARES that he will, in all respects, comply with the public contract laws of the State of Louisiana, including Title 38 of the Louisiana Revised Statutes, and particularly Section 2224 of said Title 38 of the Louisiana Revised Statutes.

WITNESSES:

CONTRACTORS

BY: _____

Sworn to and subscribed before me this _____ day of _____, 20____.

Notary Public



AIA® Document A201® – 2017

General Conditions of the Contract for Construction

for the following PROJECT:

(Name and location or address)

Job #2025-04 Additions & Alterations to Pineville Junior High School Pineville,
501 Edgewood Drive, Pineville, LA 71360
RPSB BID #52-26-02

THE OWNER:

(Name, legal status and address)

Rapides Parish School Board
P.O. Box 7117/619 Sixth Street
Alexandria, LA 71306

THE ARCHITECT:

(Name, legal status and address)

Yeager, Watson & Associates, LLC
118 S. Trenton St.
Ruston, LA 71270

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12	UNCOVERING AND CORRECTION OF WORK
13	MISCELLANEOUS PROVISIONS

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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.

14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES



Init.

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ARTICLE 1 GENERAL PROVISIONS

§ 1.1 Basic Definitions

§ 1.1.1 The Contract Documents

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

SUPPLEMENTARY CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

The following supplements modify the "General Conditions of the Contract for Construction", AIA Document A201, Sixteenth Edition, 2017. Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions remain in effect.

ARTICLE 1 - GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.1 Delete the last sentence of Subparagraph 1.1.1.

Add Subparagraph 1.1.8 to 1.1 as follows:

1.1.9 Further definitions are included in SECTION 014100 – REGULATORY REQUIREMENTS of the Project Manual.

1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

Add the following Subparagraphs 1.2.4 through 1.2.9 to 1.2:

- 1.2.4 Should the Contractor fail to request interpretations of questionable items in the contract documents prior to executing the work, neither the Owner nor the Architect will thereafter entertain an excuse for failing to execute the work in a satisfactory manner.
- 1.2.5 Where a discrepancy or inconsistency appears to exist between any of the Contract Documents regarding quantity or quality, or both, of labor and materials to be furnished for the work, the greater quantity and higher quality shall govern and will be presumed to be included in the Contract Sum
- 1.2.6 Where a given material is indicated on any of the Drawings, it is intended that such material be used throughout the length and height of walls, partitions, spandrels, panels, window, lights areas, etc., or in the assembly detail in which it occurs, for other similar locations throughout the building or project, unless another material is indicated.
- 1.2.7 All manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned in accordance with the manufacturer's written or printed directions and instructions unless otherwise indicated in the Contract Documents.
- 1.2.8 Test boring or soil test information included with the Contract Documents or otherwise made accessible to the Contractor, was obtained by the Owner for use by the Architect in the design of the building. The Owner does not warrant such information to the Contractor as an accurate or approximate indication of sub-surface conditions, and no claims for extra cost or extension of time resulting from a reliance by the Contractor on such information shall be allowed except as provided in subparagraph 4.3.6.
- 1.2.9 It is the intent of the Contract Documents that all systems and assemblies be complete, whole and functioning. Any omission from the plans or specifications or misdescriptions of details of work which are evidently necessary to carry out the intent or which are customarily performed, shall not relieve the Contractor from performing such omissions and details of work necessary to complete all portions of the Work.

ARTICLE 2 - OWNER

2.3 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.3.1 Add the following language to the end of Subparagraph 2.3.1:

; provided, however, that any approvals, easements, assessments and charges required in connection with Contractor's Construction means, methods, techniques, sequences or procedures are solely the responsibility of Contractor, regardless of the availability of any other construction means, methods, techniques, sequences, or procedures.

2.3.6 Delete Subparagraph 2.3.6 and substitute the following:

The Contractor will be furnished, free of charge, up to fifteen (15) copies of the Drawings and Project Manual. Any additional copies will be furnished at the cost of reproduction, postage and handling.

ARTICLE 3 - CONTRACTOR

3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

Add the following to the end of Subparagraph 3.2.1:

The Contractor represents and warrants that its investigation of the site was performed in detail and was sufficient to disclose the conditions and limitations under which the Work is to be performed, including, without limitation (1) the location, condition, layout and nature of the Project site and surrounding areas, (2) generally prevailing climatic conditions, (3) anticipated labor supply and costs, (4) availability and cost of materials, tools and equipment, and (5) other similar issues. The Owner assumes no responsibility or reliability for the physical condition or safety of the Project site or any improvements located on the Project site. The Contractor shall be solely responsible for providing a safe place for the performance of the Work. The Owner shall not be required to make any adjustment in either the Contract Sum or Contract Time in connection with any failure by the Contractor or any subcontractor to comply with the requirements of this Subparagraph 3.2.1.

Add the following to the end of Subparagraph 3.2.2:

Field verification of dimensions on Drawings is specifically directed and required of the Contractor as a matter of course, since locations, distances and elevations will be governed by actual field conditions. Contractor shall review plans, site plans and details of construction indicated on the Drawings, and adjust his work to conform to all conditions indicated therein or reasonably inferable therefrom. Any changes are subject to review by the Architect.

Add the following Subparagraph 3.2.5 to 3.2:

- 3.2.5 The mechanical and electrical drawings are diagrammatic only, and are not intended to show the exact physical locations or configurations of work. Such work shall be installed to clear all obstructions, permit proper clearances for the work of other trades, and present an orderly appearance where exposed. Exact locations of fixtures and outlets, and of all other devices visible in finished spaces, shall be obtained from the Architect before the work is roughed in; work installed without such information from the Architect shall be relocated at the Contractor's expense.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

Add the following Subparagraph 3.3.4 and 3.3.5 to 3.3:

- 3.3.4 The Contractor is the coordinator and expeditor of the total construction process and all of its parts, in accordance with the Agreement. The Contractor shall provide sufficient supervisory staff in the field to enable efficient and expeditious handling of these matters. There shall be a Project Manager assigned by the Contractor in his home office, as well as the field staff. The Project Manager shall attend each Progress Meeting.
- 3.3.5 The Contractor shall take all precautions necessary to prevent loss or damage cause by vandalism, theft, burglary, pilferage, or unexplained disappearance of property of the Owner, forming part of the Work, located within those areas of the Project to which the Contractor has access. The Contractor shall have full responsibility for the security of such property of the Owner for any such loss, damage, or injury, except such as may be directly caused by agents or employees of the Owner.

3.4 LABOR AND MATERIALS

Add the following Subparagraphs 3.4.4 through 3.4.6 to 3.4:

- 3.4.4 The Contractor may furnish equal brand products or equipment other than those specified in the Contract Documents, provided the Contractor submitted for prior approval a particular product other than a product specified in the Contract Documents no later than ten (10) calendar days prior to the date for the opening of the bids and the Architect issued an addendum providing approval of the product or equipment submitted. The name of a certain brand, make, manufacturer or definite specification is to denote the quality standard of the article desired; sets forth the general style, type, character; and is regarded merely as a standard. However, a Contractor must furnish the certain brand or particular brand set forth in the Contract Documents or a product approved prior to the bid opening.
- 3.4.5 The term "or approved equal" is not necessarily limited to the physical or technical properties of the product or material but encompasses the finish, color, texture and other pertinent qualities in like regard. Failure to satisfy in any one respect may result in rejection of substitute products.
- 3.4.6 Any additional cost, or any loss or damage arising from the substitution of any product, material or equipment for those originally specified, including costs of changes of all other work affected by the substitution, shall be borne by the Contractor, notwithstanding approval or acceptance of such substitution by the Owner or the Architect, unless such substitution was made at the written request or direction of the Owner or the Architect.

3.5 WARRANTY

Add the following Subparagraphs 3.5.3 through 3.5.6 to 3.5:

- 3.5.3 The Contractor shall be responsible for determining that all materials furnished for the Work meet all requirements of the Contract Documents. The Architect may require the Contractor to produce reasonable evidence that a material meets such requirements, such as certified reports of past tests by qualified experts, or other evidence which in the opinion of the Architect, would lead to reasonable certainty that any material used, or proposed to be used in the Work, meets the requirements of the Contract Documents. All such data shall be furnished at the Contractor's expense. This provision shall not require the Contractor to pay for periodic testing of different batches of the same material, unless such testing is specifically required by the Contract Documents to be performed at the Contractor's expense.
- 3.5.4 In all cases in which a manufacturer's name, trade name or other propriety designation is used in connection with materials or articles to be furnished under this Contract, whether or not the phrase "or equal" is used after such name, the Contractor shall furnish the product of the named manufacturer(s) without substitution, unless a written request for a substitute has been submitted by the Contractor and approved in writing by the Architect as provided in Subparagraph 3.4.4.

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

3.5.6 The Contractor shall comply with and furnish any and all guarantees referred to in respective Specifications Sections. As a condition precedent to his right of final payment, Contractor shall deliver to the Owner a minimum of two copies of all manufacturer's guarantees, operational manuals and instructions, service contracts and other guarantees as required, the Contractor shall require each Subcontractor to execute a satisfactory written guarantee in which the Contractor and the Owner are named as beneficiaries.

3.6 TAXES

Add the following Subparagraph 3.6.1 to 3.6:

3.6.1 The Contractor shall include all city, state, and federal taxes and sales taxes in his bid except when exempted as an Agent of Governmental Entity by Louisiana Department of Revenue Form LDR1020. Contractor and Subcontractor shall pay their contributions measured by wages of their employees required by any state or federal law.

3.7 PERMITS, FEES AND NOTICES AND COMPLIANCE WITH LAWS

Delete Subparagraph 3.7.1 and substitute the following:

3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit and other permits and governmental fees, licenses and inspections necessary for the proper execution and completion of the Work. In addition, the Contractor shall secure certificates of inspection, use, occupancy, permits and licenses with all such certifications to be delivered when the Contractor considers the Work substantially complete under paragraph 9.8 hereof in order to allow the Owner to accept the Project upon substantial completion as provided for in Louisiana Revised Statutes 38:2241.1.

3.7.4 In Subparagraph 3.7.4 in the first sentence delete the words "in no event later than 14 days" and in their place substitute the words "in no event later than 72 hours."

Add the following language to Subparagraph 3.7.4:

No adjustment in the Contract Time or Contract Sum shall be permitted, however, in connection with a concealed or unknown condition which does not differ materially from those conditions disclosed or which reasonably should have been disclosed by the Contractor's (1) prior inspections, tests, reviews and preconstruction services for the Project, or (2) inspections, tests, reviews and preconstruction services which the Contractor had the opportunity to make or should have performed in connection with the Project.

Add the following Subparagraph 3.7.6 to 3.7:

3.7.6 The Contractor must be fully qualified under any state or local licensing law for contractors in effect at the time and at the location of the Work before submitting his bid. Only the bids of contractors and subcontractors duly licensed under Louisiana Revised Statutes 37:2151 et seq. will be considered if licensing is required by law. The Contractor shall be responsible for determining that all of his subcontractors are duly licensed in accordance with the law.

3.9 SUPERINTENDENT

Add the following sentence at the end of Subparagraph 3.9.1:

"During performance of the Work" means, any time Contractor's or subcontractor's personnel are present at the jobsite. Important communications shall be confirmed in writing; other communications shall be similarly confirmed on a written request in each case.

Delete the last sentence of Subparagraph 3.9.3 and substitute the following:

The Contractor agrees not to remove this Superintendent during the execution of the Agreement except for reasons acceptable to the Owner and the Architect.

Add the following Subparagraph 3.9.4 and to 3.9:

- 3.9.4 The Contractor shall retain a competent registered professional engineer or registered land surveyor, acceptable to the Architect, who shall establish the exterior lines and required elevations of all buildings and structures to be erected on the site and shall establish sufficient lines and grades for the construction of associated work. This is not intended to require full-time engineering or surveying work.

Add the following Subparagraph 3.9.5 to 3.9:

- 3.9.5 The Contractor shall establish benchmarks in not less than two widely separated places. As the work progresses, the Contractor shall establish benchmarks and axis lines at each floor, giving exact elevations of various levels.

3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

Add the following sentence to 3.10.1:

Failure of the Work to proceed in any sequence scheduled by Contractor shall not serve as the basis for a Claim for additional compensation or time.

3.12 SHOP DRAWINGS PRODUCT DATA AND SAMPLES

Add the following Subparagraph 3.12.11 to 3.12:

- 3.12.11 Any shop or setting drawing received by Architect that indicates insufficient study of Drawings and Specifications, illegible portions, or gross errors, will be rejected outright and will require that the Contractor resubmit such drawing in a manner consistent with the information contained in the Contract Documents. Such rejections, if any, shall not constitute an acceptable reason for granting Contractor additional time to perform the work involved. The Architect's action on shop drawings is a review only for conformance with the design concept of the project and compliance with the information given in the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the site, for information that pertains solely to the fabrication processes or to the means, methods, techniques, sequences and procedures of construction, and for coordination of the work of all trades. All shop drawings require the Contractor's approval stamp before submission to the Architect, and before use for fabrication, erection, or construction.

3.13 USE OF SITE

Delete Subparagraph 3.13 and substitute the following:

- 3.13.1 The right of possession of the premises and the improvements made thereon by the Contractor shall remain at all times the property of the Owner. The Contractor's right to entry and use thereof arises solely from the permission granted by the Owner under the Contract Documents. That Contractor shall confine his apparatus, the storage of materials and the operations of his workmen to limits indicated by law, ordinances, the work limit line (property line) as shown on Site Plan, and areas made available by the Owner, and shall not unreasonably encumber the premises with his materials.

Add the following Subparagraph 3.13.2 to 3.13:

- 3.13.2 The Contractor shall repair at his own expense any damage from operations under his jurisdiction caused to Owner's property and facilities in the Contract work area and in access routes thereto.

3.14 CUTTING AND PATCHING

Add the following Subparagraph 3.14.3 to 3.14:

- 3.14.3 Specification Sections may include cutting, patching and digging for that trade section, as required for proper accommodation of all work of other trades. This, however, does not relieve the General Contractor from responsibility stated in paragraph 3.14.1 of the General Conditions.

3.15 CLEANING UP

Add the following Subparagraph 3.15.3 to 3.15:

- 3.15.3 The Contractor shall replace all broken glass or mirrors and remove all marks, undesirable stains, fingerprints, other soil, dust, dirt from painted, decorated, or stained woodwork, gypsum board, plaster, metal, and equipment surfaces; remove spots, paint and soil from resilient floor, wall covering, masonry, and ceramic tile work; remove temporary floor protections; clean, wash or otherwise treat surfaces, including doors and window frames, and hardware required to have a polished finish, free of oil, stains, dust, dirt, paint, and without fingerprints or blemishes. All non-carpeted floors are to be buffed. Also, the Contractor is to clean the premises including walks, drives, grounds, finished surfaces, fences and graded areas.

3.17 ROYALTIES, PATENTS AND COPYRIGHTS

Delete Subparagraph 3.17.1 and in its place add the following:

The Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation of the Work of any invention, design, process, product or device which is the subject of patent rights, copy rights, trade secrets or proprietary information held by others. Contractor shall indemnify and hold harmless Owner and Architect and anyone directly or indirectly employed by either of them from and against all claims, damages, losses and expenses, including attorneys' fees and court and arbitration costs, arising out of any infringement of patent rights, copy rights, trade secrets or proprietary information incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product or device and shall defend all such claims in connection with any alleged infringement of such rights. This indemnification obligation is not limited to but in addition to the insurance obligations of the performance bond required in connection with this Agreement.

ARTICLE 4 - ARCHITECT

4.2 ADMINISTRATION OF THE CONTRACT

Add the following to Subparagraph 4.2.4:

The Owner shall not provide any explanation or interpretation of the CONTRACT DOCUMENTS.

4.2.4 COMMUNICATIONS

- 4.2.10 Modify Subparagraph 4.2.10 by deleting the second sentence.

- 4.2.11 Add the following to Subparagraph 4.2.11 as follows:

If no agreement is made concerning the time within which interpretations required by the Architect shall be furnished in compliance with this Paragraph 4.2, then the Architect shall be required to furnish such interpretations within fifteen (15) days after written request is made for an interpretation.

ARTICLE 5 - SUBCONTRACTORS

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

Delete Subparagraph 5.2.1 and substitute the following:

Prior to signing the Agreement and Bonds, the Contractor shall furnish to the Owner and Architect, in writing, the names of the persons or entities, including those who furnish materials or equipment, proposed for each of the portions of the Work. The Owner shall have the right to review, and approve or reject any subcontractor or supplier on the Contractor's list. Any adjustment in the Bid Price required by rejection of a subcontractor or supplier by the Owner will be negotiated, and the Contract Price shall be adjusted accordingly.

ARTICLE 7 - CHANGES IN THE WORK

7.1 GENERAL

Add the following Subparagraph 7.1.4 to 7.1.

- 7.1.4 Any change shall be negotiated in the best interest of the Owner or let out for public bid. When the change is negotiated, the change order in accordance with Louisiana Revised Statutes 38:2212 A.(2), shall be fully documented and itemized as to the Contractor's cost, Subcontractor's cost, including each material quantities, each material costs, taxes, insurance, employee benefits, other related costs, profit and overhead. When unit prices are contained in the initial Agreement, no deviations shall be allowed in computing negotiated changes.

7.2 CHANGE ORDERS

Add the following Subparagraph 7.2.2 to 7.2:

- 7.2.2 Agreement on any change order shall constitute a final settlement of all matters relating to the change in the Work which is the subject of the Change Order, including, but not limited to all direct and indirect costs associated with such change and any and all adjustments to the Contract Sum and the Contract Time. In the event a Change Order increases the Contract Sum, Contractor shall include the Work covered by such Change Orders in Applications for Payment.

7.3 CONSTRUCTION CHANGE DIRECTIVES

Change Clause 7.3.3.3 as follows:

- 7.3.3.3 cost to be determined in a manner agreed upon by the parties and the allowance for the combined overhead and profit included in the total cost to the Owner shall be based on the following schedule:
- .1 For the Contractor, for Work performed by the Contractor's own forces, up to Fifteen (15%) percent of the cost.
 - .2 For the Contractor, for Work performed by the Contractor's Subcontractor, up to Ten (10%) percent of the amount due the Subcontractor.
 - .3 For each Subcontractor involved, for Work performed by the Subcontractor's own forces, up to Fifteen (15%) percent of the cost.

- .4 Cost to which overhead and profit is to be applied shall be determined in accordance with Subparagraph 7.3.4.
- .5 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accomplished by a complete itemization of costs including labor, materials and Subcontracts. Labor and materials shall be itemized in the manner prescribed above. Where major cost items are Subcontracts, they shall be itemized also. In no case will a change for more than \$500.00 be approved without such itemization.

Add the following Clause 7.3.3.5 to Subparagraph 7.3.3:

7.3.3.5 The credit to the Owner resulting from a change in the Work shall be the sum of:

- .1 Contractor's material and labor cost.
- .2 Subcontractor's and/or Sub-subcontractor's material and labor cost.
Credit will not be required for overhead and profit.

Add the following to the end of Subparagraph 7.3.8:

Any credit to the Owner shall be the sum of the materials and labor costs and sub-contract costs. The Owner shall not be due any credit for overhead and profit.

7.3.9 Delete this Subparagraph in its entirety.

7.3.10 Renumber this Subparagraph as 7.3.9

Add the following Subparagraph 7.3.10 to 7.3:

7.3.10 In any Change Order, no allowance or itemization of costs shall be allowed for salaries or other compensation of the Contractor's personnel at the Contractor's principal office and branch offices; any part of the Contractor's capital expenses, including interest; overhead and general expenses of any kind not included above in cost of the work; cost of supervision not specifically required by the Change Order; and costs due to negligence, including but not limited to correction of defective or nonconforming work.

7.4 MINOR CHANGES IN THE WORK

Add the following to the end of Subparagraph 7.4.:

If the Contractor claims that any verbal instruction involves an adjustment, in the Contract Sum, the Contractor shall give written notice to the Architect prior to proceeding to execute such work. The Contractor shall receive a written order before proceeding with such work. No claims for additional costs involving verbal instructions shall be allowed unless so made.

ARTICLE 8 - TIME

8.1 DEFINITIONS

Delete Subparagraph 8.1.2 and substitute the following:

8.1.2 A Notice to Proceed shall designate a Date for Commencement of the Contract time established in the Agreement. The date shall not be postponed by the failure to act of the Contractor or of persons or entities for whom the Contractor is responsible. The Notice to Proceed shall be issued by the

Architect when directed by the Owner and not more than thirty (30) days after the signing of the Agreement by the Owner, Contractor and the Contractor's Surety.

8.2 PROGRESS AND COMPLETION

Add the following to the end of Subparagraph 8.2.2:

The date of commencement of the Work shall not be changed by the effective date of such insurance.

8.3 DELAYS AND EXTENSION OF TIME

8.3.1 After the words "shall be extended" in the sixth line, delete all remaining words and substitute the following:

to the extent such delay prevents the Contractor from achieving substantial completion within the Contract Time and if performance of the Work is not, was not or would not have been delayed by any other cause for which the Contractor is not entitled to an extension in the Contract Time under the Contract Documents. The Contractor further acknowledges and agrees that adjustments in the Contract Time will be permitted for a delay only to the extent such delay (1) is not caused or could not have been anticipated by the Contractor, (2) could not be limited or avoided by the Contractor's timely notice to the Owner of the delay, and (3) is of a duration not less than one (1) day.

Add the following Subparagraph 8.3.4 to 8.3:

8.3.4 An extension of Contract Time, to the extent allowed under Paragraph 8.3 shall be the sole remedy of the Contractor for any (1) delay in the commencement of the Work, (2) hinderance or obstruction in the performance of the Work, (3) loss of productivity, unless a delay is caused by acts of the Owner which interfere with the Contractor's performance of the Work and only to the extent that such acts continue after the Contractor furnishes the Owner and Architect with written notice of such interference. In no event shall the Contractor be entitled any indirect cost, consequential damages, lost opportunity cost, impact damages or other similar claims. The Owner's exercise of any of its rights or remedies under the Contract Documents such as ordering changes in the Work, suspension, or correction of the Work, shall not be construed as an act of interference with the Contractor's performance of the Work.

Add the following paragraph 8.4 to Article 8:

8.4 LIQUIDATED DAMAGES

8.4.1 Time is of the essence in completing the Work, and, in the event of delay on the part of the Contractor in completing the Work as specified beyond the date set forth in the Contract Documents as adjusted by Change Orders, it is distinctly understood and agreed that a deduction shall be made from the Contract Sum at a rate as stated in the Bid Proposal Form for each and every day of delay until the Work is substantially complete. This is not a penalty but agreed upon liquidated damages for delay. In addition, the Contractor agrees to pay any compensation for the Architect's services and expenses made necessary due to the delay. Said amounts for the liquidated damages and for the Architect's compensation shall be deducted from the Contract Sum by Change Orders. The calculations shall be for each and every calendar day exclusive of the day within which completion was required and up to and including the date of completion of the Work as determined by the Architect and Owner. The expiration of the time stipulated without the work having been completed shall in itself constitute a default without the necessity of any notice being given to the Contractor or its Surety. The Contractor and its Surety agree that the above-mentioned sums shall be deducted from the Contract Sum by means of a written adjustment executed by the Owner without the Contractor's signature.

ARTICLE 9 - PAYMENTS AND COMPLETION

9.1 CONTRACT SUM

Delete Subparagraph 9.1.2

9.3 APPLICATIONS FOR PAYMENT

Delete Subparagraph 9.3.1 and substitute the following:

- 9.3.1 Monthly, the Contractor shall submit to the Architect an itemized Application and Certificate for Payment, AIA Document G702-G703, notarized, supported by such data substantiating the Contractor's right to payment as the Owner or the Architect may require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers and shall reflect retainage. Applications for Payment shall be submitted on or about the first of each month for the value of labor and materials incorporated in the Work and of materials stored at the site as of the twenty-fifth day of the preceding month, less normal retainage of five percent (5%) on contracts over \$500,000; ten percent (10%) on projects under \$500,000. Such Applications may not include requests for payments of amounts the Contractor does not intend to pay a Subcontractor or Material Supplier because of a dispute or other reason.

Delete Clause 9.3.1.1 and substitute the following:

- 9.3.1.1 Until Substantial Completion, the Owner will pay 95 percent (on project contracts over \$500,000); 90 percent (on project contracts under \$500,000) of the amount due the Contractor on account of progress payments based on the total construction contract cost including all executed change orders.

Add the following to the end of Subparagraph 9.3.2:

- 9.3.2 Off site materials shall be fully insured. Contractor shall provide a bill of sale for all off-site storage at the time he submits an application for payment.

Add new Subparagraph 9.3.4 as follows:

- 9.3.4 Contractor further expressly undertakes to defend the Owner and hold it harmless, at the Contractor's sole expense including attorney's fees, against any actions, lawsuits, or proceedings brought against the Owner as a result of any claim or lien filed against the Contract funds, the Work, the site of any of the Work, the Project site and any improvements thereon, or payments due the Contractor. The Contractor hereby agrees to indemnify and hold Owner harmless against any claim or lien and agrees to pay any judgment or claim or lien resulting from any such actions, lawsuits or proceedings, including attorney's fees and interest.

Add the following Subparagraph 9.3.5 as follows:

- 9.3.5 The Owner shall release any funds withheld due to a lien or affidavit of a claim if the Contractor obtains security acceptable to the Owner or a lien bond is provided by the Contractor which is (1) issued by a surety acceptable to the Owner, (2) in form and substance satisfactory to the Owner and the Clerk of Court and (3) an amount of not less than 125% of such lien claim or affidavit of claim. By posting a lien bond or other acceptable security, however, the Contractor shall not be relieved of any responsibilities or other obligations under Paragraph 9.3, including, without limitation, the duty to defend and indemnify the Owner. The cost of any premiums incurred in connection with any such

bonds and securities shall be the responsibility of the Contractor and shall not be part of, or cause any adjustment to, the Contract Sum.

Add the following Subparagraph 9.3.6 as follows:

9.3.6 Applications for Payment shall comply with DIVISION 012900 – PAYMENT PROCEDURES in Project Manual.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

9.5.1.7 Delete the word “repeated”.

Add the following Clauses 9.5.1.8, through 9.5.1.13 to 9.5.1:

9.5.1.8 Completed Work has been damaged which requires correction or replacement;

9.5.1.9 Correction of defective Work by Owner or completion of the Work by the Owner;

9.5.1.10 Belief or knowledge by the Architect of an occurrence of an event justifying termination for cause;

9.5.1.11 Failure to complete the punch list within 45 day lien period;

9.5.1.12 125% of the amount of any claim or lien that have been filed in the Mortgage Records for the Parish in which the project is located in connection with the Work or notice thereof; or

9.5.1.13 Other items such as liquidated damages entitling the Owner to withhold or set-off against the Contract Sum.

9.6 PROGRESS PAYMENTS

9.6.2 Delete the phrase: “no later than seven days” from the first sentence. At the end of the second sentence add the following:

La. R.S. 9:2784 (A) and (C) require a Contractor or Subcontractor to make payment due to each Subcontractor and supplier within fourteen (14) consecutive days of the receipt of payment from the Owner. If not paid, a penalty in the amount of ½ of 1% per day is due, up to a maximum of 15% from the expiration date until paid. The Contractor or Subcontractor, whichever is applicable, is solely responsible for payment of a penalty.

9.6.4 Delete the first two sentences of Subparagraph 9.6.4 and add the following to the end:

Pursuant to La. R.S. 38:2242 and La. R.S. 38:2242.2, when the Owner receives any claim of nonpayment arising out of the Contract, the Owner shall deduct 125% of such claim from the Contract Sum. The Contractor, or any interested party, may deposit security, in accordance with La. R.S. 38:2242.2, guaranteeing payment of the claim with the recorder of mortgages of the parish where the Work has been done. When the Owner receives original proof of such guarantee from the recorder of mortgages, the claim deduction will be added back to the Contract Sum.

Add the following Subparagraph 9.6.9 to 9.6:

9.6.9 Payments other than the final payment shall not exceed ninety-five (95%) percent of the value of the labor and materials incorporated into the project or safely stored at the job site. Unless otherwise stipulated in the Agreement, evaluation is to be based upon the schedule of values and the progress of the work.

9.7 FAILURE OF PAYMENT

Delete Clause 9.7 in its entirety.

9.8 SUBSTANTIAL COMPLETION

Delete Subparagraph 9.8.1 and substitute the following:

- 9.8.1 Substantial Completion is the finishing of the Work and construction, in accordance with the Contract Documents, as modified by any changes agreed to by the Owner and Contractor, to the extent that the Owner can use or occupy the Work for the use for which it was intended and the Contractor has delivered to the Architect all of the inspection, use, occupancy, permits and licenses from the local regulatory authorities and a Certificate of Completion from the Louisiana Department of Public Safety, Office of State Fire Marshal. Upon the recommendation of the Architect to the Owner that the Project is complete or substantially complete, the Owner may approve the Certificate of Substantial Completion and direct its recordation in the Mortgage Records of the parish in which the project is located. The time for running of all warranties and the Correction Period shall begin on the date established by the Architect that Project is substantially complete.

Add the following Subparagraph 9.8.6 to 9.8:

- 9.8.6 The Certificate of Substantial Completion from the Architect shall include the list of minor corrective items (punch list) to be completed by the Contractor together with the estimated cost of completing such minor corrective items. In addition, the Certificate of Substantial Completion shall designate that the Contractor will complete the list of minor corrective items within forty-five (45) days of the date of the Certificate. In addition to the retainage, the Owner may withhold a sum equal to One Hundred Twenty-five percent (125%) of the estimated costs for completing the minor corrective items (Punch list). If all punch list items have not been completed by the end of the 45 day lien period, through no fault of the Architect or Owner, the Owner may hold the Contractor in default. If the Owner finds the Contractor in default, the surety shall be notified. If within 30 days after notification, the surety has not taken reasonable steps to complete the punch list, the Owner may, at its option, contract to have the balance of the Work completed, and pay for such work with the unpaid funds remaining in the Contract Sum. Any and all additional Architect fees resulting from any default of the Contractor or surety shall be paid by the Owner and deducted from the remaining funds in the Contract Sum.

9.10 FINAL COMPLETION AND FINAL PAYMENT

Add to Subparagraph 9.10.1 the following:

The Contractor shall submit with the final Application for Payment, a certificate from the Recorder of Mortgages for the parish in which the project is located which shall be dated at least forty-six (46) days subsequent to the date of recordation in the same office of the acceptance of substantial completion by the Owner. The Certificate shall be to the effect that no liens or claims for labor or materials have been recorded against the Project. The Contractor shall also submit an executed AIA Document G707, Consent of Surety Company to Final Payment, with the final application for payment. If the Architect does not find the work listed on the punch list acceptable under the Contract Documents, he shall make one additional inspection to determine if a final payment is authorized. If the Work is still not acceptable, the Architect shall be paid his hourly rates for his time and his consultants at the project site for each subsequent additional inspection or visit, which compensation shall be withheld from the unpaid funds remaining in the Contract Sum. The payment shall be made by the Owner and deducted from the remaining funds of the Contract Sum.

Add to Subparagraph 9.10.2 the following at the end of the first sentence:

(6) A Certificate from the Clerk of Court for the parish in which the project is located which shall be dated at least forty-six (46) days subsequent to the date of recordation in the same office of the acceptance of substantial completion of the Owner and to the effect that no liens or claims for labor or materials have been recorded against the Project, (7) all warranties and guarantees required under or pursuant to the Contract Documents, which shall be submitted by the Architect to the Owner for acceptance as part of the final Application for Payment, (8) written confirmation of one year correction period, (9) all operation manuals and training of Owner's staff in the operation of mechanical, electrical, heating and air conditioning systems, and (10) current as built prints and other documents.

Add the following Paragraph 9.11 to Article 9:

9.11 LIQUIDATED DAMAGES

9.11.1 The Contractor and the Contractor's Surety, if any, shall be liable for and shall pay to the Owner liquidated damages as stipulated in Subparagraph 8.4.1 for each calendar day of delay until the Work is determined to be complete by the Architect and Owner. Further, the Contractor and Contractor's Surety shall be liable for and shall pay to the Owner the compensation for the Architect stipulated in Subparagraph 8.4.1.

ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

10.1 SAFETY PRECAUTIONS AND PROGRAMS

Add the following Subparagraph 10.1.2 to 10.1:

10.1.2 Any fines levied against the Owner due to the Contractor's (or his subcontractor's) failure to comply with OSHA standards or other Federal, State, and local regulations shall be paid by the Contractor.

10.2 SAFETY OF PERSONS AND PROPERTY

Add the following to Subparagraph 10.2.8 :

Calculating Claim: In calculating the amount of any Claim the following standards will apply:

- .1 No indirect or consequential damages will be allowed.
- .2 All damages must be directly and specifically related to or caused by the event which is the basis of any claim. No damages shall be based on a comparison of planned expenditures to total actual expenditures, or on estimated losses of labor efficiency, or on a comparison of planned manloading to actual manloading, or any other analysis that is used to show damages indirectly.
- .3 Damages are limited to extra costs specifically shown to have been directly caused by the event which is the basis of any claim.
- .4 No indirect or consequential damages will be recoverable.
- .5 The maximum daily limit on any recovery for delay shall be the amount estimated by the Contractor for job overhead costs divided by the total number of calendar days of Contract Time called for in the Agreement.

Add the following Subparagraphs 10.2.9 through 10.2.10 to 10.2:

- 10.2.9 In the event of temporary suspension of work, or during inclement weather, the Contractor shall protect, and shall cause his subcontractors to protect carefully his and their work and materials against damage or injury from the weather. If, any work or materials is damaged or injured by reason of failure on the part of the Contractor or any of his subcontractors so to protect his work such materials shall be removed and replaced at the expense of the Contractor.
- 10.2.10 The Contractor shall take all precautions necessary to prevent loss or damage cause by vandalism, theft, burglary, pilferage, or unexplained disappearance of property of the Owner, which is to be incorporated in the work located within those areas of the Project to which the Contractor has access. The Contractor shall have full responsibility for the security of such property of the Owner for any such loss, damage, or injury, except such as may be directly caused by agents or employees of the Owner.
- 10.4 EMERGENCIES

Add to Subparagraph 10.4.1 the following:

The Contractor shall also notify the Owner and Architect of any emergency as an informational matter only.

ARTICLE 11 - INSURANCE AND BONDS

11.1 CONTRACTOR'S INSURANCE AND BONDS

Delete all Sections 11.1 in their entirety and substitute the following:

AIA A101 – 2017 Exhibit A is not a part of these documents.

INSURANCE REQUIREMENTS FOR NEW CONSTRUCTION, ADDITIONS AND RENOVATIONS

CONTRACTOR'S LIABILITY INSURANCE

The Contractor shall purchase and maintain without interruption for the duration of the contract insurance against claims for injuries to persons or damages to property which may arise from or in connection with the performance of the Work hereunder by the Contractor, its agents, representatives, employees or subcontractors. The duration of the contract shall be from the inception of the contract until expiration of the one-year period for correction of Work.

MINIMUM SCOPE AND LIMITS OF INSURANCE

Worker's Compensation

Worker's Compensation insurance shall be in compliance with the Worker's Compensation law of the Contractor's headquarters. Employers Liability is included with a minimum limit of \$1,000,000 per accident/per disease/per employee. If Work is to be performed over water and involves maritime exposure, applicable LHWCA, Jones Act or other maritime law coverage shall be included. A.M. Best's insurance company rating requirement may be waived for Worker's compensation coverage only.

Commercial General Liability

Commercial General Liability insurance, including Personal and Advertising Injury Liability and Products and Completed Operations Liability, shall have a minimum limit per occurrence based on the project value. The

Insurance Services Office (ISO) commercial General Liability occurrence coverage form CG 00 01 (current form approved for use in Louisiana), or equivalent, is to be used in the policy. Claims-made form is unacceptable.

The aggregate loss limit must apply to each project. ISO form CG 25 03 (current form approved for use in Louisiana), or equivalent, shall also be submitted. The State project number, including part number, and project name shall be included on this endorsement.

COMBINED SINGLE LIMIT (CSL) PER OCCURRENCE

<u>Type of Construction</u>	<u>Projects up to \$1,000,000</u>	<u>Projects over \$1,000,000</u>
New Buildings:		
Each Occurrence		
Minimum Limit	\$1,000,000	\$3,000,000
Per Project Aggregate	\$2,000,000	\$6,000,000
Renovations:		
	The building(s) value for the Project is \$_____.	
Each Occurrence		
Minimum Limit	\$1,000,000**	\$3,000,000**
Per Project Aggregate	2 times per occur limit**	2 times per occur limit**

**While the minimum Combined Single Limit of \$1,000,000 is required for any renovation, the limit is calculated by taking 10% of the building value and rounding it to the nearest \$1,000,000 to get the insurance limit. Example: Renovation on a \$33,000,000 building would have a calculated \$3,300,000 combined single limit of coverage (33,000,000 times .10 = 3,300,000 and then rounding down to \$3,000,000). If the calculated limit is less than the minimum limit listed in the above chart, then the amount needed is the minimum listed in the chart. Maximum per occurrence limit required is \$10,000,000 regardless of building value. The per project aggregate limit is then calculated as twice the per occurrence limit.

Automobile Liability

Automobile Liability Insurance shall have a minimum combined single limit per occurrence of \$300,000. ISO form number CA 00 01 (current form approved for use in Louisiana), or equivalent, is to be used in the policy. This insurance shall include third-party bodily injury and property damage liability for owned, hired and non-owned automobiles.

Umbrella

Contractor shall procure and maintain during the life of this Contract, an umbrella policy in the amount of \$2,000,000 in excess of all other insurance requirements. Umbrella Insurance may be used to meet the minimum requirements for General Liability and Automobile Liability only.

Builder's Risk

Builder's Risk Insurance shall be in an amount equal to the amount of the construction contract including any amendments and shall be upon the entire Work included in the contract. The policy shall provide coverage equivalent to the ISO form number CP 10 20, Broad Form Causes of Loss (extended, if necessary, to include the perils of wind, earthquake, collapse, vandalism/malicious mischief, and theft, including theft of materials

whether or not attached to any structure). The policy must include architects' and engineers' fees necessary to provide plans, specifications and supervision of Work for the repair and/or replacement of property damage caused by a covered peril, not to exceed 10% of the cost of the repair and/or replacement.

A Specialty Contractor may provide an installation floater in lieu of a Builder's Risk policy, with the similar coverage as the Builder's Risk policy, upon the system to be installed in an amount equal to the amount of the contract including any amendments. Flood coverage is not required.

The policy must include coverage for the Owner, Contractor and any subcontractors as their interests may appear.

Pollution Liability (required when asbestos or other hazardous material abatement is included in the contract)

Pollution Liability insurance, including gradual release as well as sudden and accidental, shall have a minimum limit of not less than \$1,000,000 per claim. A claims-made form will be acceptable. A policy period inception date of no later than the first day of anticipated Work under this contract and an expiration date of no earlier than 30 days after anticipated completion of all Work under the contract shall be provided. There shall be an extended reporting period of at least 24 months, with full reinstatement of limits, from the expiration date of the policy if the policy is not renewed. The policy shall not be cancelled for any reason, except non-payment of premium.

Deductibles and Self-Insured Retentions

Any deductibles or self-insured retentions must be declared to and accepted by the Owner. The Contractor shall be responsible for all deductibles and self-insured retentions.

OTHER INSURANCE PROVISIONS

The policies are to contain, or be endorsed to contain, the following provisions:

Worker's Compensation and Employers Liability Coverage

To the fullest allowed by law, the insurer shall agree to waive all rights of subrogation against the Owner, its officers, agents, employees and volunteers for losses arising from Work performed by the Contractor for the Owner.

Commercial General Liability Coverage

The Owner, its officers, agents, employees and volunteers are to be added as additional insureds as respects liability arising out of activities performed by or on behalf of the Contractor; products and completed operations of the Contractor, premises owned, occupied or used by the Contractor. ISO Form CG 20 10 (for ongoing work) AND CG 20 37 (for completed work) (current forms approved for use in Louisiana), or equivalent, are to be used.

The Contractor's insurance shall be primary as respects the Owner, its officers, agents, employees and volunteers for any and all losses that occur under the contract. The coverage shall contain no special limitations on the scope of protection afforded to the Owner, its officers, officials, employees or volunteers. Any insurance or self-insurance maintained by the Owner shall be excess and noncontributory of the Contractor's insurance.

All Coverages

All policies must be endorsed to require 30 days written notice of cancellation to the Agency. Ten-day written notice of cancellation is acceptable for non-payment of premium. Notifications shall comply with the standard cancellation provisions in the Contractor's policy. In addition, Contractor is required to notify Agency of policy cancellations or reductions in limits.

Neither the acceptance of the completed Work nor the payment thereof shall release the Contractor from the obligations of the insurance requirements or indemnification agreement.

The insurance companies issuing the policies shall have no recourse against the Owner for payment of premiums or for assessments under any form of the policies.

Any failure of the Contractor to comply with reporting provisions of the policy shall not affect coverage provided to the Owner, its officers, agents, employees and volunteers.

Acceptability of Insurers

All required insurance shall be provided by a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located. Insurance shall be placed with insurers with an A.M. Best's rating of A-: VI or higher. This rating requirement may be waived for Worker's compensation coverage only.

If at any time an insurer issuing any such policy does not meet the minimum A.M. Best rating, the Contractor shall obtain a policy with an insurer that meets the A.M. Best rating and shall submit another certificate of insurance within 30 days.

Verification of Coverage

Contractor shall furnish the Owner with Certificates of Insurance reflecting proof of required coverage. The Certificates are to be received and approved by the Owner before Work commences and upon any contract renewal or insurance policy renewal thereafter. The Certificates for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf. The Certificate Holder must be listed as follows:

Name of Owner

Owner Address

City, State, Zip

Attn: Project # _____

The Owner reserves the right to request complete certified copies of all required insurance policies at any time. The Contractor shall, within thirty days, deliver the certified copies of any requested insurance policies to the Owner's Representative. Upon failure of the Contractor to furnish, deliver and maintain required insurance, this contract, at the election of the Agency, may be suspended, discontinued, or terminated. Failure of the Contractor to purchase and/or maintain any required insurance shall not relieve the Contractor from any liability or indemnification under the contract.

If the Contractor does not meet the insurance requirements at policy renewal, at the option of the Owner, payment to the Contractor may be withheld until the requirements have been met, OR the Owner may pay the renewal premium and withhold such payment from any monies due the Contractor, OR the contract may be suspended or terminated for cause.

Subcontractors

Contractor shall include all subcontractors as insureds under its policies OR shall be responsible for verifying and maintaining the certificates provided by each subcontractor. Subcontractors shall be subject to all of the requirements stated herein. The Owner reserves the right to request copies of subcontractor's certificates at any time. If Contractor does not verify subcontractors' insurance as described above, Owner has the right to withhold payments to the Contractor until the requirements have been met.

Worker's Compensation Indemnity

In the event Contractor is not required to provide or elects not to provide Worker's compensation coverage, the parties hereby agree the Contractor, its Owners, agents and employees shall have no cause of action

against, and shall not assert a claim against, the Owner, its departments, agencies, agents and employees as an employer, whether pursuant to the Louisiana Worker's Compensation Act or otherwise, under any circumstance. The parties also hereby agree that the Owner, its departments, agencies, agents and employees shall in no circumstance be, or considered as, the employer or statutory employer of Contractor, its Owners, agents and employees. The parties further agree that Contractor is a wholly independent Contractor and is exclusively responsible for its employees, Owners, and agents. Contractor hereby agrees to protect, defend, indemnify and hold the Owner, its departments, agencies, agents and employees harmless from any such assertion or claim that may arise from the performance of this contract.

Indemnification/Hold Harmless Agreement

Contractor agrees to protect, defend, indemnify, save, and hold harmless, the Owner, all Departments, Agencies, Boards and Commissions, its officers, agents, servants, employees and volunteers, from and against any and all claims, damages, expenses and liability arising out of injury or death to any person or the damage, loss or destruction of any property which may occur, or in any way grow out of, any act or omission of Contractor, its agents, servants and employees, or any and all costs, expenses and/or attorney fees incurred by Contractor as a result of any claims, demands, suits or causes of action, except those claims, demands, suits or causes of action arising out of the negligence of the Owner, Agencies, Boards, Commissions, its officers, agents, servants, employees and volunteers.

Contractor agrees to investigate, handle, respond to, provide defense for and defend any such claims, demands, suits or causes of action at its sole expense and agrees to bear all other costs and expenses related thereto, even if the claims, demands, suits, or causes of action are groundless, false or fraudulent. Owner may, but is not required to, consult with the Contractor in the defense of claims, but this shall not affect the Contractor's responsibility for the handling and expenses of all claims.

PERFORMANCE AND PAYMENT BOND

The Contractor shall furnish a bond covering faithful performance of the Contract and a bond covering payment of obligations arising thereunder. The costs thereof shall be included in the Contract Sum and the amount of each bond shall be equal to the One Hundred Percent (100%) of the Contract Sum.

Each Bond shall be from a good, solvent and sufficient surety and written by a surety or insurance company which qualifies with the requirements of Louisiana Revised Statutes 38:2219 as of the time of the bid opening.

The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney of the surety company.

The Contractor shall furnish and pay for a Performance Bond and a Labor and Material Payment Bond which bonds shall be issued by a company qualified to do business in the State of Louisiana, and which are acceptable to the Owner and on AIA Document A311 Form, each bond in an amount equal to 100% of the contract sum. The Performance Bond required by La. R.S. 38:2216 is security for the faithful performance of all the duties of the contractor in accordance with the contract. The Payment Bond required by La. R.S. 38:2241 shall guarantee the payment by the contractor or subcontractor to the claimants as defined in La. R.S. 38:2242 for labor or furnishing materials or supplies in connection with the work or as otherwise provided by law.

RECORDATION OF CONTRACT AND BOND

[La R.S. 38:2241 thru 38:2241.1] The Owner shall record within thirty (30) days the Contract Between Owner and Contractor and Performance and Payment Bond with the Clerk of Court in the Parish in which the Work is to be performed.

11.2 OWNER'S INSURANCE

Delete Section 11.2 in its entirety.

ARTICLE 13 - MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

Add the following Subparagraph 13.1.2 to 13.1:

- 13.1.2 The Contractor and his Surety consent and yield to the jurisdiction of the Judicial District Court for the Parish where the Project is located.

13.3 RIGHTS AND REMEDIES

Add the following Subparagraph 13.3.3 to 13.3:

- 13.3.3 Nothing contained in the Contract Documents shall create a contractual relationship or any cause of action in favor of a third party against either the Owner, Contractor or Surety. Further, the Contractor acknowledges and agrees that the Contractor has no cause of action or claim against the Architect and waives any such action for any economic losses arising out of the Contract Documents.

13.4 TESTS AND INSPECTIONS

- 13.4.1 Delete the second sentence in the subparagraph and replace it with the following:

Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections, and approvals with the Owner's Testing Laboratory, entity acceptable to the Owner, or with the appropriate public authority; Owner shall bear all related costs of tests, inspections, and approvals.

13.5 INTEREST

Delete Paragraph 13.5 INTEREST in its entirety. No interest is due by the Owner for any late payment.

Add the following Paragraphs 13.6 through 13.10 to ARTICLE 13:

13.6 EQUAL OPPORTUNITY

- 13.6.1 The Contractor shall maintain policies of employment as follows:

- 13.6.1.1 The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin or age. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex, national origin or age. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of nondiscrimination.

- 13.6.1.2 The Contractor and the Contractor's Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex, national origin or age.

- 13.6.1.3 At the Owner's request, the Contractor and all subcontractors are encouraged to give special consideration to employing local Native Americans for work required by this Contract.

13.7 WORK CONTINUATION AND PAYMENT

13.7.1 Unless otherwise agreed in writing, the Contractor shall carry on the Work, pending any claim or arbitration, and, if so, the Owner shall continue to make payments in accordance with the provisions of the Contract Documents except as to any items in dispute.

13.8 ATTORNEY'S FEES

13.8.1 If as a result of any action or lawsuit filed by the Contractor it is necessary for the Owner to retain an attorney, the Contractor shall pay all legal fees and costs incurred by the Owner, if the Owner is the prevailing party for all or a portion of any claim, in proportion and to the extent the Owner is the prevailing party.

13.09 PRECONSTRUCTION CONFERENCE

13.09.1 No later than fifteen (15) days after the date of the Notice to Proceed, a conference will be held to review the Contractor's schedule and Schedule of Values submitted to the Architect together with a review of the Contractor's plans for proceeding with the Work and such other items as may be designated by the Architect. The meeting will be convened by the Architect with a representative of the Owner and the Project representatives of the Contractor.

13.10 PROJECT MEETINGS

13.10.1 Project Meetings will be held at which the Architect, Owner's representative, and Project representative shall be present. The Contractor and the primary subcontractors shall also be represented. The Contractor is responsible to prepare the minutes of the meeting and to distribute them to all parties within five (5) days of the date of the monthly Project Meeting.

ARTICLE 14 – TERMINATION OR SUUSPENSION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

Delete Clause 14.1.1.4.

Delete Clause 14.1.3 and substitute the following:

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 the portion of the Work that was installed, performed and/or stored on the Project site, and costs incurred by reason of such termination. The Contractor shall not be entitled nor allowed consequential damages or loss of profit or overhead or attorney fees for any portion of the Work of the Contract that has not been performed.

14.2 TERMINATION BY THE OWNER FOR CAUSE

Add Clause 14.2.1.5 as follows:

14.2.1.5 Failure to complete the punch list within the lien period as provided in 9.8.7.

14.2.3 Add the following sentences to 14.2.3:

Termination by the Owner shall not suspend assessment of liquidated damages against the Contractor or Surety. Termination by the Owner under this Article shall not relieve the Contractor and/or Surety of his obligations under the liquidated damages provisions and the Contractor and/or Surety shall be liable to the Owner for per diem liquidated damages.

14.4.3 Add the following sentence to 14.4.3:

The Contractor is not entitled to recover consequential damages nor attorney fees.

ARTICLE 15 - CLAIMS AND DISPUTES

15.1.2 TIME LIMITS ON CLAIMS

Delete Clause 15.1.2 and substitute the following:

15.1.2 The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the 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. The Owner and Contractor waive all Claims and causes of action not commenced in accordance with Section 15.1.2 and La. R.S. 38:2189 and 38:2189.1.

15.1.3 NOTICE OF CLAIMS

15.1.3.1 In Subparagraph 15.1.3.1, substitute "10 days" for "21 days" and add the following sentence to the end of the paragraph:

A Reservation of Rights and similar stipulations shall not be recognized under this contract as having any effect. A party must make a claim as defined herein with the time limits provided.

15.1.6 CLAIMS FOR ADDITIONAL TIME

Delete Clause 15.1.6.1 and substitute the following:

15.1.6.1 If the Contractor wishes to make a claim for an increase in the Contract Time, written notice not later than the tenth day of the month following the month in which the delay occurred as provided herein shall be given to the Architect and Owner.

Delete Clause 15.1.6.2 and substitute the following:

15.1.6.2 If unusual inclement or adverse weather conditions are the basis for a claim for additional time, the Contractor shall document that the weather conditions had an adverse effect on the scheduled construction, that is-the weather prevented the execution of major items of Work on normal working days. An increase in the Contract Time due to weather shall not be cause for an increase in the Contract Sum. Any such claim must be accompanied by sufficient documentation evidencing the adverse days and the impact on construction supported by copies of the Contractor's daily reports.

Add the following Clauses 15.1.6.3, 15.1.6.4 and 15.1.6.5:

15.1.6.3 Unusual inclement weather means unusually severe weather which is beyond the normal weather recorded and expected for the area. The following are considered normal days of unusually severe weather at the site of this project:

Rain days:

January	<u>10</u> days	July	<u>11</u> days
February	<u>8</u> days	August	<u>11</u> days
March	<u>8</u> days	September	<u>10</u> days
April	<u>7</u> days	October	<u>6</u> days
May	<u>8</u> days	November	<u>8</u> days
June	<u>9</u> days	December	<u>9</u> days

Temperature days with low temperature less than 32 degrees:

January	<u>6</u> days	November	<u>1</u> days
February	<u>3</u> days	December	<u>4</u> days
March	<u>1</u> days		

15.1.6.4 The Contractor shall list the dates and total number of unusual inclement weather days for each month a claim is made. The Architect and Owner will consider only the number of days over the allowable number of days (.01" or more) stated in Subparagraph 15.1.6.3.

15.1.6.5 No change in the Work, whether by way of alteration or addition to the Work, shall be the basis of an addition to the Contract Sum or a change in the Contract Time unless and until such alteration or addition has been authorized by a Change Order executed and issued in accordance with and in strict compliance with the requirements of the Contract Documents. Any claim for increased cost for delay shall be asserted in accordance with the provisions of Subparagraph 15.1.3 unless the time is extended in writing by the Owner. This requirement is of the essence of the Contract Documents. Accordingly, no course of conduct or dealings between the parties, nor express or implied acceptance of alterations or additions to the Work, and no claim that the Owner has been unjustly enriched by any alteration or addition to the Work, whether or not there is in fact any such unjust enrichment, shall be the basis for any claim to an increase in the Contract Sum or change in the Contract Time. No claim shall be valid unless so made.

15.2 INITIAL DECISION

15.2.1 In Subparagraph 15.2.1, add to the end of the third sentence the phrase: "arising prior to the date final payment is due."

END
SUPPLEMENTARY CONDITIONS
OF THE
CONTRACT FOR CONSTRUCTION

DIVISION 1 – GENERAL REQUIREMENTS

011100	SUMMARY OF WORK
012300	ALTERNATES
012513	PRODUCT SUBSTITUTION PROCEDURES
012600	CONTRACT MODIFICATION PROCEDURES
012900	PAYMENT PROCEDURES
012973	SCHEDULE OF VALUES
013113	PROJECT COORDINATION
013119	PROJECT MEETINGS
013216	CONSTRUCTION PROGRESS SCHEDULE
013300	SUBMITTAL PROCEDURES
014100	REGULATORY REQUIREMENTS
014500	QUALITY CONTROL
015000	TEMPORARY FACILITIES AND CONTROLS
017329	CUTTING AND PATCHING
017700	CLOSEOUT PROCEDURES
017839	PROJECT RECORD DOCUMENTS

SECTION 011100 - SUMMARY OF WORK**PART 1 - GENERAL****1.1 DESCRIPTION OF WORK****A. THE PROJECT:**

1. The project consists of additions and alterations to the existing Pineville Junior High School, 501 Edgewood Drive, Pineville, LA 71360. All work is located on the existing campus. The project is anticipated to be one lump sum Base Bid + two Additive Alternate Proposals for this project.

B. PROJECT COMPONENTS:

1. Work Includes:

- a. Site demolition to prepare for a new Gymnasium Lobby Addition.
- b. Construction of a new Gymnasium Lobby Addition and exterior renovations to the existing gymnasium.
- c. Interior demolition and renovations at the existing gymnasium and various restrooms in multiple buildings on campus.
- d. Associated sitework, paving, drainage and utility work.

C. THE WORK:

1. All work or portions of work necessary to perform additions and improvements to the existing Pineville Junior High School campus as scheduled in these documents.

1.2 CONTRACT DESCRIPTION

- A. Perform Work of Contract under one publicly bid, lump sum contract with Owner in accordance with the Conditions of the Contract, and as modified by Supplementary Conditions of the Contract.

1.3 CONTRACTS AND USE OF SITE**A. Contractor Use of Premises:**

1. Confine operations at site to areas permitted by:
 - a. Law
 - b. Ordinances
 - c. Permits
 - d. Contract Documents
2. Do not unreasonably encumber site with materials or equipment.
3. Assume full responsibility for protection and safekeeping of products stored on premises.
4. Obtain and pay for use of additional storage or work areas as needed for operations.
5. Contractor shall establish secured staging area for work and coordinate and provide for safe passage and exit from building areas during construction, as determined by City and District officials.
6. Contractor shall coordinate all construction activities with Owner.
7. Owner reserves the right to perform construction operations with its own forces or to employ separate contractors on portions of the Project. Contractor shall coordinate with this work in terms of providing site access, work space, and storage space, cooperation of work forces, scheduling, and technical requirements.
8. Coordinate all utility shutdowns with Owner and, as required, with local utility companies, one week prior to commencement of shutdown.

- B. Owner Occupancy:
 - 1. The Owner reserves the right to occupy the overall site that contain buildings, the existing playfield and track, parking and access drives. Contractor shall coordinate his efforts with the Owner to minimize any conflicts.
 - 2. A Certificate of Substantial Completion will be executed in accordance with conditions of the Contract.
 - 3. Contractor shall obtain a Certificate of Occupancy from local building officials prior to Owner occupancy.
- C. Coordination with Owner's Forces or Owner's Contractors:
 - 1. Provide site access, space allocation, scheduling coordination, coordination of work forces and coordination of technical requirements with contractors that may be selected and employed by Owner to perform work simultaneously and in conjunction with the Work.

1.4 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Architects/Engineers written responses to Change directives, Change Proposal Requests, and other supplemental instructions.
 - 5. Change Orders and other modifications to the Contract.
 - 6. Reviewed Shop Drawings, Product Data, and Samples.
 - 7. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Refer to section 017839, Project Record Documents for additional information.

1.5 PROTECTION OF EXISTING PROPERTY

- A. Contractor shall provide and maintain adequate protection of Owner's existing property within the construction area during duration of Project.
- B. Contractor shall verify location of all existing underground utilities and pipelines on site of such pipelines and authorities having jurisdiction and shall provide and maintain adequate protection of all such pipelines during duration of Project.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Refer to Specification Sections.

PART 3 - EXECUTION

3.1 CONSTRUCTION SCHEDULE

- A. The Work shall commence upon Contractor's receipt of a Notice to Proceed and the Work shall be Substantially Complete on or before **510 calendar days** thereafter.
- B. The Contractor shall commence with site and infrastructure preparation for the reroofing immediately.

- C. Coordinate the schedule for renovations with the Owner to minimize disruptions to the school schedule. Completion of construction work is scheduled for Summer of 2027.
- D. Refer to Section 013216 for other scheduling requirements. .

END OF SECTION 011100

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for alternates.

1.2 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 the 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 alternates into the Work. No other adjustments are made to the Contract Sum.
 - 3. The intent of the numbering of the Alternates is to award them in the numbered order indicated. If the alternate amounts at bid do not change the order of the bidders, then the Owner reserves the right to award alternates in any order he chooses.

1.3 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. Execute accepted alternates under the same conditions as other work of the Contract.
- C. 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. Base Bid: The work of the Base Bid is generally described in Section 011100 – Summary of Work.
- B. Additive Alternate 1 – Metal Athletic Lockers in Gymnasium Locker Rooms:
 - 1. All work associated with replacement of existing metal lockers with new athletic lockers.
- C. Additive Alternate 2 – Millwork as Scheduled in Locker Room Spaces:
 - 1. Millwork items M7-M13 as shown in locker room storage spaces and coach's spaces and as listed in the Equipment Schedule.

END OF SECTION 012300

SECTION 012513 - PRODUCT SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Specified product compliance, and product quality assurance
- B. Specific administrative and procedural requirements for handling requests for substitutions made prior to award of Contract.
- C. Requirements for product delivery, storage and handling.

1.2 RELATED REQUIREMENTS

- A. Instructions to Offerors: Product options and procedures for submittal of requests for substitutions during the Proposal period.

1.3 DESCRIPTION OF REQUIREMENTS

- A. Definitions: Definitions used in this Section are not intended to negate the meaning of other terms used in the Contract Documents, including such terms as “specialties”, “systems”, “structure”, “finishes”, “accessories”, “furnishings”, “special construction”, and similar terms. Such terms are self-explanatory and have recognized meanings in the construction industry.
 - 1. Products: Shall mean items purchased for incorporation in the Work, regardless of whether they were specifically purchased for the project or taken from the Contractor's previously purchased stock. The term “product” as used herein includes the terms “material”, “equipment”, “system”, and other terms of similar intent.
 - a. Named Products: Are those identified by the use of the manufacturer's name for a product, including such items as a make or model designation, as recorded in published product literature, of the latest issue as of the date of the Contract Documents.
 - b. Specified Products: same as Named Products.
 - 2. Materials: Shall mean products that must be substantially cut, shaped, worked, mixed, finished, refined, or otherwise fabricated, processed, or installed to form units of work.
 - 3. Equipment: Is defined as a product with operational parts, regardless of whether motorized or manually operated, and in particular, a product that requires service connections such as wiring or piping.

1.4 PRODUCT QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same generic kind, from a single source, for each unit of work.
 - 1. When it is discovered that specific products are available only from sources that do not or cannot produce an adequate quantity to complete project requirements in a timely manner, consult with the Architect/Engineer for a determination of what product quantities are most important before proceeding. The Architect/Engineer will designate those qualities, such as visual, structural, durability, or compatibility,

that are most important. When the Architect/Engineer's determination has been made, select products from those sources that produce products that possess the most important qualities, to the fullest extent possible.

- B. Compatibility of Options: Compatibility of products is a basic requirement of product selection. When the Contractor is given the option of selecting between two (2) or more products for use on the project, the product selected must be compatible with other products previously selected, even if the products previously selected were also Contractor options. The complete compatibility between the various choices available to the Contractor is not assured by the various requirements of the Contract Documents, but must be provided by the Contractor.
- C. Or Equal:
 - 1. Where the phrase "or equal", "or equivalent", "or Architects approved equal", or similar phrasing, occurs in the Proposal Documents, do not assume that materials, equipment, or methods of construction will be approved by the Architect unless the item has been specifically approved for this Work by the Architect.
 - 2. The decision of the Architect shall be final.
- D. Where a proposed substitution involves the work of more than one (1) contractor, each contractor involved shall cooperate and coordinate the work with each other contractor involved, so as to provide uniformity and consistency and to assure the compatibility of products.
- E. Foreign Product Limitations: "Foreign products" as distinguished from "domestic products" are defined as products that are either manufactured substantially (50 percent or more of value) outside of the United States and its possessions, or produced or supplied by entities known to be substantially owned (more than 50 percent) by persons who are not citizens of nor living within the United States and its possessions.
 - 1. Except under one (1) of the following conditions, select and provide domestic, not foreign, products for inclusion in the Work.
 - a. There is no domestic product available that complies with the requirements of the Contract Documents.
 - b. Available domestic products that comply with the requirements of the Contract Documents are available only at prices or other procurement terms that are substantially higher (25 percent or more) than for available foreign products that comply with the requirements of the Contract Documents.
 - c. At the discretion of the Architect or Owner.
 - 2. Final determination and acceptance will be the responsibility of the Architect.
- F. Standards: Refer to Section 01 41 00, Regulatory Requirements for the applicability of industry standards to the products specified for the Project, and for the acronyms used in the text of the Specification Sections.

1.5 SUBSTITUTIONS OF PRODUCTS

- A. The products described in the Proposal Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution. The materials and equipment named in, and the procedures covered by these specifications have been selected as a standard because of quality, particular suitability or record of satisfactory performance. It is not intended to preclude the use of equal or better materials or equipment provided that

same meets the requirements of the particular project and is approved in an Addendum as a substitution prior to the submission of proposals.

- B. No substitution will be considered prior to receipt of proposals unless written request for approval has been received by the Architect at least ten (10) days prior to the date for receipt of proposals. Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including drawings, cuts, performance and test data and any other information necessary for an evaluation. The Architect's decision of approval or disapproval of a proposed substitution shall be final.
- C. If the Architect approves any proposed substitution prior to receipt of proposals, such approval will be set forth in an Addendum. Offeror shall not rely upon approvals made in any other manner.
- D. The Architect and Owner reserve the right to disapprove the use of any manufacturer who in their judgment is unsuitable for use on the Project and that decision will be final
- E. The following are not considered as substitutions:
 - 1. Revisions to the Contract Documents, when requested by the Owner, Architect, or any of their consultants are considered as "changes" not substitutions.
 - 2. Specified Contractor options on products and construction methods included in Contract Documents are choices made available to the Contractor and are not subject to the requirements specified in this Section for substitutions.
 - 3. Except as otherwise provided in the Contract Documents, the Contractor's determination of and compliance with governing authorities do not constitute "substitutions" and do not constitute a basis for change orders.
- F. The following may be considered as a reason for a request for substitution:
 - 1. The request is directly related to an "or approved equal" clause or similar language in the Contract Documents.
 - 2. The specified product or method of construction cannot be provided within the Contract Time in accordance with paragraph below concerning availability of specified items.
 - 3. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
 - 4. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other consideration of merit, after deducting offsetting responsibilities the Owner may be required to bear. These additional responsibilities may include such considerations as additional compensation to the Architect/Engineer for redesign and evaluation services, the increased cost of other work by the Owner or separate contractors, and similar considerations.
 - 5. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.
 - 6. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.
 - 7. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.
- G. Availability of specified items:

1. Verify prior to submittal of Proposal that all specified items will be available in time for installation during orderly and timely progress of the work.
2. In the event specified items will not be so available, notify the Architect prior to receipt of Proposals. Submit Request for Substitutions in accordance with this section.
3. The request will not be considered if the product or method cannot be provided as a result of the Contractor's failure to pursue the work promptly or coordinate activities properly.
4. Costs of delays because of non-availability of specified items, when such delays could have been avoided by the Contractor, will be back-charged as necessary and shall not be borne by the Owner.

H. A request constitutes a representation that Offeror:

1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
2. Will provide same warranty for Substitution as for specified product, except when inability to provide specified Warranty is reason for request for substitution as described above.
3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension which may subsequently become apparent.
5. Will reimburse the Owner and pay for all costs, including Architect/Engineer's redesign and evaluation costs resulting from the use of the proposed substitution, or for review or redesign services associated with re-approval by authorities having jurisdiction.

I. No substitutions will be considered after the Award of Contract.

1.6 SUBSTITUTION REQUEST SUBMITTAL

A. Requests for Substitutions: Submit three (3) copies of each request for substitution. In each request identify the product or fabrication or installation method to be replaced by the substitution; include related Specifications Section and Drawing numbers, and complete documentation showing compliance with the requirements for substitutions. Include, as appropriate, with each request, the following information:

1. Product data, drawings and descriptions of products, fabrication and installation procedures.
2. Samples, where applicable or requested.
3. A detailed comparison of the significant qualities of the proposed substitution with those of the work originally specified. Significant qualities may include elements such as size, weight, durability, performance and visual effect, where applicable.
4. Coordination information, including a list of changes or modifications needed by other parts of the work and to construction performed by the Owner and separate Contractors that will become necessary to accommodate the proposed substitution.
5. A statement indicating the effect the substitution will have on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
6. Cost information, including a proposal of the net change, if any in the Contract Sum.
7. Certification by the Contractor to the effect that, in the Contractor's opinion, after thorough evaluation, the proposed substitution will result in work that in every significant respect is equal-to or better than the work required by the Contract

Documents, and that it will perform adequately in the application indicated. Include the Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.

8. A statement indicating the Contractor will reimburse the Owner and pay for all costs, including Architect/Engineer's re-design and evaluation costs resulting from the use of the proposed substitution.

- B. Work-Related Submittals: The Contractor's submittal of, and the Architect/Engineer's acceptance of, Shop Drawings, Product Data, or Samples which are related to work not complying with the Contract Documents, does not constitute an acceptance or valid request for a substitution, nor approval thereof.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. General: Deliver, store, and handle products in accordance with manufacturer's recommendations, using means and methods that will prevent damage, deterioration and loss, including theft. Control to prevent overcrowding of construction spaces or overloading of structure. In particular, coordinate delivery and installation to ensure minimum holding or storage times for items known or recognized to be flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other sources of loss.
 1. Deliver products to the site in the manufacturer's sealed containers or other packaging system, complete with labels intact, and instructions for handling, storage, unpacking, installing, cleaning and protecting.
 2. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation or potential degradation of product.
 3. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
 4. Store products at the site or in a bonded and insured off-site storage facility or warehouse in a manner that will facilitate inspection and measurement of quantity or counting of units. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.
 5. Store heavy materials away from the project structure or in a manner that will not endanger the supporting construction.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT COMPLIANCE

- A. General: Requirements for individual products are indicated in the Contract Documents; compliance with these requirements is in itself a contract requirement. These requirements may be specified in any one (1) of several different specifying methods, or in any combination of these methods. These methods include the following:
 1. Proprietary
 2. Descriptive
 3. Performance
 4. Compliance with Reference Standards

Compliance with codes, compliance with graphic details, allowances, and similar provisions of the Contract Documents also have a bearing on the selection process.

- B. Procedures for Selecting Products: The Contractor's options in selecting products are limited by requirements of the Contract Documents and governing regulations. They are not controlled by industry traditions or procedures experienced by the Contractor on previous construction projects. Required procedures include, but are not limited to the following for the various indicated methods of specifying:
1. Proprietary and Semi-Proprietary Specification Requirements:
 - a. Single Product Name: Where only a single product or manufacturer is named, provide the product indicated, unless the specification indicates the possible consideration of other products. Advise the Architect/Engineer before proceeding, when it is discovered that the named product is not a reasonable or feasible solution.
 - b. Two (2) or More Product Names: Where two (2) or more products or manufacturers are named, provide one (1) of the products named, at the Contractor's option. Exclude products that do not comply with specification requirements. Do not provide or offer to provide an unnamed product, unless the specification indicates the possible consideration of other products. Advise the Architect/Engineer before proceeding where none of the named products comply with specification requirements, or are not feasible for use. Where products or manufacturers are specified by name, accompanied by the term "or approved equal" or similar language, comply with this Section regarding "substitutions" to obtain approval from the Architect/Engineer for the use of an unnamed product.
 2. Non-Proprietary Specification Requirements: Where the specifications name products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to the use of these products only, the Contractor may, at his option, use any available product that complies with the Contract requirements.
 3. Descriptive Specification Requirements: Where the specifications describe a product or assembly generically, in detail, listing the exact characteristics required, but without use of a brand name, provide products or assemblies that provide the characteristics indicated and otherwise comply with Contract requirements.
 4. Performance Specification Requirements: Where the specifications require compliance with indicated performance requirements, provide products that comply with the specific performance requirements indicated, and that are recommended by the manufacturer for the application indicated. The manufacturer's recommendations may be contained in published product literature, or by the manufacturer's individual certification of performance. General overall performance of a product is implied where the product is specified for specific performances.
 5. Compliance with Standards, Codes, and Regulations: Where the specifications require only compliance with an imposed standard, code or regulation, the Contractor has the option of selecting a product that complies with specification requirements, including standards, codes, and regulations.
 6. Visual Matching: Where matching an established sample is required, the final judgment of whether a product proposed by the Contractor matches the sample satisfactorily will be determined by the Architect. Where there is no product available within the specified product category that matches the sample satisfactorily and also complies with other specified requirements, comply with the provisions of this Section regarding "substitutions" and other Contract Documents for "change orders" for the selection of a matching product in another product category, or for non-compliance with specified requirements.
 7. Visual Selection: Except as otherwise indicated, where specified product requirements include the phrase "...as selected from the manufacturer's standard colors, patterns, textures..." or similar phrases, the Contractor has the option of

selecting the product and manufacturer, provided the selection complies with other specified requirements. The Architect is subsequently responsible for selecting the color, pattern and texture from the product line selected by the Contractor.

8. Allowances: Refer to individual sections of the specifications and Section 01 21 00, Allowances for an indication of product selections that are controlled by established allowances, and for the procedures required for processing such selections.

- C. Producer's Statement of Applicability: Where individual specification sections indicate products that require a "Statement of Applicability" from the manufacturer or other producer, submit a written-certified statement from the producer stating that the producer has reviewed the proposed application of the product on the project. This statement shall state that the producer agrees with or does not object to the Architect/Engineer's specification and the Contractor's selection of the product on the project is suitable and proper.

2.2 SUBSTITUTIONS

- A. Condition: The Contractor's request for substitution will be received and considered when extensive revisions to Contract Documents are not required, when the proposed changes are in keeping with the general intent of the Contract Documents, when the request is timely, fully documented and properly submitted, and when one (1) or more of the above conditions are satisfied, all as judged and determined by the Architect/Engineer; otherwise the requests will be returned without action except to record non-compliance with these requirements.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

- A. General: Except as otherwise indicated in individual sections of these specifications, comply with the manufacturer's instructions and recommendations for installation of the products in the applications indicated.
- B. Anchor each product securely in place, accurately located and aligned with other work.
- C. Clean exposed surfaces and protect surfaces as necessary to ensure freedom from damage and deterioration at time of acceptance.
- D. Products and assemblies shall be installed complete, in-place, watertight and structurally sound.

3.2 INSTALLATION OF APPROVED SUBSTITUTIONS

- A. Coordinate all approved substitutions with adjacent work.
- B. Comply with the manufacturer's and/or supplier's instructions and recommendations for installation of the products in the applications indicated.
- C. Provide all items required by manufacturer and/or supplier regarding installation, i.e. supplemental supports, anchors, fasteners, painting, etc. whether or not indicated or specified.

END OF SECTION

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Change procedures.
- B. Defect assessment.

1.2 GENERAL

- A. Coordinate requirements of this Section with the requirements of the General and Supplementary Conditions of the Contract concerning change procedures.

1.3 CHANGE PROCEDURES

- A. Submittals: Submit name of individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. Minor Changes: The Architect/Engineer may advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions on Minor Change form or by other similar documents in the form issued by the Architect.
- C. Change Proposal Request: The Architect may issue a Change Proposal Request (CPR) or other similar request for proposal in the form issued by the Architect, including a detailed description of proposed change with supplementary or revised Drawings and Specifications, a change in Contract Time for executing the change and the period of time during which the requested price will be considered valid. Contractor will prepare and submit estimate in the form of a Change Proposal so as to not cause delays in the Project.
- D. Contractor may propose changes which, in his opinion, will provide value to the Owner, by submitting a request for change to Architect, describing proposed change and its full effect on the Work. Include a statement describing reason for the change, and effect on Contract Sum/Price and Contract Time with full documentation and a statement describing effect on Work by separate or other Contractors. If accepted by Architect and approved by Owner, submit a Change Order in accordance with the requirements of this Section. This request will not be considered a substitution except as defined by Section 01 25 13, Product Substitution Procedures. Owner is not obligated to accept this request.
- E. Construction Change Directive: Architect/Engineer may issue directive, on AIA Form G713 Construction Change Directive or other similar document in the form issued by the Architect, and signed by Owner, instructing Contractor to proceed with change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute change.
- F. Document each quotation for change in cost or time with sufficient data to allow evaluation of quotation.
- G. Change Order Forms: AIA G701 - Change Order.

- H. Execution of Change Orders: The Architect will prepare and sign the Change Order, the contractor shall sign the Change Order indicating acceptance of the change, and then the Owner will execute the Change Order.
- I. Correlation Of Contractor Submittals:
 - 1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.
 - 2. Promptly revise progress schedules to reflect change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
 - 3. Promptly enter changes in Project Record Documents.

1.4 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements at no additional cost to the Owner.
- B. If, in the opinion of the Architect/Engineer or Owner, it is not practical to remove and replace the Work, the Architect will direct appropriate remedy or adjust payment.
- C. The defective Work may remain, but sum/price will be adjusted to new sum/price at the discretion of Architect or Owner.
- D. Individual specification sections may modify these options or may identify specific formula or percentage sum/price reduction.
- E. Authority of Architect/Engineer, or other appropriate agent identified to perform assessment by the Architect/Engineer or Owner, to assess defects and identify payment adjustments, is final.
- F. Non-Payment For Rejected Products: In addition to replacement of rejected Work, payment will not be made for rejected products for any of the following:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined as unacceptable before or after placement.
 - 3. Products not completely unloaded from transporting vehicle.
 - 4. Products placed beyond lines and levels of required Work.
 - 5. Products remaining on hand after completion of the Work.
 - 6. Loading, hauling, and disposing of rejected products.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Procedures for submitting Applications for Payment.

1.2 GENERAL

- A. Coordinate requirements of this Section with the requirements of the General and Supplementary Conditions of the Contract concerning payment procedures.

1.3 SCHEDULE OF VALUES

- A. Submit printed schedule on AIA Form G703 - Continuation Sheet for G702 in accordance with Section 012973, Schedule of Values.

1.4 APPLICATIONS FOR PAYMENT

- A. Submit four (4) notarized originals of each application on AIA Form G702 - Application and Certificate for Payment and AIA G703 - Continuation Sheet for G702 or other similar form approved by the Owner.
- B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
- C. Submit updated construction schedule with each Application for Payment.
- D. Payment Period: Submit at intervals stipulated in the Agreement in accordance with Supplementary Conditions of the Contract.
- E. Only materials stored on the project site shall be paid for unless the materials are stored in a bonded warehouse.
- F. Substantiating Data: When Architect/Engineer requires substantiating information, submit data justifying dollar amounts in question. Items which may be requested by the Architect or Owner to substantiate costs include, but are not limited to the following:
 - 1. Current Record Documents as specified in Section 01 77 00, Closeout Procedures, for review by Owner which will be returned to Contractor.
 - 2. Labor time sheets, purchase orders, or similar documentation.
 - 3. Affidavits attesting to off-site stored products.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

Not Used.

END OF SECTION

SECTION 012973 - SCHEDULE OF VALUES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Provide a detailed breakdown of the agreed Contract Sum showing values allocated to each of the various parts of the work, as specified herein and in other provisions of the Contract Documents.
- B. Coordinate requirements of this Section with the requirements of the General and Supplementary Conditions of the Contract concerning Schedule of Values.

1.2 QUALITY ASSURANCE

- A. Use required means to assure arithmetical accuracy of the sums described.
- B. When so required by the Owner, provide copies of the subcontracts or other data acceptable to the Owner, substantiating the sums described.

1.3 SUBMITTALS

- A. Prior to the first Application for Payment, submit a proposed schedule of values to the Program Manager at the Pre-Construction Meeting on AIA Form G703 – Continuation Sheet for G702, as outlined below:
 - 1. Meet with the Owner and determine additional data, if any, required to be submitted.
 - 2. Secure the Owner's approval of the schedule of values prior to submitting first Application for Payment.

1.4 SCHEDULE OF VALUES

- A. The Schedule of Values shall be broken down into item costs for each specification section as a minimum. After review by the Architect, the Schedule of Values shall be broken down into further items as required. (See following suggested list.).
- B. Schedule of Values - Items in addition to Specification Sections.
 - 1. Mobilization
 - 2. Clean Up
 - 3. Building Permit
 - 4. Bonds, Insurance
 - 5. Misc. Mechanical Accessories
 - 6. Demolition
 - 7. Rough-In Labor - (Electrical)
 - 8. Rough-In Material - (Electrical)
 - 9. Finish Labor - (Electrical)
 - 10. Finish Material - (Electrical)
 - 11. Allowances (listed separately)
 - 12. Record drawings and close-out documents
 - 13. Submittals listed separately per mechanical, electrical and plumbing
 - 14. Roof warranty as a line item
 - 15. Closeout Documents.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 SCHEDULE OF VALUES

A. Submit on AIA Form G703 – Continuation of Sheet G702.

END OF SECTION

SECTION 013113 – PROJECT COORDINATION

PART 1 - GENERAL

1.1 REQUIREMENTS

- A. General: notify the Architect whenever there is need of clarification or interpretation of the Contract Documents prior to commencement of work.
- B. Commencement of work without Architect's prior notification means Contractor's acceptance of responsibility.
- C. Commencement of work without Architect's prior notification implies Contractor's understanding of conditions, assemblies, methods, or procedures.

1.2 PRE-INSTALLATION CONFERENCE

- A. General: Notify the Architect 48 hours in advance of certain stages of construction, and, as required by the Architect, organize a pre-installation meeting with each trade individually prior to commencement of their portion of the Work. At a minimum, representatives of the Architect, the General Contractor's project superintendent, and the Sub-contractor's Foreman and Project Manager shall be present at each meeting. The Engineer shall be notified as applicable.
- B. As indicated in each specific section of this Project Manual, or as required by the Architect.
- C. In addition to notifying the Architect, notify the Structural Engineer (48 hours) prior to the following stages:
 - 1. Drilling, reinforcing, and placing of first piers and footings.
 - 2. Placing first reinforcing, grade beams and slabs.
 - 3. Erecting structural steel elements.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 PRE-CONSTRUCTION CONFERENCE AND OTHER MEETINGS

- A. Pre-Construction Meeting shall not occur until approval of all contracts. The Notice to Proceed shall be issued at the Pre-Construction Meeting.
- B. The Contractor shall contact Architect prior to commencing construction in order for Architect to schedule a pre-construction meeting with Contractor, Architect, and Owner. This meeting must occur prior to commencement of any construction and is required attendance for all subcontractors and consultants.
- C. Refer to Section 013119, Project Meetings for requirements pertaining to Pre-Construction Conference, Progress Meetings and Pre-Installation Conferences.

END OF SECTION

SECTION 013119 – PROJECT MEETINGS

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDE

A. The Architect:

1. Scheduling of each meeting (pre-construction meeting, periodic project meetings, and specialty called meetings throughout the progress of the Work).
2. Preparation of agenda for meetings.
3. Presiding at minutes, including all significant proceedings and decisions.

B. The Contractor:

1. Making physical arrangement for meetings.
2. Participation in all meetings and conferences.
3. Scheduling attendance of Job Superintendent, Project Coordinator, and other parties affecting or affected by decisions made at meetings and conferences as their interests require.
4. Scheduling Pre-installation conferences.
5. Scheduling Pre-Closeout Meeting
6. Providing updated schedules.
7. Providing status reports/logs of CPRs, MCs, RFI logs and shop drawings/submittals.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 PRE-CONSTRUCTION CONFERENCE

A. Contractor shall contact Architect prior to commencing construction in order for Architect to schedule a pre-construction meeting with Contractor, Architect, and Owner. This meeting must occur prior to commencement of any construction.

B. Architect will:

1. Administer pre-construction conference for the establishment of communication methods, procedures and Owner requirements.

C. Location: To be determined.

D. Attendance:

1. Contractor or Contractor's Representative
2. Job Superintendent
3. Project Coordinator (Manager)
4. Owner or Owner's Representative
5. Subcontractors
6. Architect's Representative
7. Consultants as needed
8. Others as appropriate

- E. Meeting Agenda, may include, but is not limited to:
1. Discussion on major subcontracts and suppliers and projected construction schedules.
 2. Critical work sequencing.
 3. Major equipment deliveries and priorities. Discussion of long lead time items.
 4. Project coordination and designation of responsible personnel.
 5. Procedures and processing of field decisions, proposal requests, submittals, minor changes, change orders and applications for payment.
 6. Method of distribution of Contract Documents.
 7. Procedures for maintaining Record Documents.
 8. Use of premises, office work and storage areas, on-site parking, and Owner's requirements.
 9. Construction facilities and temporary utilities.
 10. Housekeeping procedures.
- F. Items to be submitted by GC at the Pre-Construction Meeting:
1. Schedule of Values
 2. Project Schedule
 3. List of Subcontractors and Suppliers

3.2 PROGRESS MEETINGS

- A. Architect will:
1. Schedule project meetings throughout progress of the work at regular monthly intervals, and specially called meetings.
 2. Set agenda and administer said meetings.
 3. Preside at meetings.
- B. Contractor shall:
1. Make physical arrangements for meetings.
 2. Record meeting minutes, including all significant proceedings and decisions.
 3. Reproduce and distribute copies of meeting minutes to all participants and parties affected by decisions made at the meetings.
- C. Attendance:
1. Contractor or Contractor's Representative
 2. Job Superintendent
 3. Owner or Owner's Representative
 4. Major subcontractors
 5. Architect's Field Representative
 6. Consultants as needed
 7. Others as appropriate
- D. Meeting Agenda, may include, but is not limited to:
1. Review of Work progress since previous meeting.
 2. Field observations, problems, and conflicts.
 3. Review of off-site fabrication and delivery schedules.
 4. Corrective measures and procedures to regain projected schedule.

5. Revisions to Construction Schedule.
6. Action item log.
7. Plan progress and schedule during succeeding work period.
8. Coordination of schedules.
9. Review submittal schedules and expedite as required.
10. Maintenance of quality standards.
11. Review of proposed changes and substitutions for effect on Construction Schedule and on completion date.
12. Status of Change Proposal Requests (CPRs).
13. Status of Minor Changes (MCs).
14. Status of submittals, review of submittal log.
15. Other items and critical issues affecting Work.

3.3 PRE-INSTALLATION CONFERENCES

- A. In accordance with the requirements of Section 013113, Project Coordination, the Contractor will convene pre-installation conferences when required by individual specification Sections or as required by the Architect, prior to the Contractor commencing Work of the Section.
- B. Attendance, optional:
 1. General Contractor or Contractor's Representative
 2. Owner or Owner's Representative
 3. Architect's Project Manager (Project Executive)
- C. Attendance, required:
 1. Project Superintendent
 2. Architect's Field Representative
 3. Sub-contractor's Project Manager
 4. Sub-contractor's Foreman
 5. Engineer's Representative, as needed.
 6. Manufacturer's Representative, as needed.
 7. Governing Agency Official, as required
 8. Inspection Agency Representative, as required.
 9. Others affecting or affected by Work.
- D. Meeting Agenda, may include, but is not limited to:
 1. Review of conditions of installation.
 2. Preparation and installation procedures.
 3. Coordination with related work
 4. Review of the contract document requirements.
 5. Review of code enforcement or testing requirements.
 6. Questions related to work required.

3.4 PRE-CLOSEOUT MEETING

- A. In accordance with the requirements of Section 017700, Closeout Procedures, the Contractor will convene a pre-closeout meeting when he considers the Work or designated portion of the Work is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the work for its intended use.

B. Attendance, required:

1. Owner or Owner's Representative
2. General Contractor or Contractor's Representative
3. Project Superintendent
4. Architect's Project Manager
5. Architect's Field Representative
6. Engineer's Representative, as needed.

C. Meeting Agenda, may include, but is not limited to:

1. Review of the contract document requirements for Substantial Completion and Project Closeout
2. Review of Work which remains to be completed or corrected.
3. Closeout Document review schedule and log
4. Review of closeout procedures including, but not limited to Record Drawings, Warrantees, Operation and Maintenance Manuals, and Owner Demonstrations and Start-up.
5. Review of code enforcement or testing requirements.
6. Questions related to work required.
7. Key Turnover meeting.

END OF SECTION

SECTION 013216 – CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.1 SUBMITTALS

- A. Construction Schedule: Within 14 (fourteen) days after receipt of Notice to Proceed, submit 4 (four) color prints of the construction schedule to the Architect.

1.2 RELIANCE UPON SCHEDULE

- A. The construction schedule as approved by the Architect will be an integral part of the contract and will establish conditions for various activities and phases of constructions.

1.3 CONSTRUCTION SCHEDULE

- A. Diagram: Graphically show the order of all activities necessary to complete the work and the sequence in which each activity is to be accomplished.
- B. Activities shown on the diagram shall include but not necessarily be limited to:
 - 1. Project mobilization
 - 2. Submittals and approvals of shop drawings and samples
 - 3. Phasing of construction
 - 4. Final clean-up
 - 5. Final inspection and testing
- C. The construction schedule shall be updated and submitted with each Application for Payment.

1.4 CONSTRUCTION SCHEDULE LIMITATIONS

- A. Work performed under this Contract shall be done in accordance with the following paragraphs:
 - 1. All work may proceed immediately upon Notice to Proceed and continue uninterrupted.
 - 2. The Owner has a critical need for the work to begin upon Notice to Proceed and be Substantially Complete according to the Project Schedule.
 - 3. The successful Offeror will be subject to liquidated damages for work not completed beyond the agreed date which the Contractor shall require for Substantial Completion of the work included in this contract. Refer to Supplementary Conditions for additional requirements and liquidated damages.
 - 4. Failure to complete and close-out project after substantial completion may result in liquidated damages. Refer to Supplementary Conditions for additional requirements and liquidated damages.
 - 5. Certificate of Substantial Completion will be issued for any of the above mentioned areas of work which are complete prior to the completion of the entire project.
 - 6. The Owner may at his discretion approve changes recommended by the successful Offeror to the above-mentioned schedule provided that the Owner's uses of newly completed areas are not disrupted.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 01 33 00 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUBMITTAL PROCEDURES

- A. Transmit to the Architect/Engineer each item indicated in individual specification sections with approved form identifying:
 - 1. Date of submission and dates of any previous submissions.
 - 2. Project title and number
 - 3. Contract identification
 - 4. Names of Contractor, Supplier, Manufacturer
 - 5. Pertinent drawing sheet and detail number, and specification section number, as appropriate
 - 6. Deviations from Contract Documents.
- B. Contractor shall be responsible for initial review prior to submittal to Architect/Engineer to verify adequacy and conformance to contract requirements. Lack of review by Contractor may be grounds for rejection.
- C. Apply Contractor's stamp, signed, to each item submitted, certifying that review and verification of products, field dimensions, adjacent construction work and coordination of information is in accordance with the requirements of the work and contract documents.
- D. Transmit submittals electronically by email to **SUBMITTALS@YEAGERWATSON.COM**. If hard copies are submitted, furnish the number of copies required by each particular section of the project manual.
- E. Allow minimum of three (3) weeks for adequate Architect/Engineer review of each submittal. Time may vary according to scope and complexity of item under review. Allow adequate time in schedule for revisions and resubmittal as deemed necessary.
- F. Submit each item according to individual specification sections and identified by Division, Section, and individual submittal number.
- G. Revise and resubmit submittal as required; identify all changes made since previous submittal.
 - 1. Make any corrections or changes in the submittals required by the Architect/Engineer and resubmit until approved.
 - 2. Submit new submittal as required for initial submittal.
- H. Upon written request and at the Architect's discretion, digital CAD files of contract drawings may be provided to the Contractor or designated subcontractors for the limited purpose of coordinating shop drawings. Files will be provided in AutoCAD 2024 (.dwg) format. These files are for reference only and shall not be considered contract documents. The Contractor shall remain solely responsible for the content and accuracy of shop drawings. A Digital File Release Agreement must be executed prior to any file transfer. Architect assumes no liability for use or modification of digital files.

1.2 PROPOSED PRODUCTS LIST

- A. Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product at the Pre-Construction Meeting.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.3 PRODUCT DATA

- A. Submit to Architect for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Submit the number of copies of product data and samples which the Contractor and his subcontractors need for their use PLUS two (2) additional sets for the Architect, one (1) additional set for the Owner and one (1) additional set for each of the Architect's consultants involved with the particular Section of Work.
- C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project

1.4 SHOP DRAWINGS

- A. Submit to Architect/Engineer for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. Dimensions indicated on the drawings are based on the specific models and manufacturers of products, equipment, fixtures and miscellaneous items specified. If the Contractor uses an approved product by another listed manufacturer which is different than the specific model and manufacturer listed in these specifications, then the Contractor shall be solely responsible for the coordination of any dimensional changes required, including structural, relocation of walls, equipment, fixtures, ceilings and miscellaneous items. When dimensional changes are required in these situations, the Contractor shall submit a proposed modification drawing to the Architect for approval prior to proceeding with the work. All causes and effects of the dimensional change shall be indicated on the Contractor's drawing submittal.

1.5 SAMPLES

- A. Submit for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Submit for aesthetic, color, or finish selection. Submit full range of manufacture's standard colors, textures, and patterns for Architect's selection.
- C. Submit samples to illustrate functional characteristics of the Product, with integral parts and attachment devices. Coordinate submittal of different categories for interfacing work.
- D. Submit the number specified in respective Specification Section; or minimum of 3 samples.

- E. Reviewed samples which may be used in the Work are indicated in individual specification sections.
- F. Samples will not be used for testing purposes unless specifically stated in specification section.

1.6 DESIGN DATA

- A. When required, submit for Architect/Engineer's knowledge as contract administrator or for Owner.
- B. Submit design data for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.7 TEST REPORTS

- A. In accordance with Section 014523, Inspection and Testing Laboratory Services, submit test reports for Architect/Engineer's knowledge as contract administrator or for Owner. Architect will determine whether corrective action is required.
- B. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.8 CERTIFICATES

- A. When specified in individual specification sections, submit certification by manufacturer, installation/application subcontractor, or Contractor to Architect, in quantities specified.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect and Owner.

1.9 GUARANTEES

- A. When specified in individual specification sections, submit warranties by manufacturer, installation/application subcontractor, fabricator, or Contractor to Architect, in quantities specified.
- B. Submit warranties in accordance with Section 017700, Closeout Procedures.

1.10 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Architect for delivery to Owner in quantities specified.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

1.11 ERECTION DRAWINGS

- A. When required, submit drawings for Architect/Engineer's benefit or for Owner.
- B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.
- C. Data indicating inappropriate or unacceptable Work may be subject to action by Architect/Engineer or Owner. Architect will determine whether corrective action is required.

1.12 CONSTRUCTION PHOTOGRAPHS

- A. Provide photographs monthly of site and construction throughout progress of Work.
- B. Photographs: digital; sent to Architect via email, or provide on non-rewritable compact disk.
- C. Photograph project conditions five (5) days maximum prior to submitting indicating relative progress of the Work. As able, take photographs from same position indicating same view in successive installments.
- D. Identify each photograph with name of Project, room or view, and date.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 014100 – REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Quality Assurance.
- B. References Standards.
- C. Definitions.
- D. Abbreviations.
- E. Format and Specification Context Explanations.
- F. Drawing Symbols.
- G. General Requirements.

1.2 QUALITY ASSURANCE

- A. General:
 - 1. For products or workmanship specified by a standard of an association, trade, or Federal standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable code authorities having jurisdiction.
 - 2. The contractual relationship of the parties to the Contract should not be altered from the Contract Documents by mention or inference otherwise in any reference standard.
 - 3. Obtain copies of standards when required by Contract Documents.
 - 4. Maintain copy of standards at jobsite during submittals, planning, and progress of the specific work for which the standards pertain, until the date of Substantial Completion.
 - 5. In the absence of specific instructions in the specifications, materials, products, equipment and their installation shall conform to the applicable codes, regulations and standards specified therein. When a conflict exists between the applicable code, regulation and standard and that specified, the more stringent code regulation or standard shall prevail, except as authorized by applicable authorities having jurisdiction.
- B. Specifications and Drawings: The Drawings and Specifications are correlative and have equal authority and priority. Base disagreements in themselves or in each other on the most expensive combination of quantity and quality of work indicated. In the event of such disagreement bring it to the attention of the Architect, who will determine the appropriate method to perform the work.
- C. Industry Standards: Where compliance with two (2) or more industry standards or sets of requirements are specified, and overlapping of those different standards or requirements establishes different or conflicting minimums or levels of quality, the most stringent requirement is intended and will be enforced, unless specifically detailed language written into Contract Documents clearly indicates that a less stringent requirement is to be fulfilled. Refer apparently equal-but-different requirements, and uncertainties as to which level of quality is more stringent, to the Architect for a decision before proceeding.

- D. Contractor's Option: Except for overlapping or conflicting requirements, where more than one (1) set of requirements are specified for a particular unit of work, option is intended to be Contractor's regardless of whether or not it is specifically indicated as such.
- E. Minimum Quality/Quantity: In every instance, the quality level or quantity shown or specified is intended to be the minimum for the work to be performed or provided. Except as otherwise specifically indicated, the actual work may either comply exactly with the minimum (within specified tolerances), or may exceed that minimum within reasonable limits. In complying with requirements, indicated numeric values are either minimums or maximums as noted or as appropriate for context of requirements. Refer instances of uncertainty to Architect for decision before proceeding.
- F. Specialists' Assignments: In certain instances, specification text requires (or implies) that specific work is to be assigned to specialists, who are engaged for performance of work. Such assignments shall be recognized as special requirements over which the Contractor has no choice or option. These requirements should not be interpreted so as to conflict with applicable regulations, union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of requirements remains with the Contractor.

1.3 REFERENCE STANDARDS

- A. Dates of codes, regulations and standards specified shall be the latest date of issue of that code, regulation or standard prior to the date of issue of this Project Manual or Document, except as modified or otherwise directed by the applicable codes and their supplements and amendments adopted by the code authorities having jurisdiction.
 - 1. Date of Issue - The "date of issue" as it appears in the statement above, means the date which appears on the cover of the Project Manual or Document corresponding to the date of issue of the Contract Documents.
 - 2. Code Authorities: The "code authorities" as it appears in the statement above, means the authorities responsible for code enforcement.

1.4 DEFINITIONS

- A. General Explanation: A substantial amount of specification language consists of definitions for terms found in other Contract Documents, including those in the AIA A201 General Conditions of the Contract for Construction, Supplementary Conditions, the Drawings, and the Specifications. Drawings must be recognized as being diagrammatic in nature and not completely descriptive of requirements indicated thereon. Certain terms used in the Contract Documents are defined in the General Conditions, Supplementary Conditions, and in this Section. Definitions and explanations contained in this Section are not necessarily either complete or exclusive, but are general for this Work to the extent that they are not stated more explicitly in another element of the Contract Documents. In the event of a conflict in definitions or explanations within the Contract Documents or whenever there is need of clarification or interpretation of definitions within or between the Contract Documents, notify the Architect immediately and proceed as directed. Except in cases where definitions are determined by code authorities having jurisdiction, the Architect's interpretation of all definitions will take precedence.

- B. General Requirements: The provisions or requirements of Division 1 - Sections apply to entire Work of Contract and, where indicated, to other elements which are included in the Project.
- C. Special Conditions: Wherever the term "Special Conditions", appears in the Contract Documents, it refers collectively to all requirements of the Owner in addition to the sections in Division 1, General Requirements, and to Articles contained in the General Conditions and Supplementary Conditions.
- D. Contractor, General Contractor, Construction Manager, Design Builder, etc: Wherever the term "Contractor", "General Contractor", "Construction Manager", "Design Builder" or any derivative thereof, or similar term appear in the Contract Documents, they mean one and the same.
- E. Subcontractor, Sub-subcontractor, Bidder, etc.: Wherever the term "Subcontractor", Sub-subcontractor", "Bidder", "Bidder/Vendor", "Vendor", "Installer", "Integrator", "Respondent", "Offeror", or any derivative thereof, or similar term appears in the Contract Documents, they mean one and the same, and shall refer to the entity (person or firm) licensed and meeting all applicable regulations.
 - 1. Responsibilities: To avoid any misunderstanding or lack of interpretation, the responsibility for performing the Work is totally that of the entity defined above, and the resolutions proposed in his shop drawings and related documentation shall be demonstrated throughout the Work and specified warranty period.
 - 2. In the event of a controversy involving the Contract Documents or interpretation of Project requirements, the decision of the Architect will take precedence.
- F. "Owner", or similar such term appears in the Contract Documents, it means the Louisiana Technical College, Address, City, State Zip Code, phone number (000) 000-0000, or its authorized representative(s).
- G. Consultants: Wherever the term "Consultant", or any derivative thereof appears in the Contract Documents, it means the following to whom that portion of the work applies.
 - 1. Owner's Consultants:
 - a. Geotechnical Consultant: or their authorized representative(s).
 - b. Surveyors: or their authorized representative(s).
 - 2. Architect's Consultants:
 - a. Civil Engineer: or their authorized representative(s).
 - b. Sports Planning Architect: or their authorized representative(s).
 - c. MEP Engineer: or their authorized representative(s).
 - d. Structural Engineer: or their authorized representative(s).
 - e. Landscape Architect: or their authorized representative(s).
- H. Indicated: Wherever the term "indicated", or any derivative thereof appears in the Contract Documents, it means a cross-reference to graphic representations, notes, or schedules on Drawings, to other paragraphs or schedules in the Specifications, and to similar means of recording requirements in the Contract Documents. Where terms such as "shown", "noted", "scheduled", and "specified" are used in lieu of "indicated", it is for the purpose of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.

- I. Directed, Requested, Etc: Where not otherwise explained, terms such as “directed”, “requested”, “authorized”, “selected”, “approved”, “required”, “accepted”, and “permitted” or any derivative thereof appears in the Contract Documents, it means as “directed by the Architect”, “requested by the Architect”, and similar phrases with actions taken by the Architect. However, no meaning or otherwise shall be interpreted to extend the Architect’s responsibility into Contractor’s area of construction supervision.
- J. Approve: Wherever the term “Approve”, or any derivative thereof appears in the Contract Documents, it means only the Architect, or an individual designated by him as his representative, can approve or disapprove contract actions. Even if the specifications indicate that an individual other than the Architect, such as the “Engineer” or “Consultant” will approve or disapprove an action, it is understood that only the Architect has this authority unless the individual is so designated by him in writing. Even when an individual is so designated, the Contractor may appeal the action to the Architect and the Architect’s decision will be final. In no case will “approval” by the Architect be interpreted as a release of the Contractor from responsibility to fulfill requirements of the Contract Documents.
- K. Furnish: Wherever the term “Furnish”, or any derivative thereof appears in the Contract Documents, it means supply or deliver to Project site, ready for unloading, unpacking, assembly, erection, placing, installing, anchoring, applying, curing, finishing, protecting, cleaning and similar operations, as applicable in each instance.
- L. Install: Wherever the term “Install”, or any derivative thereof appears in the Contract Documents, it means performing the operations at the Project site, of unloading, unpacking, assembly, erection, placing, installing, anchoring, applying, curing, finishing, protecting, cleaning and similar operations, as applicable in each instance.
- M. Provide: Wherever the term “Provide”, or any derivative thereof appears in the Contract Documents, it means furnish and install at the Project site, complete and ready for intended use, as applicable in each instance.
- N. Project, Site: Wherever the term “Project”, “Site”, or similar such term appears in the Contract Documents, it means the space available to the Contractor for performance of the Work, either exclusively or in conjunction with others performing work as part of the Project. The extent of project or site is shown on the Drawings, and may or may not be identical with description of land upon which Project is to be built.
- O. Installer: Wherever the term “Installer”, or any derivative thereof appears in the Contract Documents, it means the entity (person or firm) engaged by the Contractor or its subcontractor or sub-subcontractor for performance of a particular unit of work at the Project, including installation, erection, application and similar required operations. It is a general requirement that such entities (Installers) be expert in operations they are engaged to perform.
- P. Specialist: Wherever the term “Specialist”, or any derivative thereof appears in the Contract Documents, it means an individual or firm of established reputation (or if newly organized, whose personnel have previously established a reputation in the same field), which is regularly engaged in, and which maintains a regular force of workmen skilled in either (as applicable) manufacturing or fabricating items required by the Contract, installing items required by the Contract, or otherwise performing work required by the Contract. Where the Contract Specification requires installation by a specialist, that term shall also be deemed to mean either the manufacturer of the item or firm who will perform the work under the manufacturer’s direct supervision.

- Q. Testing Laboratory: Wherever the term "Testing Laboratory", or any derivative thereof appears in the Contract Documents, it means an independent entity engaged to perform specific inspections or tests of the work, either at the Project site or elsewhere; and to report and (if required) interpret results of those inspections or tests.

1.5 FORMAT AND SPECIFICATION CONTEXT EXPLANATIONS

- A. Underscoring: Is used strictly to assist reader of specification text in scanning text for key words (for quick recall). No emphasis on or relative importance is intended where underscoring is used.
- B. Capitalization: Except for manufacturer, product, or trademark names, capitalization is used strictly to assist reader of specification text in scanning text for key words (for quick recall). No emphasis on or relative importance is intended where capitalization is used.
- C. Imperative language: Is used generally in specifications. Except as otherwise indicated, requirements expressed imperatively are to be performed by Contractor. For clarity of reading at certain locations, contrasting subjective language is used to describe responsibilities which must be fulfilled indirectly by the Contractor, or when so noted, by others.
- D. Section Numbering: Is used to facilitate cross-reference in Contract Documents. Sections are placed in Project Manual in numeric sequence; however, numbering sequence is not complete, and listing of sections at beginning of Project Manual must be consulted to determine numbers and names of specification sections in Contract Documents.
- E. Page Numbering: Pages are numbered independently for each section. The section number is shown preceded by the project number and followed by the page number at the bottom of each page, to facilitate the location of text. The project number is given to identify the project, for which specification was written, should the section become separated from the Project Manual.
- F. Specifying Methods: The techniques or methods of specifying to record requirements varies throughout text, and may include "prescriptive", "open-generic descriptive", "compliance with standards", "performance", or a combination of these. The method used for specifying one unit of work has no bearing on requirements for another unit of work.
- G. Abbreviations: The language of Specifications and other Contract Documents is of the abbreviated type in certain instances, and implies words and meanings which will be appropriately interpreted. Actual work abbreviations of a self-explanatory nature have been included in texts. Specific abbreviations have been established, principally for lengthy technical terminology and primarily in conjunction with coordination of specification requirements with notations on drawings and in schedules. These are frequently defined in section at first instance of use. Trade association names and titles of general standards are frequently abbreviated. Singular words will be interpreted as plural and plural words will be interpreted as singular where applicable and where full context of the Contract Documents so indicates. A list of typical abbreviations, includes, but is not limited to the following trade associations and organizations. Refer to Drawings and other Contract Documents for other abbreviations.

AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturer's Assn.
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
ACIL	American Council of Independent Laboratories
ADA	Americans with Disabilities Act – 2010 Accessibility Guidelines

AGA	American Gas Association
AGC	Associated General Contractors of America
AHA	American Hardboard Association
AHGA	American Hotdip Galvanizers Association
AI	Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron & Steel Institute
AITC	American Institute of Timber Construction
ANSI	American National Standards Institute
APA	American Plywood Association
ARI	Air Conditioning & Refrigeration Institute
ASA	Acoustical Society of America
ASA	American Subcontractors Association
ASAH	American Society of Architectural Hardware Consultants
ASC	Adhesive & Sealant Council, Inc.
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigeration, and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASPE	American Society of Professional Engineers
ASPI	American Wood Preserver's Institute
ASTM	ASTM International
AWI	Architectural Woodwork Institute
AWS	American Welding Society
BIA	Brick Institute of America
BRI	Building Research Institute
CRA	California Redwood Association
CLFMI	Chain Link Fence Manufacturers Institute
CRSI	Concrete Reinforcing Steel Institute
CSI	Construction Specifications Institute
DHI	Door and Hardware Institute
EPA	Environmental Protection Agency
FTI	Facing Tile Institute
FGMA	Flat Glass Marketing Association
GA	Gypsum Association
HPMA	Hardwood Plywood Manufacturers Association
IBC	International Building Code
ICBO	International Conference of Building Officials
ICC	International Code Council
IEEE	Institute of Electrical and Electronic Engineers
JSMA	Joint Sealer Manufacturers Association
MFMA	Maple Flooring Manufacturers Association
ML/SFA	Metal Lath/Steel Framing Association
NAAMM	National Association of Architectural Metal Manufacturers
NAMM	National Association of Mirror Manufacturers
NBLP	National Bureau of Lathing & Plastering
NCPI	National Clay Pipe Institute
NCMA	National Concrete Masonry Association
NEMA	National Electrical Manufacturers Assn.
NESC	National Environmental Systems Contractors
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NHLA	National Hardwood Lumber Association
NOMMA	National Ornamental Metal Manufacturers Assn
NPVLA	National Paint, Varnish and Lacquer Assn.

NRMCA	National Ready Mixed Concrete Assn.
NRCA	National Roofing Contractors Association
NSPE	National Society of Professional Engineers
NWMA	National Woodwork Manufacturers Assn., Inc.
OSHA	Occupational Safety and Health Administration
PDCA	Painting and Decorating Contractors of America
PI	Perlite Institute, Inc.
PCA	Portland Cement Association
RFCI	Resilient Floor Covering Institute
RVFC	Rubber and Vinyl Floor Council
SBCCI	Southern Building Code Congress International, Inc.
SFPA	Southern Forest Products Association
SHLMA	Southern Hardwood Lumber Manufacturing Assn.
SDI	Steel Deck Institute
SDI	Steel Door Institute
SJI	Steel Joist Institute
SSPC	Steel Structures Painting Council
TCA	Tile Council of America, Inc.
UBC	Uniform Building Code
UL	Underwriter's Laboratories, Inc.
VFI	Vinyl Fabrics Institute
WCLIB	West Coast Lumber Inspection Bureau
WRCLA	Western Red Cedar Lumber Association
WWPA	Western Wood Products Association

1.6 DRAWING SYMBOLS

- A. General: Except as otherwise indicated, graphic symbols used on drawings are those symbols recognized in the construction industry for purposes indicated. Where not otherwise noted, symbols defined by "Architectural Graphic Standards", published by the American Institute of Architects (AIA) and John Wiley & Sons, Inc., latest edition. Refer instances of uncertainty to Architect for clarification before proceeding.
- B. Mechanical/Electrical Drawings: Graphic symbols used in Mechanical/Electrical Drawings are generally aligned with symbols recommended by American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE). Where appropriate, those symbols are supplemented by more specific symbols as recommended by other recognized technical organizations, including, but not limited to American Society of Mechanical Engineers (ASME), American Society of Professional Engineers (ASPE), Institute of Electrical and Electronic Engineers (IEEE) and similar organizations. Refer instances of uncertainty to Architect for clarification before proceeding.

1.7 GENERAL REQUIREMENTS

- A. Color, Texture, or Pattern Requirements:
 - 1. When color, texture, or pattern is specified, the item, product, or material shall be furnished in the specified color, texture, or pattern, as applicable.
 - 2. When more than one (1) approved manufacturer is named in the Specifications, Contractor may select any of the approved manufacturers and submit the full range of colors, textures, and patterns (standard and special) available of that manufacturer for the Architect's review and selection.
 - 3. When the term "match existing", or any derivative thereof appears in the Contract Documents, it means that the sample must match the Owner's existing work in every respect as to color, texture, and pattern, as applicable.

4. When the term "match Architect's approved sample", or any derivative thereof appears in the Contract Documents, it means that the Architect has selected a sample which must be matched in every respect as to color, texture, and pattern, as applicable.
 5. When an item or product is specified of a manufacturer for which only one (1) color, texture, or pattern is available, and a color, texture, or pattern other than that one is specified, Contractor shall bring it to the attention of the Architect for a decision prior to proceeding with the work. Do not proceed with the work until Architect has approved the color, texture, and pattern, as applicable.
 6. When an item or product is specified of a manufacturer for which no color, texture, or pattern is specified, and colors, textures, and patterns are available, Contractor shall bring it to the attention of the Architect and submit the full range of colors, textures, and patterns (standard and special) available of that manufacturer for the Architect's review and selection. Do not proceed with the work until Architect has selected and approved the color, texture, and pattern, as applicable.
 7. When due to the nature of the item, product, or material, i.e. face brick, tile pavers, natural stone, etc, Contractor shall submit sample or samples which exhibits the full range of characteristics (colors, i.e. lights and darks, as well as textures, and patterns) for which the item, product, or material is available. The Architect will select the color, texture, and pattern, as applicable, from those available and request a sample panel exhibiting the approved characteristics. The approved color range, texture, and pattern, as applicable will then become the standard for which all work on the project will be judged. Architect will be final judge as to having performed work in conformance with approved characteristics.
 8. Under no circumstances are colors, textures, patterns, or any other characteristics for which an item, product, or material are available to be selected by anyone other than the Architect or his authorized representative.
 9. Non-conforming work shall be removed from the site and replaced with new conforming work at no additional expense to Owner.
- B. Continuity of Building Envelope, Full Height Partitions, and Fire Rated Construction:
1. Continuity of Building Envelope:
 - a. All materials such as exterior sheathing, membrane flashings, vapor barriers, insulations, dampproofing, waterproofing, roofing, flashings, etc. and all penetrations, holes, gaps, joints, and openings through such materials shall be sealed to ensure continuity of building envelope, whether indicated or not.
 - b. Refer instances of uncertainty to Architect for clarification before proceeding with work.
 2. Full Height Partitions:
 - a. All full height partitions shall be from floor to bottom of deck structure and shall be made to fit around steel joists, beams, etc., whether indicated or not.
 - b. Seal joints at top of partitions, in flutes of steel deck, and around structural elements with a compressible filler and/or sealant to accommodate movement due to expansion, contraction, and deflection, whether indicated or not. Treat seals in joints of fire rated partitions as specified below for fire rated construction, whether indicated or not.
 - c. Refer instances of uncertainty to Architect for clarification before proceeding with work.

3. Fire Rated Construction:
 - a. All seals in fire rated construction, whether at top, bottom, or penetrations through fire rated construction, shall be made with firestopping and fire safing materials to maintain fire rating integrity of construction and satisfy authorities having jurisdiction, whether indicated or not.
 - b. Refer instances of uncertainty to Architect for clarification before proceeding with work.

- C. Plumbing Line Protection:
 1. Placing or washing materials, including, but not limited to the following, down any plumbing line or fixture is strictly forbidden.
 - a. Concrete, cement, sludge, mortar, grout, plaster, or any other cementitious material
 - b. Paint, paint thinner, turpentine, kerosene, gasoline, oil, or any other petroleum or hazardous products.
 2. Cleaning painting equipment, including brushes in new or existing plumbing fixtures is strictly prohibited.
 3. If requested, Contractor shall certify that all affected plumbing lines and fixtures are clean, free flowing and running. Plumbing lines and fixtures damaged as a result of any of the above shall be repaired or replaced at no expense to Owner. Contractor shall bear responsibility and all costs of fines, penalties, and legal fees attributed to violations as levied by authorities having jurisdiction.

- D. Hanging Items from Deck and Structure: Ducts, pipes, conduits, equipment, and other items indicated to be supported from the structure shall be accomplished using approved hang-wires, hangers, or devices of type, size and material recommended to suit the application and installed in accordance with recommendations of the hanger or device manufacturer, Architect and/or Structural Engineer, or code authorities having jurisdiction, whichever is the more stringent requirement. Nothing shall be hung from the deck and structure unless directed to do so by the Architect and/or Structural Engineer. Powder activated devices in metal deck are not permitted.

- E. Ducts, Pipes, Conduits, and Wires: Shall be concealed in walls, chases, and enclosed areas out of view, unless specifically indicated as exposed or where exposure is required for proper function of item, such as air registers, air returns, louvers, grilles, vents, thermostats, electrical receptacles, telephone/data terminals and jacks, light switches, etc. Refer instances of uncertainty to Architect for clarification before proceeding.

- F. Fasteners:
 1. Unless specifically indicated or directed otherwise, all fasteners in work exposed to view, shall be concealed in the finished work.
 2. No fasteners shall show through or telegraph through exposed face of finished work and all finished surfaces shall be free of all evidence of the existence of fasteners.
 3. Fasteners shall be spaced to accurately and rigidly secure work in place.
 4. If not shown or otherwise required or recommended by manufacturer, standard, or code authorities having jurisdiction, fastener spacing shall not exceed 12 inches on center.
 5. Non-conforming work shall be removed from the site and replaced with new conforming work at no additional expense to Owner.

G. Exposed Metal Work:

1. Unless specifically indicated or directed otherwise, all exposed metal work shall be flat with all surfaces free of distortions, oil canning, waves, dents, scratches, weld marks, and other surface defects detrimental to good appearance or function.
2. All steel exposed to exterior weather or moisture, either exposed or concealed in work, shall be hot-dip galvanized, phosphate treated for paint retention and shop prime painted in compliance with Section 09 91 00.
3. Non-conforming work shall be removed from the site and replaced with new conforming work at no additional expense to Owner.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 014500 – QUALITY CONTROL

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Quality Assurance: Requirements for material and product quality and control of installation.
- B. Tolerances
- C. References and Standards
- D. Mock-ups
- E. Testing Laboratory Services
- F. Inspection Services
- G. Manufacturers' field services

1.2 RELATED SECTIONS

- A. Section 014100 – Regulatory Requirements
- B. Section 014523 – Testing and Inspecting Services
- C. Section 013300 - Submittal Procedures
- D. Section 023200 - Geotechnical Report
- E. The Work of this Section shall be included as a part of all Sections of Work, whether referenced therein or not.

1.3 DESCRIPTION OF REQUIREMENTS

- A. Unless specifically noted otherwise, perform all Work shown, mentioned, or reasonably inferred and comply with all work restrictions.
- B. Many of the requirements specified elsewhere are included herein for reference and convenience. Where a conflict occurs between the Contract Documents, either within themselves or each other, the more stringent requirement or the most expensive combination of materials and workmanship shall prevail.
- C. Contractor shall:
 - 1. perform Work in accordance with the General Conditions, as specified herein, and with the quality control requirements of each Specification Section;
 - 2. perform Work in the highest quality workmanship, unless specified otherwise;
 - 3. join materials with a uniform and accurate fit so they meet with neat straight lines, free of smears, overlaps or irregularities, as applicable to the work;

4. install all exposed materials appropriately level, plumb, and at accurate angles as shown and flush with adjoining materials;
5. attach materials with sufficient strength, and with number and spacing of fasteners and attachments that will not fail until materials joined are broken or permanently deformed;
6. use concealed fasteners, unless shown or directed otherwise.

1.4 QUALITY ASSURANCE AND CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturer's instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
- G. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.5 TOLERANCES

- A. Monitor fabrication and installation tolerance control of Products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- C. Adjust Products to appropriate dimensions; position before securing Products in place.

1.6 REFERENCES AND STANDARDS

- A. For Products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Owner-Design Builder Agreement except where specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. When specified reference standards conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.

- E. Neither contractual relationships, duties, responsibilities of parties in Contract nor those of Architect/Engineer shall be altered from Contract Documents by mention or inference otherwise in reference documents.
- F. Refer to Section 014100, Codes, Regulations and Standards, for additional information concerning applicable reference and standards requirements.

1.7 TESTING SERVICES

- A. Owner will appoint, employ, and pay for specified services of an independent firm to perform testing.
- B. The independent firm will perform tests and other services specified in individual specification sections and as required by the Architect/Engineer, Owner, or authority having jurisdiction.
- C. Testing and source quality control may occur on or off the project site. Perform off-site testing as required by the Architect/Engineer or the Owner.
- D. Reports will be submitted by the independent firm to the Owner, Architect/Engineer, and Contractor, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
- E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 - 1. Notify Architect/Engineer and independent firm 48 hours prior to expected time for operations requiring services, or as specified in individual specification sections.
 - 2. Make arrangements with independent firm and pay for additional samples and tests required.
- F. Testing does not relieve Contractor to perform Work to contract requirements.
- G. Re-testing required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Architect/Engineer. Payment for re-testing will be charged to the Contractor by deducting testing charges from the Contract Sum/Price.
- H. Refer to Section 01 45 23, Testing and Inspecting Services, for additional information concerning testing, and submittal procedures and requirements for Testing Reports.

1.8 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as required, and to initiate instructions when necessary.
- B. Submit qualifications of observer to Architect/Engineer within ten (10) days after receipt of Notice to Proceed, in advance of required observations. Observer subject to approval of Architect/Engineer and Owner.

- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- D. Refer to Section 013300, Submittal Procedures, for additional information concerning submittal procedures and requirements for Manufacturers Field Reports.

PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Verify utility services are available, of correct characteristics, and in correct locations.

3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

END OF SECTION

SECTION 015000 – TEMPORARY FACILITIES AND CONTROLS**PART 1 - GENERAL****1.1 DESCRIPTION OF REQUIREMENTS**

- A. Specific administrative and procedural minimum actions are specified in this Section, as extensions of provisions in other Contract Documents. These requirements have been included for special purposes as indicated. Nothing in this Section is intended to limit types and amounts of temporary work required, and no omission from this Section will be recognized as an indication that such temporary activity is not required for successful completion of the Work and compliance with requirements of the Contract Documents. Provisions of this Section are applicable to, but are not limited to the temporary power, temporary water, temporary heat, field office, mobile telephone, sanitary facilities, storage facilities, signs, barriers, security, construction fence, cleaning, first aid facilities, fire protection, construction aids, parking facilities, storm water control and pollution prevention plan, as further expanded in this Section.

1.2 JOB CONDITIONS

- A. General: Establish and initiate use of each temporary facility at time first reasonably required for proper performance of the Work. Terminate use and remove facilities at earliest reasonable time, when no longer required or when permanent facilities have, with authorized use, replaced their need.
- B. Conditions of Use:
 - 1. Install, operate, maintain and protect temporary facilities in a manner and at locations which will be safe, non-hazardous, sanitary, and protective of persons and property, and free of deleterious effects.
 - 2. Be responsible for overloading or excess use of or damage resulting from the overloading or excess use of existing utilities.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Materials, not specifically described herein, but required for proper completion of Work of this Section, may be new or used as selected by the Contractor, but shall be of design, type, size, and strength recommended to suit intended purpose.
- B. Items required to protect the tenants, workmen, and public from danger, shall be sufficiently designed to protect them. Where required, exclude the public from all hazards.

PART 3 - EXECUTION**3.1 UTILITIES**

- A. Temporary Power: Provide temporary power and all wiring, lamps, distribution of power, and equipment required for construction, inspection and testing of Work.
- B. Temporary Water: Provide temporary water and all hoses and equipment required for construction, inspection and testing of Work.

- C. Temporary Climate Control: Provide temporary climate control (heating, cooling and humidity control) required for construction of Work.
 - 1. Provide heat to prevent freezing and to avoid damage to materials in storage, during and after installation, and during curing and drying of materials and finishes. Provide and maintain such dependable source of supply of heat, cooling, and humidity control as necessary until the Work is accepted. No open fire heaters will be permitted. No mold, mildew, rust, or sagging materials due to humidity will be allowed. Contractor shall remediate any and all evidence of mold, mildew, or rust per applicable state standards and requirements.

3.2 FIELD OFFICE

- A. Not required.

3.3 SANITARY FACILITIES

- A. Furnish and maintain temporary sanitary facilities. Comply with regulations of State Department of Health and other authorities having jurisdiction. The Contractor may not use the Owner's facilities.

3.4 STORAGE FACILITIES

- A. Provide and maintain adequate weather-tight lockable storage facilities, raised above the ground, with sides and top enclosed.
- B. Replace materials improperly stored and damaged by weathered conditions.
- C. Remove storage facilities when materials can be stored within the structure in a weather-tight condition.
- D. Provide for temporary freeze protection as needed.

3.5 SIGNS

- A. Furnish and install 1 (one) project sign, 4'-0" by 8'-0" in size at the jobsite. Design of sign shall be as provided by the Architect. Contractor will be responsible for the cost of printing the image and installing the sign at the site. Coordinate the sign location with the Architect. The sign shall be on-site and shall remain for the duration of the construction period.
- B. Other signs permitted at the site:
 - 1. Warning signs.
 - 2. Directional signs.
 - 3. Identification signs at field offices.
 - 4. Emergency medical services sign.
 - 5. Signs required by Authorities Having Jurisdiction
- C. Contractor shall allow no other signs to be displayed at the project site, unless authorized by the Owner.

3.6 BARRIERS

- A. Provide temporary barricades on all portions of the site adjacent to the construction and accessible to the public.
- B. Provide approved barriers around trees and plants designated to remain. Protect against vehicular traffic, stored materials, dumping, chemically injurious materials, water puddling and continuous running water.

3.7 SECURITY

- A. Determine if and when watchmen are necessary for protection of the Work, and provide such services when necessary. Neither the provision of watchmen nor the failure to provide watchmen shall relieve the Contractor of responsibility in event of injury to persons or damage to property.

3.8 CONSTRUCTION FENCE

- A. Provide chain link or plastic fabric construction fence around the perimeter of the construction area for the duration of the construction period. Provide construction zone warning signage at appropriate locations.

3.9 CLEANING

- A. Trash removal: Clear the building and site of trash at least once a week. When rapid accumulation occurs, make more frequent removals. Remove highly combustible trash such as paper and cardboard daily. Dumpsters will not be allowed to overflow and should be emptied on a regular basis.
- B. Disposition of Debris: Remove debris from site and make legal disposition. Locations for disposal shall be of the Contractor's choice within the above restriction. Neither debris nor material may be buried or burned at the site. Take necessary precautions to prevent accidental burning of materials by avoiding large accumulations of combustible materials.
- C. Final Cleaning: Thoroughly clean the Work, including the removal of smudges, marks, stains, fingerprints, soil, dirt, paint spots, dust, lint, discolorations, and other foreign materials.

3.10 TEMPORARY FIRST AID FACILITIES

- A. Provide first aid equipment and supplies, with qualified personnel continuously available to render first aid at the site.
- B. Provide a sign, posted at the field office telephone, listing the telephone numbers for emergency medical services: Physicians, ambulance services and hospitals.

3.11 TEMPORARY FIRE PROTECTION

- A. Provide a fire protection and prevention program for employees and personnel at the site; and provide and maintain fire extinguishing equipment ready for instant use at all areas of the Project and at specific areas of critical fire hazard.

B. Equipment:

1. Hand extinguishers of the types and sizes recommended by the National Board of Fire Underwriters to control fires from particular hazards.
2. Water hoses connected to an adequate water pressure and supply system.

C. Enforce fire-safety discipline:

1. Store volatile materials in an isolated, protected location.
2. Avoid accumulations of flammable debris and waste in or about the Project.
3. Prohibit smoking in the vicinity of hazardous conditions.
4. Closely supervise and provide fire watches as required by authorities having jurisdiction during and after welding and torch-cutting operations in the vicinity of combustible materials and volatile conditions.
5. Supervise locations and operations of portable heating units and fuel.

D. Contractor shall maintain fire-extinguishing equipment in working condition, with current inspection certificate attached to each extinguisher.

3.12 CONSTRUCTION AIDS

- A. Provide construction aids and equipment required to assure safety for personnel and to facilitate the execution of the Work; Scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes and other equipment.
- B. Maintain all equipment in a first-class, safe condition.

3.13 PARKING FACILITIES

- A. Coordinate location of parking for personnel and employees at the facility to avoid interference with traffic, walks, work and storage areas, or with materials-handling equipment.
- B. Vehicular access to the site shall be maintained.

END OF SECTION

SECTION 017329 – CUTTING AND PATCHING

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

- A. Definition: “Cutting and Patching” includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original undamaged condition, including original fire rating of fire rated construction.
 - 1. Cutting and patching is performed for coordination of the work for access or inspection, to obtain samples for testing, as indicated or required, to remove/replace defective work or work not conforming to the contract documents, to permit alterations to be performed, or for other similar purposes.
 - 2. Cutting and patching performed during the manufacture of products or during the initial fabrication, erection, or installation processes is not considered to be “cutting and patching” under this definition. Drilling of holes to install fasteners and similar operations are also not considered to be “cutting and patching”.
- B. Refer to other Sections of these Specifications for specific cutting and patching requirements and limitations applicable to individual units of work.
 - 1. Unless otherwise specified, requirements of this Section also apply to mechanical and electrical work.

1.2 QUALITY ASSURANCE

- A. Visual requirements - Do not cut and patch work exposed on the building's exterior or in its occupied spaces, in a manner that would, in the Architect's opinion, result in lessening the building's aesthetic qualities. Do not cut and patch work in a manner that would result in substantial visual evidence of cut and patchwork. Remove and repair or replace work judged by the Architect to be cut and patched in a visually unsatisfactory manner

1.3 RELATED WORK

- A. All Sections of Work requiring cutting and patching, including electrical requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General - Except as otherwise indicated or as directed by Architect, use materials for cutting and patching that are identical to materials being cut and patched. If identical materials are not available, or cannot be used, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials for cutting and patching that will result in equal or better performance characteristics.
 - 1. Use materials, products, and devices to maintain integrity of fire rating of existing fire rated construction which comply with the requirements of authorities having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Before starting work, examine the surfaces to be cut and patched and the conditions under which the work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with the work.
 - 1. Before the start of cutting work, meet at the work site with all parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict between the various trades. Coordinate layout of the work and resolve potential conflicts before proceeding with the work.
 - 2. After uncovering work, examine conditions affecting installation of product or performance of work.
 - 3. Report unsatisfactory or questionable conditions to Architect in writing; do not proceed with work until Architect has provided further instructions.

3.2 PREPARATION

- A. Provide temporary support to prevent failure of the work to be cut.
- B. Protect other work during cutting and patching to prevent damage. Provide protection from adverse weather conditions of that part of the Project that may be exposed during cutting and patching operations.
- C. Take precautions not to cut existing pipe, conduit, ducts, or wires serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE

- A. General - Employ only skilled workmen to perform the cutting and patching work. Except as otherwise indicated or as approved by Architect, proceed with cutting and patching at the earliest feasible time and complete the work without delay.
- B. Cut the work using methods that are least likely to damage work to be retained or adjoining work. Where possible, review proposed cutting and patching procedures with the original installer and comply with original installer's recommendations.
 - 1. In general, where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine such as Carborundum saw or core drill to insure a neat hole. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces. Temporarily cover openings when not in use.
 - 2. Comply with requirements of other applicable sections where cutting and patching requires excavating and backfilling.
 - 3. By-pass utility services such as pipe and conduit, before cutting, where such utility services are shown or required to be removed, relocated, or abandoned. Cut-off conduit and pipe in walls or partitions to be removed. After by-passing and cutting, cap, valve, or plug and seal tight remaining portion of conduit and pipe to prevent entrance of moisture, vermin, or other foreign matter.

- C. Patching - Patch with seams which are durable and as invisible as possible. Comply with specified tolerance, if any, for the work.
1. Where feasible, inspect and test patched areas to demonstrate integrity of work.
 2. Restore exposed finishes of patched areas and where necessary extend finish restoration into retained adjoining work in a manner which will eliminate evidence of patching and refinishing.
 3. Where removal of walls or partitions extends one finished area into another finished area, patch and repair floor, wall, and ceiling surfaces in the new space to provide an even surface of uniform color and appearance. If necessary to achieve uniform color and appearance, remove existing floor and wall coverings or materials, and ceiling finish materials and replace with new materials.
 - a. Where patch occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing patch, after patched area has received prime and base coats.
 4. Patch, repair, or re-hang existing ceilings as necessary to provide an even plane surface of uniform appearance.
 5. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through non-fire-rated floors and walls, and through finished surfaces.
- D. Fire Rated Construction - Where cutting and patching is necessary in existing fire rated construction, use sealant and other fire resistive materials, products, and devices as required and acceptable by the authorities having jurisdiction to repair, patch, and otherwise restore original fire rating and integrity of construction.

3.4 CLEANING

- A. Thoroughly clean area and spaces where work is performed or used as access to work. Remove completely: paint, mortar, cement, oils, putty, sealant, and items of similar nature. Thoroughly clean piping, conduit, and similar features before painting or other finishes are applied. Restore damaged pipe covering to its original undamaged condition.

END OF SECTION

SECTION 017700 – CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 PRE-CLOSEOUT MEETING

- A. Pre-Closeout Meeting: Schedule and convene Pre-Closeout Meeting with Owner and Architect in accordance with Section 013119, Project Meetings.

1.2 SUBSTANTIAL COMPLETION

- A. The items listed in Supplementary Conditions, Paragraph 9.8 and the following items shall be completed before Substantial Completion will be granted:
1. Contractor's Completion List (Punch List): Submit a thorough list of items to be completed or corrected, along with a written request for Substantial Completion and for review of the Work or portion of the Work. The Architect/Engineer's Project Representative, at their discretion, may attend and assist in the preparation of the Contractor's Punch List.
 2. Architect's Supplemental Punch List: The Architect/Engineer, along with the Owner at the Owner's discretion, will inspect the Work utilizing the Contractor's prepared Punch List, noting completed items and incomplete items, and will prepare a supplemental list of items that have been omitted or incomplete items that were not previously noted.
 3. Operations and Maintenance Manuals: Submit as described in paragraph 1.3.
 4. Final Cleaning: Provide final cleaning and adequate protection of installed construction as described in paragraph 1.6 and 1.7.
 5. Starting of systems: Start up equipment and systems as described in paragraph 1.8.
 6. Testing and balancing: Testing and balancing of systems must be performed, and the report submitted and accepted by Architect/Engineer and Owner, as described in the Contract Documents. Make adjustments to equipment as required to achieve acceptance.
 7. Demonstrations: If required by individual specification sections or by Owner, provide demonstrations and instructions for use of equipment as described in paragraph 1.9.
 8. Contractor shall be responsible for key turnover meeting: Attendees shall include the Program Manager, Owner, Architect, Contractor or Design Builder and Hardware Supplier.
- B. Date of Substantial Completion: Complete or correct items identified on Punch List and confirm that all items have been corrected prior to Architects re-inspection. Architect/Engineer, along with the Owner, will re-inspect the corrected work to establish the Date of Substantial Completion. Incomplete items remaining will be appended to the Certificate of Substantial Completion (AIA G704). The Date of Substantial Completion represents day one (1) of the closeout period, and represents the date of commencement of the Contractors correctional period and all warranty periods as described and required by the Contract Documents, except as amended in the Certificate of Substantial Completion and elsewhere in the Contract Documents.
- C. Certificate of Substantial Completion: When the Work or designated portion thereof is substantially complete; Architect will prepare the Certificate of Substantial Completion to be executed by the Owner, Contractor and Architect. Items on the appended Punch List shall be completed or corrected within the time limits established in the Certificate.

1.3 OPERATIONS AND MAINTENANCE MANUAL

- A. As a requirement for Substantial Completion, the final Operation and Maintenance Manual shall be submitted to, and reviewed and accepted by the Architect prior to issuance of the Certificate.
- B. Prepare 3-ring D-slant binder cover and spline with printed title "OPERATIONS AND MAINTENANCE MANUAL", title of project, and subject matter of binder when multiple binders are required.
- C. Submit one (1) copy of preliminary Operations and Maintenance Manuals to respective consultants (Civil, MEP, Structural, etc.) for review of conformance with contract requirements prior to submitting final to Architect. Allow time for proper review.
- D. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- E. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- F. Contents: Prepare Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
 - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.
 - 2. Part 2: Operation and Maintenance, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
 - a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Equipment start-up instructions
 - e. Operating instructions.
 - f. Maintenance instructions for equipment and systems.
 - g. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
 - 3. Part 3: Project documents and certificates, including the following:
 - a. Product data.
 - b. Air and water balance reports.
 - c. Photocopies of warranties, certificates and bonds. Submit originals with Closeout Documents as specified below.
- G. Submit one (1) final original and one (1) pdf electronic copy to Architect.

1.4 PROJECT CLOSEOUT

- A. Final Payment will not be recommended to the Owner for payment by the Architect until the Architect finds the Work acceptable under the Contract Documents, subject to the

completion and acceptance of the following requirements and other applicable Contract requirements:

1. Close-out Documents: Provide bound closeout documents as described in paragraph 1.5.
2. Record Documents: Submit as described in paragraph 1.10.
3. Extra materials: Provide extra stock, materials, and products as described in paragraph 1.11 when required by individual specification sections.
4. Temporary Facilities: Discontinue and remove temporary facilities from the site, along with mockups, construction aids, and similar elements.
5. Warranties, Certificates and Bonds: Execute and assemble transferable warranty documents, certificates, and bonds from subcontractors, suppliers, and manufacturers as described in paragraph 1.12.
6. Final Inspection and Acceptance by Architect is achieved as described in paragraph 1.13.

1.5 CLOSEOUT DOCUMENTS

- A. Coordinate the following items with the requirements of Document CB, Supplementary Conditions of the Contract.
- B. Prepare 3-ring D-slant binder cover and spline with printed title "CLOSEOUT DOCUMENTS", title of project, and subject matter of binder when multiple binders are required. Submit one (1) original and two (2) copies.
- C. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- D. The close-out documents shall be neatly organized and easily useable as determined by the Architect and Owner. Separate Close-out Documents binders from Operations and Maintenance Manuals. Documents identified as "affidavit" shall be notarized.
- E. Contents: Prepare Table of Contents for each volume, with each item description identified, typed on white paper, in five (5) parts as follows:
 1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers. All General Contractor's vendors/suppliers and subcontractors that provided materials or performed any work related to this project must be listed on this form.
 2. Part 2: Closeout Documents and Affidavits, include the following:
 - a. AIA G707 - Consent of Surety to Final Payment;
 - b. Copy of Clerk of Court Clear Lien Certificate;
 - c. AIA G706 - Contractor's Affidavit of Payment of Debts and Claims;
 - d. AIA G706A - Contractor's Affidavit of Release of Liens;
 - e. Subcontractor's Release of Lien: Include similar notarized form of Affidavit of Subcontractor's Release of Lien.
 3. Part 3: Project documents and certificates, including the following:
 - a. Copy of Certificate of Substantial Completion (AIA G704);
 - b. Copy of All Permits;
 - c. Copy of Final Utility Bill or letter of transfer;
 - d. Copy of Certificate of Occupancy;

- e. Hazardous Material Certificate: Submit affidavits from Contractor, Subcontractors and General Contractor's vendors or suppliers stating that no hazardous materials/products have been used or installed in this project.
- 4. Part 4: Warranties, compile sequentially based on specification sections:
 - a. General Contractor's Warranty: Submit on company letterhead as described below. This Warranty shall state all sections of Work performed by General Contractor's own forces, and warranty period for each section of Work;
 - b. Subcontractor's Warranty: Submit on company letterhead as described below. These Warranties shall state all sections of Work performed by Subcontractor's own forces, and warranty period for each section of Work ;
- 5. Part 5: Receipts:
 - a. Extra Stock: Provide original receipts for delivery of "Extra Stock" items as described below, (if applicable). Receipts must be signed by an authorized Owner's representative;
 - b. Keys: Provide original receipts for delivery of "Keys", (if applicable). Receipts must be signed by an authorized Owner's representative.
- F. Failure to complete and close-out project after substantial completion may result in liquidated damages being assessed to the Contractor. Refer to Instructions to Bidders, and Supplementary Conditions for additional requirements and liquidated damages.

1.6 FINAL CLEANING

- A. Execute final cleaning prior to final project inspection and acceptance.
- B. Clean interior and exterior glass, and surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces, mop hard floor surfaces.
- C. Remove smudges, marks, stains, fingerprints, soil, dirt, spots, dust, lint, and other foreign materials from finished and exposed surfaces
- D. Clean equipment and fixtures to sanitary condition with cleaning materials appropriate to surface and material being cleaned.
- E. Clean and replace filters of operating equipment as required by Contract Documents
- F. Clean debris from roofs, gutters, downspouts, and drainage systems.
- G. Clean site; sweep paved areas, rake clean landscaped surfaces.
- H. Remove waste and surplus materials, rubbish, and temporary construction facilities from site.

1.7 PROTECTING INSTALLED CONSTRUCTION

- A. Protect installed Work and provide special protection where specified in individual specification sections until Work is accepted by Architect and Owner.

- B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- F. Prohibit traffic from landscaped areas.

1.8 PROJECT RECORD DOCUMENTS

- A. Record Documents, as described in Section 017839, shall be submitted at Project Closeout. Final Payment will not be authorized by the Architect until final review and acceptance by Architect and Engineers is achieved in accordance with the Owners requirements.
- B. At the Contractors request, Architect may provide electronic versions of the construction drawing and specification files for Contractors use, subject to the terms and conditions of Architects standard electronic document transfer agreement.

1.9 EXTRA STOCK, MATERIALS AND MAINTENANCE PRODUCTS

- A. Furnish extra stock, maintenance, and extra products in quantities specified in individual specification sections.
- B. Deliver to Project site and place in location as directed by Owner; obtain signed receipt from Owner's authorized representative prior to final application for payment. Delivery of materials to, or obtaining receipt from anyone other than Owner's authorized representative may constitute breach of this requirement and may require delivery of additional materials at no cost to the Owner if original materials are misplaced.
- C. Include signed receipts for delivery of extra stock and materials, including keys, with Closeout Documents.

1.10 WARRANTIES, CERTIFICATES AND BONDS

- A. Definitions:
 - 1. Standard Product Warranties: preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
 - 2. Special Warranties: written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide coverage of specific defects, or both.

- B. In accordance with the general warranty obligations under Paragraph 3.5 of the General Conditions as amended by the Supplementary Conditions, the General Contractor's warranty shall be for a period of one (1) year following the date of Substantial Completion, hereinafter called the one-year warranty period. The Contractor's one-year general warranty shall include all labor, material and delivery costs required to correct defective material and installation. This warranty shall not limit the Owner's rights with respect to latent defects, gross mistakes, or fraud.
- C. The Contractor's one-year warranty shall run concurrently with the one (1) year period for correction of Work required under Paragraph 12.2 of the General Conditions.
- D. In addition to the Contractor's one-year warranty, Special Warranties as described in individual specifications sections, shall extend the warranty period for the period specified without limitation in respect to other obligations which the Contractor has under the Contract Documents.
- E. Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products, nor does it relieve the suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.
- F. Warranty Requirements:
 - 1. When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
 - 2. When Work covered by a warranty has failed and been corrected by replacement or reconstruction, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
 - 3. Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
 - 4. Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
 - 5. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or designated portion of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- G. Compile copies of each required warranty properly executed by the Contractor and the subcontractor, supplier, or manufacturer. Verify documents are in proper form, contain full information, and are notarized. Co-execute warranties, certificates and bonds when required and include signed warranties with Closeout Documents submitted to the Architect.

1.11 FINAL COMPLETION AND FINAL PAYMENT

- A. Final Notice and Inspection:

1. When all items on the Punch List have been corrected, final cleaning has been completed, and installed work has been protected, submit written notice to the Architect that the Work is ready for final inspection and acceptance.
 2. Upon receipt of written notice that the Work is ready for final inspection and acceptance, the Architect and Engineer will schedule and make final inspection.
- B. Final Application for Payment: When all of the above items are successfully complete, submit to the Architect a final Application for Payment and request for release of retainage.
- C. Release of Retainage: Release of retainage will be per the guidelines outlined in Subparagraph 9.8 of the Supplementary Conditions.

1.12 TERMINAL (WARRANTY) INSPECTION

- A. Immediately prior to expiration of the one (1) year period for correction of the Work, the Contractor shall make an inspection of the work in the company of the Architect and the Owner. The Architect and the Owner shall be given not less than ten (10) days notice prior to the anticipated date of terminal inspection.
- B. Where any portion of the work has proven to be defective and requires replacement, repair or adjustment, the Contractor shall immediately provide materials and labor necessary to remedy such defective work and shall execute such work without delay until completed to the satisfaction of the Architect and the Owner, even if the date of completion of the corrective work may extend beyond the expiration date of the correction period.
- C. The Contractor shall not be responsible for correction of work which has been damaged because of neglect or abuse by the Owner nor the replacement of parts necessitated by normal wear in use.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

SECTION 017839 – PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Architects/Engineers written responses to Minor Change directives, Change Proposal Requests, and other supplemental instructions.
 - 5. Change Orders and other modifications to the Contract.
 - 6. Reviewed Shop Drawings, Product Data, and Samples.
 - 7. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner. Architect will review documents for general conformance but will not be responsible for completeness or accuracy of the recorded information.
- C. Do not use record documents for construction purposes. Store record documents separate from documents used for construction. Protect record documents from deterioration and loss in a secure, weather-tight location in accordance with Section 015000, Temporary Facilities.
- D. Record information concurrent with construction progress, not less than weekly. Provide access to record documents for Architect's reference during normal working hours.
- E. Give particular attention to information on concealed products and installations that would be difficult to identify or measure and record later.
- F. Mark record sets in red erasable colored pencil; use other colors to distinguish between changes for different categories of the Work at the same location.
 - 1. Mark important additional information which was either shown schematically or omitted from original Documents.
 - 2. Note construction change directive numbers, alternate numbers, Change Order numbers and similar identification.
 - 3. Where feasible, the individual or entity who obtained record data, whether the individuals or entity is the installer, subcontractor, or similar entity, is required to prepare the mark-up on record documents.
 - a. Accurately record information in an understandable drawing technique.
 - b. Record data as soon as possible after it has been obtained. In the case of concealed installations, record and check the mark-up prior to concealment.
 - 4. Sign or initial and date each mark-up.
- G. Upon completion of the Work, submit Project Record Documents to Architect for the Owner's records in accordance with Section 017700, Closeout Procedures.

1.2 RECORD SPECIFICATIONS

- A. Record Specifications: Maintain one complete copy of the Project Manual including addenda and modifications issued. Legibly mark and record at each product section a description of actual products installed and variations in actual Work performed in comparison with products specified. Include the following:
1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by addenda and modifications.
 4. Related record drawing information and Product Data.
 5. Other information necessary to provide a record of selections made and to document coordination with record Product Data submittals and maintenance manuals.

1.3 RECORD DRAWINGS

- A. Record Drawings: Maintain one complete black line copy of the Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies from the Work as originally shown.
1. Legibly mark each item to record actual construction including, but not limited to the following:
 - a. Measured depths of foundations in relation to project finish floor datum.
 - b. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - c. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - d. Field changes of dimension and detail.
 - e. Details not on original Contract drawings.
 - f. Revisions to details shown on the drawings.
 - g. Dimensional changes to the drawings.
 - h. Actual equipment locations.
 - i. Duct size and routing.
 - j. Changes made by Change Order; include change order number.
- B. Mark completely and accurately record prints of Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions. Where Shop Drawings are marked to reflect changes in the Work, record a cross-reference at the corresponding location on the Contract Drawings.
- C. Label the marked-up record set of drawings and project manual as the "AS-BUILT" set, and transmit to the Architect at closeout.

1.4 RECORD PRODUCT DATA

- A. Maintain one copy of each Product data submittal for record document purposes. Mark Product Data to indicate the actual product installation. Include significant changes in the product delivered to the site, and changes in manufacture's instructions and recommendations for installation.

1.5 RECORD SAMPLE SUBMITTAL

- A. Immediately prior to date of Substantial Completion, meet with the Architect, and Owner, at the Owner's discretion, at the site to determine which of the Samples maintained during the construction period shall be transmitted to Owner for record purposes. Comply with the Architect's instructions for packaging, identification marking, and delivery to Owner's Sample storage space. Dispose of other Samples in manner specified for disposal of surplus and waster materials.

1.6 MISCELLANEOUS RECORD DOCUMENTS

- A. Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Immediately prior to Substantial Completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for use and reference. Categories of requirements resulting in miscellaneous records, include, but are not limited to the following:
 - 1. Inspections and certifications by governing authorities.
 - 2. Inspection and testing by Owner's inspection agency.
 - 3. Fire resistance and flame spread test results.

1.7 CERTIFICATION

- A. By submittal of Project Record Documents, Contractor certifies, that to the best of his knowledge, informational and belief the documents are a true and complete representation of the actual construction of the Work of this Project.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

DIVISION 2 – SITE CONSTRUCTION

024100	REMOVAL OF STRUCTURES AND OBSTRUCTIONS
024116	STRUCTURE DEMOLITION

SECTION 02 41 00REMOVAL OF STRUCTURES AND OBSTRUCTIONSPART 1 - GENERAL

1.1 Scope: This Section covers the work required to remove those existing structures and other obstructions not designed or permitted to remain for construction. Existing structures and obstructions to be removed, demolished or partially demolished include, but are not limited to concrete walks, pavement, etc. as noted on the Drawings.

1.2 Referenced Standard: Conform to the following Section of the State of Louisiana, Department of Transportation and Development, "Louisiana Standard Specifications for Roads and Bridges", 2006 Edition, except as modified herein:

Section 202 - Removal of Structures and Obstructions

Section 723 - Granular Material

All references made therein to measurement and payment are deleted.

PART 2 - PRODUCTS

2.1 Non Shrink Cement Grout: Non-shrink cement grout shall consist of cement, aggregate and additives formulated to meet the following volume change requirements. Early volume change (within 24 hours) as tested by ASTM C 827 shall be limited to zero (0) percent shrinkage and four (4) percent maximum expansion. Long term volume change of hardened non-shrink cement grout (after 1 day for cure) shall conform to the Corps of Engineers Specification for Non-Shrink Grout, CRD-C621-82B. Shrinkage shall be zero (0) percent and expansion limited to a maximum of 0.4 percent volume change. Cement additives required to meet this specification shall be recommended by the grout manufacturer but shall be non-staining and non-metallic. Grout shall be equal to "Five Star" cement products manufactured by the U.S. Grout Corporation, Quikrete Companies, or approved equal.

2.2 Granular Backfill: Granular Backfill shall be fine aggregate or sandy material as specified in Section 1003.07 of the Reference Standard.

2.3 Select Fill: Select fill shall have a unified soil classification (ASTM D2487) as silty-clayey sands (SM-SC), low plasticity sandy clays (CL) or clayey sands (SC) with a plasticity index (PI) range of eight (8) to twenty (20), with a minimum 30 percent retained on the No. 200 sieve.

PART 3 - EXECUTION

3.1 General: The CONTRACTOR shall remove and dispose of all structures and obstructions designated for demolition, etc. that would interfere with construction or are required to permit construction as designed. It shall include backfilling resulting trenches, holes, pits, etc. Debris or excess material shall be disposed of off the project site.

3.2 Material Difference in Conditions: If structures or obstructions are encountered which differ materially from those ordinarily encountered, said conditions shall be immediately reported to the ENGINEER and the scope of work determined and appropriate costs negotiated for a change order.

3.3 Salvageable Material: (None Required this Project) CONTRACTOR shall meet with OWNER prior to beginning work to determine which materials, if any, shall be salvaged. CONTRACTOR shall be responsible for delivering designated salvageable material to the OWNER.

3.4 Re-Installed Material: (None Required this Project) CONTRACTOR shall carefully remove items/materials designated for re-installation and temporarily store as required. Re-installation, if required, shall be performed as shown on the Drawings.

3.5 Compaction: Compaction shall conform to Paragraphs 3.11 of Section 31 23 33 - Excavation, Backfill and Compaction for Trenches.

- END OF SECTION -

SECTION 024116 - STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of buildings.
2. Removing below-grade construction.
3. Disconnecting, capping or sealing, and removing site utilities.
4. Salvaging items for reuse by Owner.

1.2 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.3 FIELD CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.
- B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
 2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
 - a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.
- C. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
1. Hazardous materials will be removed by Owner before start of the Work.
 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

- E. On-site storage or sale of removed items or materials is not permitted.
- F. Arrange demolition schedule so as not to interfere with Owner's on-site operations or operations of adjacent occupied buildings.

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 ASSE A10.6 and NFPA 241.

2.2 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Section 312000 "Earthwork Under Buildings."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting demolition operations.
- B. 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.
- C. Inventory and record the condition of items to be removed and salvaged.

3.2 PREPARATION

- 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.
 - 5. Protect items from damage during transport and storage.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Utilities to be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished.
 - 1. Owner will arrange to shut off utilities when requested by Contractor.
 - 2. Arrange to shut off utilities with utility companies.
 - 3. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
 - 4. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.
 - 5. 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.
- C. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
- D. 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 existing site improvements, appurtenances, and landscaping to remain.
 - 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 - 4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
 - 6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
 - 7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.
- E. 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

- A. General: Demolish indicated buildings and site improvements 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 adequate ventilation when using cutting torches.
 - 3. 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.
 - 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
- C. Explosives: Use of explosives is not permitted.
- D. 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.
- E. 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.
- F. Salvage: Items to be removed and salvaged are indicated on Drawings.
- G. Demolish foundation walls and other below-grade construction.
 - 1. Remove below-grade construction, including basements, foundation walls, and footings, completely.
- H. Existing Utilities: Demolish existing utilities and below-grade utility structures that are within outside footprint indicated for new construction. Abandon utilities outside this area.
- I. Hydraulic Elevator Systems (if applicable): Demolish and remove elevator system, including cylinder, plunger, well assembly, steel well casing and liner, oil supply lines, and tanks.
- J. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Section 312000 "Earth Moving."
- K. 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.
- L. Promptly repair damage to adjacent buildings caused by demolition operations.

3.6 CLEANING

- 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.
- B. Do not burn demolished materials.
- C. 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.

END OF SECTION 024116

DIVISION 3 - CONCRETE

031100	CONCRETE FORMWORK – CIVIL SITEWORK
032100	CONCRETE REINFORCEMENT – CIVIL SITEWORK
033000	CAST-IN-PLACE CONCRETE
033053	CAST-IN-PLACE CONCRETE – CIVIL SITEWORK

SECTION 03 11 00

CONCRETE FORMWORK (CIVIL SITEWORK)

PART 1 - GENERAL

1.1 Scope: This Section includes the furnishing of all labor, materials, tools and equipment, and perform all operations necessary for formwork for Portland Cement concrete.

1.2 Storage and Handling:

- A. Forms shall be stored in a neat and orderly fashion and protected from damage.
- B. If any form is deemed by the ENGINEER to be unfit for use, it shall be removed from the job.
- C. Forms shall be cleaned and stacked immediately after stripping from concrete.

1.3 Reference Standard: Conform to the following Sections of the State of Louisiana, Department of Transportation and Development, "Louisiana Standard Specifications for Roads and Bridges", 2006 Edition, except as modified herein.

- Section 601 - Portland Cement Concrete Pavement
- Section 706 - Concrete Walks, Drives and Incidental Paving
- Section 707 - Curbs and Gutters
- Section 805 - Structural Concrete
- Section 901 - Portland Cement Concrete

All references made therein to Measurement and Payment are deleted.

PART 2 - PRODUCTS

2.1 General: Materials shall conform to applicable provisions of Sections or Subsections referred to in the Reference Standard.

PART 3 - EXECUTION

3.1 General: All work related to this Section shall conform to the applicable provisions contained in the Reference Standard.

- END OF SECTION -

SECTION 03 21 00

CONCRETE REINFORCEMENT (CIVIL SITEWORK)

PART 1 - GENERAL

1.1 Scope: This Section includes furnishing of all labor, materials, tools and equipment, and perform all operations necessary for concrete reinforcement work as indicated on the Drawings and as directed by the ENGINEER.

1.2 Reference Standard: Work shall conform to the following Sections of the State of Louisiana, Department of Transportation and Development, "Louisiana Standard Specifications for Roads and Bridges", 2000 Edition, except as may be modified herein:

Section 806 - Reinforcement

Section 1009-Reinforcing Steel and Wire Rope

All references made therein to measurement and payment are deleted.

1.3 Submittals: Submittals consisting of mill certificates and steel bending fabrication drawings and bar tests shall be provided in accordance with Section 01 33 00 – Submittal Procedures.

PART 2 - PRODUCTS

2.1 General: Reinforcement shall conform to Subsection 1009 of the Reference Standard, except that all reinforcement shall be Grade 60.

PART 3 - EXECUTION

3.1 General: All work related to this Section shall conform to the applicable provisions contained in the Reference Standard.

- END OF SECTION -

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Related Requirements:
 - 1. Section 312000 "Earthwork (Under Buildings)" for drainage fill under slabs-on-grade.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture.
- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement.

1.3 INFORMATIONAL SUBMITTALS

- A. Material certificates.
- B. Material test reports.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that 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. Testing Agency shall be employed by the Contractor.
 - 1. Testing laboratory technician must be present during all concrete placement operations.

1.5 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 306.1.
 - 1. 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.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301.
 2. ACI 117.

2.2 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.3 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- C. Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- D. Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.
- E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.4 CONCRETE MATERIALS

- A. Cementitious Materials:
1. Portland Cement: ASTM C 150/C 150M, Type I or Type III.
 2. Fly Ash: Refer to Structural Drawings.
- B. Normal-Weight Aggregates: ASTM C 33/C 33M, graded.
1. Maximum Coarse-Aggregate Size: in accordance with ACI 318.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Air-Entraining Admixture: ASTM C 260/C 260M.

- D. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and 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 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.
- E. Water: ASTM C 94/C 94M and potable.

2.5 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Barrier-Bac; Inteplast Group, Ltd.; VB-350.
 - b. Fortifiber Building Systems Group; Moistop Ultra 15.
 - c. Grace Construction Products; W.R. Grace & Co. -- Conn.; Florprufe 120.
 - d. Raven Industries, Inc; Vapor Block 15.
 - e. Stego Industries, LLC; Stego Wrap 15 mil Class A.
 - f. W. R. Meadows, Inc; Perminator 15 mil.
 - g. Or approved equal.

2.6 CURING MATERIALS

- A. Evaporation Retarder (if necessary): Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Euclid Chemical Company (The); an RPM company; Eucobar.
 - b. L&M Construction Chemicals, Inc; E-CON.
 - c. Sika Corporation; Caltexol CIMFILM.
 - d. Or approved equal.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear Sealer/Densifier: Certified by curing compound manufacturer to not interfere with bonding of floor covering.
 - 1. Products: Subject to compliance with requirements, provide one of the following:

- a. BASF Corporation; Construction Systems; Kure-N-Seal 30.
 - b. Euclid Chemical Company (The); an RPM company; Euco Diamond Hard.
 - c. L&M Construction Chemicals, Inc; Sealhard.
 - d. Or approved equal.
- F. Clear, Waterborne Curing Compound: ASTM C 309, Type 1, Class B, 18 to 25 percent solids, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Corporation; Construction Systems; MasterKure CC 200 WB.
 - b. Euclid Chemical Company (The); an RPM company; Diamond Clear VOX.
 - c. L&M Construction Chemicals, Inc; Dress & Seal WB.
 - d. Or approved equal.

2.7 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Waterstop Strips at Keyed and Construction Joints: AllCo "Volclay RX101 and RX102" waterstop strips as required by conditions at keyed foundation construction joints and floor slab construction joints. Furnish with accessory primer and adhesive required by condition. Other acceptable products include ADCOR waterstops by GCP Applied Technologies and SYNKO-FLEX waterstops by Henry Co.

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, according to ACI 301.
- B. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use 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 heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a w/c ratio below 0.50.

2.9 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Normal-Weight Concrete:
 - 1. Minimum Compressive Strength: 3500 psi as indicated at 28 days.
 - 2. Maximum W/C Ratio: 0.48.
 - 3. Slump Limit: 5 inches, plus or minus 1 inch.
 - 4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.

5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
6. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.10 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.11 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 1. When air temperature is between 85 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.

PART 3 - EXECUTION

3.1 FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Chamfer or tool exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEM INSTALLATION

- 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. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.4 STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

3.5 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool 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 does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: 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.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
- B. 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. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

3.7 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed-finished as-cast concrete where indicated:
 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 1. Apply float finish to surfaces indicated to receive trowel finish.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 1. Apply a trowel finish to surfaces indicated 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.
 2. Finish and measure surface, so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.
 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.9 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed 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.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for remainder of curing period.
- D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for 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. Cure for not less than seven days. 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.
 - a. 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.
 - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a 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. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.10 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

3.11 FIELD QUALITY CONTROL

- A. Contractor shall notify the Architect and Program Manager 48 hours prior to any concrete pour greater than 10 cu. Yds.

- B. Special Inspections: Contractor will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF SECTION 033000

SECTION 03 30 53CAST-IN-PLACE CONCRETE (CIVIL SITEWORK)PART 1 - GENERAL

1.1 Scope: This Section covers all operations necessary for cast-in-place concrete work as indicated on the Drawings and specified herein.

1.2 Reference Standard: Work shall conform to the following Sections of the State of Louisiana, Department of Transportation and Development, "Louisiana Standard Specifications for Roads and Bridges", 2006 Edition, except as may be modified herein:

- Section 601 - Portland Cement Concrete Pavement
- Section 706 - Concrete Walks, Drives and Incidental Paving
- Section 707 - Curbs and Gutters
- Section 805 - Structural Concrete
- Section 901 - Portland Cement Concrete

All references made therein to Measurement and Payment are deleted.

1.3 Submittals: Submit product data in accordance with provisions of Section 01 33 00-Submittal Procedures.

PART 2 - PRODUCTS

2.1 General: Material for Portland Cement concrete shall conform to the applicable sections and subsections for the Reference Standard.

2.2 Portland Pozzolan Cement: No Portland Pozzolan cement shall be used for any structure for this project.

2.3 Non-Shrink Cement Grout: Non-shrink cement grout shall consist of cement, aggregate and additives formulated to meet the following volume change requirements. Early volume change (within 24 hours) as tested by ASTM C827 shall be limited to zero (0) percent shrinkage and four (4) percent maximum expansion. Long term volume change of hardened non-shrink cement grout (after 1 day for cure) shall conform to the Corps or Engineers Specification for Non-Shrink Grout, CRD-C621-82B. Shrinkage shall be zero (0) percent and expansion limited to a maximum of 0.4 percent volume change. Cement additives required to meet this specification shall be recommended by the grout manufacturer but shall be non-staining and non-metallic. Grout shall be equal to "Five Star" cement products manufactured by the U.S. Grout Corporation.

2.4 Non-Shrink Epoxy Grout: Non-shrink epoxy grout shall meet plastic volume changes within the first four (4) hours of zero (0) percent shrinkage and four (4) percent maximum expansion as tested by ASTM C827. Restrained hardened epoxy grout shall have zero (0) percent shrinkage as tested by ASTM C537. Epoxy grout shall have zero (0) percent expansion

in volume change after set under constant temperature conditions. Epoxy grout shall be 100 percent solids formulated with resin, hardener and aggregate as recommended by the manufacturer. Epoxy grout shall be equal to "Five Star" epoxy products manufactured by the U.S. Grout Corporation.

PART 3 - EXECUTION

3.1 General: All work related to this Section shall conform to the applicable provisions contained in the Reference Standard.

3.2 Concrete Compressive Strength: The average compressive strength in 28 days of Portland Cement concrete shall be as follows:

Item	28 Day Compressive Strength (PSI)	Structural Class/Pavement Type
Drive Repairs	3,500*	A
Incidental Paving (Walk Repairs), Fence/Post Footings, Drain Outfall	3,000	M

*3,500 psi acceptable in lieu of LADOTD specified 3,800 psi.

- END OF SECTION -

DIVISION 4 - MASONRY

042000 UNIT MASONRY

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Clay face brick.
 - 3. Building (common) brick.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: For each type and color of exposed masonry unit and colored mortar.
- C. Material Certificates: For each type and size of product.

1.3 QUALITY ASSURANCE

- A. Sample Panels: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.
 - 1. Build sample panels for each type of exposed unit masonry construction in sizes approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high.

1.4 FIELD CONDITIONS

- A. 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 TMS 602/ACI 530.1/ASCE 6.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

PART 2 - PRODUCTS

2.1 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6, except as modified by requirements in the Contract Documents.

- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
 - 1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
- B. Integral Water Repellent: Provide units made with integral water repellent for exposed units.
- C. CMUs: ASTM C 90.
 - 1. Density Classification: Lightweight unless otherwise indicated.

2.3 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 shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Clay Face Brick: Facing brick complying with ASTM C 216 or hollow brick complying with ASTM C 652.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Acme Brick, modular velour brick, or comparable products by one of the following:
 - a. Boral.
 - b. Other prior approved manufacturers.
 - 1) NOTE: Brick samples of matching colors to the Basis-of-Design Products must be submitted for review prior to bid in accordance with Section 012513.
 - 2. Grade: SW.
 - 3. Color/Texture:
 - a. Color: Match the existing velour brick color on the existing original Gymnasium.

4. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
5. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing according to ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet (3 m).
6. Size (Actual Dimensions): 3-5/8 inches (92 mm) wide by 2-1/4 inches (57 mm) high by 7-5/8 inches (194 mm) long.

- C. Building (Common) Brick: ASTM C 62, Grade MW or SW.
1. Size: Match size of face brick.

2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type N for brick veneer, Type S for all load-bearing masonry.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C 91/C 91M.
- E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979M. Use only pigments with a record of satisfactory performance in masonry mortar.
- F. Aggregate for Mortar: ASTM C 144.
 1. White-Mortar Aggregates: Natural white sand or crushed white stone.
 2. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- G. Aggregate for Grout: ASTM C 404.
- H. 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.
- I. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.
- J. Water: Potable.

2.5 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).

- B. Masonry-Joint Reinforcement, General: ASTM A 951/A 951M.
 - 1. Interior Walls: Mill- galvanized carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized carbon steel.
 - 3. Wire Size for Side Rods: 0.148-inch (3.77-mm) diameter.
 - 4. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
 - 5. Wire Size for Veneer Tab Ties: 0.148-inch (3.77-mm) diameter.
 - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches (407 mm) o.c.
 - 7. Provide in lengths of not less than 10 feet (3 m).
- C. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.

2.6 TIES AND ANCHORS

- A. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into veneer but with at least a 5/8-inch (16-mm) cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
 - 2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
 - 3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches (100 mm) wide.
 - 1. Wire: Fabricate from 3/16-inch- (4.76-mm-) diameter, hot-dip galvanized-steel wire.
- D. Adjustable Anchors for Connecting to Structural Steel Framing: 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- (6.35-mm-) diameter, hot-dip galvanized-steel wire.
 - 2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized-steel wire.
- E. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
 - 1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.105-inch- (2.66-mm-) thick steel sheet, galvanized after fabrication
 - 2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized-steel wire.
- F. Partition Top Anchors: 0.105-inch- (2.66-mm-) thick metal plate with a 3/8-inch- (9.5-mm-) diameter metal rod 6 inches (152 mm) long welded to plate and with closed-end plastic tube

fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.

- G. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.35 mm) thick by 24 inches (610 mm) long, with ends turned up 2 inches (51 mm) or with cross pins unless otherwise indicated.

- 1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

- H. Adjustable Masonry-Veneer Anchors:

- 1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf (445-N) load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch (1.5 mm).
 - 2. Fabricate wire ties from 0.187-inch- (4.76-mm-) diameter, hot-dip galvanized-steel wire unless otherwise indicated.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC].

- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

- C. Mesh Weep/Vent: Free-draining mesh; made from polyethylene strands, full height and width of head joint and depth 1/8 inch (3 mm) less than depth of outer wythe; in color selected from manufacturer's standard.

- a. Basis-of-Design Product: Subject to compliance with requirements, provide Mortar Net Solutions ; Mortar Net Weep Vents. or a comparable product by one of the following:

- 1) Advanced Building Products Inc.
 - 2) CavClear/Archovations, Inc.
 - 3) Keene Building Products.

- D. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

- 1. Basis-of-Design Product: Subject to compliance with requirements, provide Mortar Net Solutions ; Mortar Net with Insect Barrier. or a comparable product by one of the following:

- a. Advanced Building Products Inc.
 - b. CavClear/Archovations, Inc.
 - c. Hohmann & Barnard, Inc.

2. Configuration: Provide one of the following:

- a. Strips, full depth of cavity and 10 inches (250 mm) high, with dovetail shaped notches 7 inches (175 mm) deep that prevent clogging with mortar droppings.
- b. Strips, not less than 3/4 inch (19 mm) thick and 10 inches (250 mm) high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.

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. Basis-of-Design Product: Subject to compliance with requirements, provide PROSOCO, Inc ; Sure Klean® 600. or a comparable product by one of the following:
 - a. Diedrich Technologies, Inc.; a Hohmann & Barnard company.
 - b. EaCo Chem, 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. Use portland cement-lime or masonry cement mortar unless otherwise indicated.
 3. 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, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
1. Non-load bearing masonry (brick and split-face veneer):
 - a. Type: ASTM C 270, Type "N".
 - b. Proportions: 1 part cement, 1 part hydrated lime and 6 parts sand to provide a compressive strength of 750 psi in 28 days. Do not use calcium chloride.
 2. Load bearing structural masonry (CMU):
 - a. Type: ASTM C 270, Type "S".
 - b. Proportions: 1 part cement, 1/2 part hydrated lime and 4-1/2 parts sand to provide a compressive strength of 1800 psi in 28 days. Do not use calcium chloride.

- D. Pigmented Mortar: Use colored cement product.
 - 1. Pigments shall not exceed 10 percent of portland cement by weight.
 - 2. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
 - 3. Mix to match Architect's sample.
 - 4. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Decorative CMUs.
 - b. Clay face brick.
- E. 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 TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
 - 2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
 - 3. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143/C 143M.
- F. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.
 - 1. Application: Use epoxy pointing mortar for exposed mortar joints with the following units:
 - a. Pre-faced CMUs.
 - b. Glazed structural clay facing tile.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. 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.
- B. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- C. 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 according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.2 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch (12 mm) or minus 1/4 inch (6 mm).

2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch (12 mm).
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch (6 mm) in a story height or 1/2 inch (12 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2-inch (12-mm) maximum.
2. 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.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.
4. 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.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9 mm in 6 m), or 1/2-inch (12-mm) maximum.

C. Joints:

1. For 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).
2. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus 1/4 inch (6 mm).
3. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm).

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; do not use units with less-than-nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- C. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- D. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- E. Fill cores in hollow CMUs 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 brick and CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
- B. Lay solid masonry units and hollow brick 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 as follows:
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, use adjustable-type (two-piece-type) reinforcement.
- 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. Collar Joints in Clay Tile Masonry: After each course is laid, fill the vertical, longitudinal joint between wythes solidly with mortar at exterior walls, except cavity walls.
- D. Corners: Provide interlocking masonry unit bond in each wythe and course at corners unless otherwise indicated.
- E. 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. Bond wythes of cavity walls together [using one of the following methods] [as follows]:
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, use adjustable-type (two-piece-type) reinforcement.

- c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) reinforcement to allow for differential movement regardless of whether bed joints align.
- B. 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.
- C. Parge cavity face of backup wythe in a single coat approximately 3/8 inch (10 mm) thick. Trowel face of parge coat smooth.

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, 1/2 inch (13 mm) elsewhere. 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 and parapet walls.
 - 3. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.
- 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.

3.8 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
 - 1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.

3.9 FLASHING, WEEP HOLES, AND CAVITY 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 multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches (200 mm), and through inner wythe to within 1/2 inch (13 mm) of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately 2 inches (50 mm) on interior face.
 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. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal drip edge.
 5. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch (13 mm) back from outside face of wall, and adhere flexible flashing to top of metal flashing termination.
- C. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.
1. Use specified weep/cavity vent products to form weep holes.
 2. Space weep holes 24 inches (600 mm) o.c. unless otherwise indicated.
 3. Cover cavity side of weep holes with plastic insect screening at cavities insulated with loose-fill insulation.
- D. Place cavity drainage material in airspace behind veneers to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
- 3.10 REINFORCED UNIT MASONRY INSTALLATION
- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than 12.67 ft. (3.86 m).

3.11 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Inspection and Testing Lab services shall be in accordance with Section 014523.

3.12 REPAIRING, POINTING, AND CLEANING

- A. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- B. 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.
 - 3. Protect adjacent surfaces from contact with cleaner.
 - 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 masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.

3.13 MASONRY WASTE DISPOSAL

- A. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

DIVISION 5 - METALS

051200	STRUCTURAL STEEL FRAMING
054000	COLD-FORMED METAL FRAMING
055000	METAL FABRICATIONS

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.
2. Grout.

1.2 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication of structural-steel components.
- C. Qualification Data: For Fabricator.
- D. Welding certificates.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with applicable provisions of the following specifications and documents:
1. AISC 303.
 2. AISC 360.
 3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M.
- B. Channels, Angles, Shapes: ASTM A 36/A 36M.
- C. Plate and Bar: ASTM A 36/A 36M.
- D. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, structural tubing.
- E. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.
- F. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
- B. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.
 - 1. Finish: Hot-dip or mechanically deposited zinc coating.
- C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- D. Unheaded Anchor Rods: ASTM F 1554, Grade 36.
 - 1. Finish: Plain Hot-dip zinc coating, ASTM A 153/A 153M, Class C Mechanically deposited zinc coating, ASTM B 695, Class 50, as indicated.
- E. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.
 - 1. Finish: Plain Hot-dip zinc coating, ASTM A 153/A 153M, Class C Mechanically deposited zinc coating, ASTM B 695, Class 50, as indicated.
- F. Threaded Rods: ASTM A 36/A 36M.
 - 1. Finish: Plain Hot-dip zinc coating, ASTM A 153/A 153M, Class C Mechanically deposited zinc coating, ASTM B 695, Class 50, as indicated.
- G. Clevises and Turnbuckles: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1035.

2.4 PRIMER

- A. Primer: Comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- B. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

2.5 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
- B. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

2.7 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened, unless indicated for Pretensioned or Slip critical.
- 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.

2.8 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: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 2, "Hand Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to 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.

2.9 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M.
- D. Prepare test and inspection reports.

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.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Baseplates, 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 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 shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

3.3 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 1. Joint Type: Snug tightened, unless indicated as Pretensioned or Slip critical.
- 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 AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
 1. Verify structural-steel materials and inspect steel frame joint details.
 2. Verify weld materials and inspect welds.
 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
 1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.

END OF SECTION 051200

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior non-load-bearing wall framing.
 - 2. Miscellaneous hat channels and other shapes.

1.2 SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory.
- B. Design Calculations: Verify specified sizes, gauges, spacing of members and connections to meet design criteria and manufacturer's requirements for supported materials. Show methods and practices used in installation.

1.3 QUALITY ASSURANCE

- A. Product Tests: Mill certificates or data from a qualified independent testing agency.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide ClarkDietrich Building Systems; cold-formed metal framing, or a comparable product by one of the following:
 - 1. Marino\WARE.
 - 2. Nuconsteel, A Nucor Company.
 - 3. Or approved equal.

2.2 PERFORMANCE REQUIREMENTS

- A. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
- B. Fire-Resistance Ratings (if required): Comply with ASTM E 119; testing by a qualified testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3 COLD-FORMED STEEL FRAMING, GENERAL

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: ST33H.
 - 2. Coating: G60, A60, AZ50, or GF30.
- B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: 33.
 - 2. Coating: G60.

2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs (CSJ), of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 33 mills (20 ga.) 33 ksi, or as indicated.
 - 2. Flange Width: 1-5/8 inches, or as indicated.
 - 3. Flange Depth: 6 or 8 inches at exterior walls as indicated.
 - 4. Flange Depth at Miscellaneous Stud Framing: 2-1/2 and 4 inches as indicated.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and matching minimum base-metal thickness of steel studs.
- C. Vertical Deflection Clips: Manufacturer's standard clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure.
- E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

2.5 MISCELLANEOUS FRAMING MEMBERS

- A. General: Of 22 gauge to 16 gauge galvanized steel, ASTM A446, Grade D, G60 minimum.
- B. Framing and Furring Members: Provide miscellaneous shaped framing members in the sizes and configurations indicated (includes but is not necessarily limited to):
 - 1. Hat-shaped furring channels as detailed, gauge as indicated, galvanized finish.
 - 2. Various size Cee and Zee-shaped members, gauge as indicated, where indicated at exterior framing conditions, galvanized or shop primed finish.
 - 3. Miscellaneous bent angles, shapes and plates, gauge as indicated, galvanized finish.

2.6 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration.

2.7 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.
- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel hex-headed bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C, or mechanically deposition according to ASTM B 695, Class 50.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.8 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: [SSPC-Paint 20 or MIL-P-21035B] [ASTM A 780].
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density multimonomer plastic, and nonleaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
- B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.2 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
- D. Install framing members in one-piece lengths.
- E. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- F. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- G. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- I. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: 16 inches, or as indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
 - 1. Install single deep-leg deflection tracks and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
 - a. Install solid blocking at centers indicated.
 - 2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.4 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous steel framing and supports.
2. Angle counter frames.
3. Angle bench brackets.
4. Stair and ramp handrails/guardrails.

B. Products furnished under this Section, and installed by others, include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Manufactured stair nosings at exterior concrete stairs.

1.2 SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

PART 2 - PRODUCTS

2.1 METALS

- 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.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.
- D. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.
- E. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- F. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.
- G. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.2 FASTENERS

- A. General: Unless otherwise indicated, provide Type 304 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.
 - 3. Provide stainless-steel fasteners for fastening nickel silver.
 - 4. Provide bronze fasteners for fastening bronze.
- B. 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.
- C. 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, 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, and nuts, ASTM F 594.

2.3 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting," Section 099123 Interior Painting," and Section 099600 "High-Performance Coatings."
- 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. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- H. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
- C. 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.
- D. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Locate joints where least conspicuous.
- E. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c.

2.5 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.

2.6 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.
- B. Galvanize loose steel lintels located in exterior walls.

2.7 STAIR & RAMP HANDRAILS/GUARDRAILS

- A. Provide steel pipe and bracket handrails for floor mounting and wall mounting as detailed. Fabricate all rails in shop. Grind all welded connections smooth. Shop prime components. Field prime all field welds. Provide all rails as detailed on the drawings.

2.8 MANUFACTURED STAIR NOSINGS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide 4 inch wide x 5/16 inch thick ALUMOGRIT Type AG101.4 Abrasive Cast Aluminum Safety Nosings with integral anchors at 12 inches on center where scheduled, as manufactured by Wooster Products, Inc., www.wooster-products.com, or a comparable product by one of the following:
1. American Stair Treads.
 2. Sure-Foot Corp., Bold Step.
 3. Grating Pacific.
- B. Design Features:
1. Material: Cast aluminum.
 2. Texture: #20 virgin grain Aluminum Oxide abrasive integrally cast into the walking surface, minimum 1/32 inch deep.
 3. Pattern: Cross-hatched surface with "feature strip" at back edge.
 4. Anchors: Wing type anchor. Steel wing anchors, bolts, and nuts are furnished for field attachment into factory drilled and countersunk holes. Spacing is 3 inches from ends and 12 inches on center.
 5. Finish: Shot blasted.
 6. Dimensions: 4 inches deep x length as required by drawings. 8 feet, 6 inches maximum length per section. Verify required lengths in the field.

2.9 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.

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.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
1. Shop prime with primers specified in Section 099113 "Exterior Painting" unless zinc-rich primer is 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. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 4. 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.

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.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

3.2 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.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 055000

DIVISION 6 – WOOD AND PLASTICS

061000	ROUGH CARPENTRY
061600	SHEATHING
062023	INTERIOR FINISH CARPENTRY
064023	INTERIOR ARCHITECTURAL WOODWORK
064116	PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Framing with dimension lumber.
 - 2. Wood blocking and nailers.
 - 3. Wood furring and grounds.
 - 4. Wood sleepers.
 - 5. Plywood backing panels.

1.2 SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. Evaluation Reports: For the following, from ICC-ES:
 - 1. Wood-preservative-treated wood.
 - 2. Fire-retardant-treated wood.
 - 3. Engineered wood products.
 - 4. Shear panels.
 - 5. Power-driven fasteners.
 - 6. Post-installed anchors.
 - 7. Metal framing anchors.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: Grade lumber 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. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.

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 that 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 items indicated on Drawings, and the following:
 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 4. Wood framing members that are less than 18 inches (460 mm) above the ground in crawlspaces or unexcavated areas.
 5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

- A. Non-Load-Bearing Interior Partitions: Construction or No. 2 grade.
- B. Framing Other Than Non-Load-Bearing Partitions: No. 2 grade.
 1. Species:
 - a. Southern pine; SPIB.
 - b. Spruce-pine-fir; NLGA.
 - c. Douglas fir-south; WWPA.
 - d. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

2.4 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 1. Blocking.
 2. Nailers.
 3. Furring.
 4. Grounds.
- B. Dimension Lumber Items: Construction or No. 2 grade lumber of any species.
- C. Concealed Boards: 19 percent maximum moisture content of the following species and grades:
 1. Mixed southern pine or southern pine; No. 2 grade; SPIB.
 2. Eastern softwoods; No. 2 Common grade; NeLMA.
 3. Western woods; Construction or No. 2 Common grade; WCLIB or WWPA.

2.5 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, in thickness indicated or, if not indicated, not less than 3/4-inch (19-mm) nominal thickness.

2.6 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- C. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 ICC-ES or AC193 as appropriate for the substrate.

2.7 METAL FRAMING ANCHORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Simpson Strong-Tie Co., Inc.; hurricane ties, connectors, hangers, etc., or comparable products by one of the following:
 - 1. KC Metals Products, Inc.
 - 2. USP Structural Connectors.
- B. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.
 - 1. Use for interior locations unless otherwise indicated.
- C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch (0.9 mm) thick.
 - 1. Use for wood-preservative-treated lumber and where indicated.

2.8 MISCELLANEOUS MATERIALS

- A. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate **[furring,]**nailers, blocking, **[grounds,]**and similar supports to comply with requirements for attaching other construction.
- C. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- D. Do not splice structural members between supports unless otherwise indicated.
- E. Comply with AWPAM4 for applying field treatment to cut surfaces of preservative-treated lumber.
- F. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code (IBC).
 - 2. ICC-ES evaluation report for fastener.

3.2 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.

END OF SECTION 061000

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Wall sheathing.
 - 2. Roof sheathing.

1.2 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product.

PART 2 - PRODUCTS

2.1 WALL SHEATHING

- A. Paper-Surfaced Gypsum Sheathing: ASTM C 1396/C 1396M, gypsum sheathing; with water-resistant-treated core and with water-repellent paper bonded to core's face, back, and long edges.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide National Gypsum Company; Gold Bond Gypsum Sheathing, or a comparable product by one of the following:
 - a. Georgia-Pacific Gypsum LLC.
 - b. USG Corporation.
 - 2. Type and Thickness: Type X, ½ or 5/8 inch thick as scheduled.

2.2 ROOF SHEATHING

- A. Plywood Sheathing: DOC PS 1, Exterior Exposure 1 sheathing.
 - 1. Thickness: Nominal 5/8 inch thick, or as noted on the drawings.

2.3 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

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.
 - 2. ICC-ES evaluation report for fastener.
- D. Coordinate wall and roof 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.
- E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall and Roof Sheathing:
 - a. Nail or staple to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
 - b. Screw to cold-formed metal framing.
 - c. Space panels 1/8 inch (3 mm) apart at edges and ends.

END OF SECTION 061600

SECTION 062023 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior trim.
 - 2. Interior veneer plywood.

1.2 SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product.
- B. Samples: For each type of paneling.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20.
 - 1. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
 - a. For exposed lumber, mark grade stamp on end or back of each piece.
- B. Softwood Plywood: DOC PS 1.
- C. Hardboard: AHA A135.4.
- D. MDF: ANSI A208.2, Grade 130.
- E. Particleboard: ANSI A208.1, Grade M-2.
- F. Manufactured Column Material: Composite fiberglass type.

2.2 INTERIOR TRIM

- A. Softwood Lumber Trim:
 - 1. Species and Grade: Southern pine or poplar, B & B finish; SPIB.
 - 2. Maximum Moisture Content: 15 percent.
- B. Hardwood Lumber Trim:

1. Species and Grade: White Oak; Clear; NHLA.
 2. Maximum Moisture Content: 9 percent.
- C. Softwood Moldings for Transparent Finish (Stain or Clear Finish): WMMPA WM 4, N-grade wood moldings. Made to patterns included in WMMPA WM 12.
1. Species: Southern pine.
 2. Maximum Moisture Content: 15 percent.
- D. Hardwood Moldings for Transparent Finish (Stain or Clear Finish): WMMPA HWM 2, N-grade wood moldings made to patterns included in WMMPA HWM 1.
1. Species: White Oak, AWI Grade 1..
 2. Maximum Moisture Content: 9 percent.
- E. Moldings for Opaque Finish (Painted Finish): Made to patterns included in WMMPA WM 12.
1. Softwood Moldings: WMMPA WM 4, P grade.
 - a. Species: Southern pine or poplar.
 - b. Maximum Moisture Content: 15 percent.
 2. Hardwood Moldings: WMMPA HWM 2, P-grade.
 - a. Species: Magnolia, soft maple, or yellow poplar.
 - b. Maximum Moisture Content: 9 percent.
 3. Optional Material: Primed MDF.
- F. Molding Patterns:
1. Miscellaneous Trim & Molding Patterns & Profiles: Base Pattern: As designated on the drawings.

2.3 INTERIOR VENEER PLYWOOD PANELING

- A. Hardwood Veneered Plywood:
1. Species and Grade: White Oak, Grade A4, Quarter Sawn.
 2. Maximum Moisture Content: 9 percent.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours unless longer conditioning is recommended by manufacturer.

3.2 INSTALLATION, GENERAL

- A. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Countersink fasteners, fill surface flush, and sand unless otherwise indicated.
 - 3. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining interior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.

3.3 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints.

END OF SECTION 062023

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Interior standing and running trim.

1.2 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior architectural woodwork until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 INTERIOR ARCHITECTURAL WOODWORK, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

2.2 INTERIOR STANDING AND RUNNING TRIM FOR OPAQUE FINISH

- A. Grade: Economy.
- B. Wood Species: C Grade Southern Yellow Pine (SYP) or Poplar.

2.3 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of interior architectural woodwork and quality grade specified unless otherwise indicated.
 - 1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
 - 2. Wood Moisture Content: 8 to 13 percent.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Before installation, condition interior architectural woodwork to average prevailing humidity conditions in installation areas.
- B. Grade: Install interior architectural woodwork to comply with same grade as item to be installed.
- C. Install interior architectural woodwork level, plumb, true in line, and without distortion. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- D. Scribe and cut interior architectural woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor interior architectural woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with interior architectural woodwork.
- F. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 96 inches (2400 mm) long except where shorter single-length pieces are necessary.
 - 1. Scarf running joints and stagger in adjacent and related members.
 - 2. Fill gaps, if any, between trim and wall with latex sealant, painted to match wall.
 - 3. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches (3 mm in 2400 mm).
- G. See Section 099123 "Interior Painting" for final finishing of installed interior architectural woodwork not indicated to be shop finished.

END OF SECTION 064023

SECTION 064116 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

B. Related Requirements:

1. Section 123623.13 "Plastic-Laminate-Clad Countertops."

1.2 SUBMITTALS

A. Product Data: For each type of product, including panel products high-pressure decorative laminate adhesive for bonding plastic laminate and cabinet hardware and accessories.

B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

C. Samples:

1. Plastic laminates, for each color, pattern, and surface finish.
2. Thermoset decorative panels, for each color, pattern, and surface finish.

1.3 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 ARCHITECTURAL CABINET FABRICATORS

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. Bayou Wood Products, 1315 Hwy. 15, West Monroe, LA 71291, (318) 397-0000.
2. Other prior approved acceptable millwork/casework manufacturers.

2.2 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
- B. Grade: Custom.
- C. Type of Construction: Face frame.
- D. Cabinet, Door, and Drawer Front Interface Style: Flush overlay.
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Abet Laminati, Inc.
 - b. Formica Corporation.
 - c. Pionite: a Panolam Industries International, Inc. brand.
 - d. Wilsonart Americas
 - e. Nevamar brand.
- F. Laminate Cladding for Exposed Surfaces:
 - 1. Horizontal Surfaces: Grade HGS (0.048 inch) thick.
 - 2. Postformed Surfaces: Grade HGP (0.039 inch) thick.
 - 3. Vertical Surfaces: Grade VGS (0.028 inch) thick.
 - 4. Pattern Direction: As indicated.
- G. Edgebanding for Plastic Laminate: Rigid PVC extrusions, through color with satin finish, 3 mm thick at doors and drawer fronts, 1 mm thick elsewhere.
- H. Edgebanding for Thermoset Decorative Panels: PVC or polyester edgebanding matching thermoset decorative panels.
- I. Materials for Semiexposed Surfaces:
 - 1. Surfaces Other Than Drawer Bodies: Thermoset decorative panels.
 - 2. Drawer Sides and Backs: Thermoset decorative panels with PVC or polyester edge banding.
 - 3. Drawer Bottoms: Thermoset decorative panels.
- J. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As selected by Architect from laminate manufacturer's full range in the following categories:
 - a. Solid colors, matte finish.
 - b. Solid colors with core same color as surface, matte finish.
 - c. Wood grains, matte finish.
 - d. Patterns, matte finish.

2.3 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Wood Moisture Content: not to exceed 8 percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
 - 1. Medium-Density Fiberboard: ANSI A208.2, Grade 130.
 - 2. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
 - 3. Softwood Plywood: DOC PS 1, medium-density overlay.
 - 4. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.
 - 5. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

2.4 PLASTIC-LAMINATE-CLAD COUNTERTOPS

- A. Refer to Section 123623.13 – PLASTIC-LAMINATE-CLAD COUNTERTOPS for Countertop specifications.

2.5 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087111 "Door Hardware (Descriptive Specification)."
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 135 degrees of opening minimum.
- C. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.
- D. Catches: Magnetic catches, BHMA A156.9, B03141.
- E. Tall Cabinet Door Catches: Hafele Elbow Catch, Item # 245.74.200, spring-loaded, chrome plated.
- F. Shelf Rests: BHMA A156.9, B04013; nylon or metal, two-pin type with shelf hold-down clip.
- G. Drawer Slides: BHMA A156.9.
 - 1. Grade 1 and Grade 2: Side mounted; full-extension type; epoxy-coated steel with polymer rollers.
 - 2. Grade 1HD-100 and Grade 1HD-200: Side mounted; full-extension type; zinc-plated or epoxy-coated steel ball-bearing slides.
 - 3. For drawers not more than 3 inches high and not more than 24 inches wide, provide Grade 1.
 - 4. For drawers more than 3 inches high but not more than 6 inches high and not more than 24 inches wide, provide Grade 1HD-100.
 - 5. For drawers more than 6 inches high or more than 24 inches wide, provide Grade 1HD-100.

6. For file drawers, provide 3-part progressive opening slide, full-extension Grade 1HD-100. Also provide body-mounted molded rails for hanging file system for legal or letter size system as required. Cutting or machining of body/face is not permitted.
 7. For computer keyboard shelves, provide Grade 1HD-100.
 8. For paper storage drawers, provide Grade 1HD-200.
- H. Hinges for Trophy Case Glass Doors: Basco Shower Door Company Celesta Hinge or approved equal, pivot hinge, brushed nickel finish.
- I. Glass Bracket for Trophy Case: Basco Shower Door Company Celesta Glass Brackets or approved equal, brushed nickel.
- J. Door Locks: BHMA A156.11, E07121.
- K. Drawer Locks: BHMA A156.11, E07041.
- L. Door and Drawer Silencers: BHMA A156.16, L03011.
- M. Grommets:
1. 2 ½ inch diameter plastic, with flip-top tab in cap, equal to Model No. EDP3 as manufactured by Doug Mockett & Company, Inc., color as selected from manufacturer's standard colors.
 2. Provide for all locations where electrical, telephone and computer data wiring need to pass through tops whether shown or not.
- N. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Stainless Steel: BHMA 630 (US26D finish).
- 2.6 MISCELLANEOUS MATERIALS
- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesive for Bonding Plastic Laminate: PVA.
1. Adhesive for Bonding Edges: Hot-melt adhesive.
- 2.7 FABRICATION
- A. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

- B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
- C. Install glass to comply with applicable requirements in Section 088000 "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

3.2 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
- C. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- D. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails **[or finishing screws]** for exposed fastening, countersunk and filled flush with woodwork.
- E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
 - 1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
 - 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips, or No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

END OF SECTION 064116

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

071113	BITUMINOUS DAMPPROOFING
072100	THERMAL INSULATION
072119	FOAMED-IN-PLACE INSULATION
072200	ROOF INSULATION
072500	WEATHER BARRIERS
074213.13	FORMED METAL WALL PANELS
074293	SOFFIT PANELS
075419	POLYVINYL-CHLORIDE (PVC) ROOFING
076200	SHEET METAL FLASHING AND TRIM
077100	ROOF SPECIALTIES
078413	PENETRATION FIRESTOPPING
079200	JOINT SEALANTS
079513.13	EXPANSION JOINT COVER ASSEMBLIES

SECTION 071113 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Cold-applied, emulsified-asphalt dampproofing.

1.2 SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise indicated.

2.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Basis-of-Design Product: Subject to compliance with requirements, provide BASF Corp. - Construction Chemicals ; MasterSeal 610, or a comparable product by one of the following manufacturers:
 - 1. Euclid Chemical Company (The); an RPM company.
 - 2. Mar-flex Waterproofing & Building Products.
 - 3. W. R. Meadows, Inc.
- B. Brush, Roller and Spray Coats: ASTM D 1227, Type III, Class 1.

2.3 AUXILIARY MATERIALS

- A. Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
- B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.
- C. Asphalt-Coated Glass Fabric: ASTM D 1668/D 1668M, Type I.

PART 3 - EXECUTION

3.1 APPLICATION, GENERAL

- A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless otherwise indicated.
 - 1. Apply dampproofing to provide continuous plane of protection.
 - 2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.
- B. Where dampproofing footings and foundation walls, 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.
 - 1. Extend dampproofing 12 inches (300 mm) onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 - 2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where indicated as "reinforced," by embedding an 8-inch- (200-mm-) wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.
- C. Where dampproofing exterior face of inner wythe of exterior masonry cavity walls, lap dampproofing at least 1/4 inch (6 mm) onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
 - 1. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe.
 - 2. Lap dampproofing at least 1/4 inch (6 mm) onto shelf angles supporting veneer.
- D. Where dampproofing interior face of above-grade, exterior concrete and masonry walls, continue dampproofing through intersecting walls by keeping vertical mortar joints at intersection temporarily open or by dampproofing wall before constructing intersecting walls.

3.2 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Masonry Backup for Brick Veneer Assemblies: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq. m).
- B. Exterior Face of Inner Wythe of Cavity Walls: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft. (0.4 L/sq. m).

END OF SECTION 071113

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Rigid cavity wall insulation board.
 - 2. Glass-fiber blanket.
 - 3. Mineral wool blankets.
 - 4. Retrofit reflective bubble insulation system.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Product test reports.
- C. Research reports.

PART 2 - PRODUCTS

2.1 RIGID CAVITY WALL INSULATION BOARD

- A. Extruded Polystyrene (XPS) Rigid Foam Insulation: ASTM C 578, Type X; with maximum flame-spread and smoke-developed indexes of 10 and 175, respectively, per ASTM E 84.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Owens Corning FOAMULAR 150 extruded polystyrene (XPS) rigid foam insulation, or a comparable product by one of the following:
 - a. DuPont (Styrofoam Brand Cavitymate).
 - b. Kingspan (GG25-LG).
- B. Physical Properties:
 - 1. Thickness: 1 inch.
 - 2. LTTR Value (minimum) per inch: 5.0, ASTM C 518.
 - 3. Compressive Strength: 15 psi minimum, ASTM D 1621.
 - 4. Flexural Strength: 40 psi minimum, ASTM C 203.
 - 5. Water Absorption: 0.3, ASTM C 272.
 - 6. Water Vapor Permeance: 1.5, ASTM E 96.
 - 7. Flame Spread: 10, ASTM E 84.
 - 8. Smoke Developed: 175, ASTM E 84.

2.2 GLASS-FIBER BLANKET (Thermal and Acoustical)

- A. Glass-Fiber Blanket, Unfaced: 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.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Knauf Insulation; QuietTherm blanket insulation, or a comparable product by one of the following:
 - a. CertainTeed Corporation (AcoustaTherm).
 - b. Johns Manville; a Berkshire Hathaway company (Therma SHIELD Thermal Insulation).
 - c. Owens Corning (EcoTouch Insulation).
- B. Glass-Fiber Blanket, Reinforced-Foil Faced: ASTM C 665, Type III (reflective faced), Class A (faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Knauf Insulation; EcoBatt FSK-25 with ECOSE Technology. or a comparable product by one of the following:
 - a. CertainTeed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Owens Corning.

2.3 MINERAL-WOOL BLANKETS (Fire Safing Insulation)

- A. Mineral-Wool Blanket, Unfaced: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Industrial Insulation Group, LLC (IIG-LLC) (JM MinWool).
 - b. Roxul Inc. (ROXUL SAFE).
 - c. Thermafiber Inc.; an Owens Corning company (FS-15).

2.4 RETROFIT REFLECTIVE BUBBLE ROOF INSULATION SYSTEM

- A. Retrofit Insulation System consisting of blown-in fiberglass insulation with maximum flame-spread and smoke-developed indexes of 25 and 50 respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics, and a bottom reflective bubble insulation sheet attached to the bottom of roof purlins with impaling pin clips, angles and other shapes as required. System shall also be installed down the exterior perimeter walls to the top of the masonry. Edges and penetrations to be sealed with manufacturer's selection of tape and other accessories. Acceptable system manufacturers include, but are not necessarily limited to the following:
 - 1. Fi-Foil "Retrosshield System" with blown-in fiberglass insulation. Fi-Foil Company, Inc., PO Box 800, Auburndale, Florida 33823. Toll Free 800-448-3401. Phone 863-965-1846. Fax 863-967-0137. Website www.fifoil.com. E-mail info@fifoil.com. As provided and installed by Tempco Insulation, 901 Wood St., West Monroe, LA 71291, (318) 325-1485, www.tempcoinsulation.com.

2. Other prior approved equal systems, manufacturers and installers.

B. System Components

1. Blown-in fiberglass insulation: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation (UltraComfort blown-in insulation).
 - b. Guardian Building Products, Inc. (AtticGuard Plus blown-in insulation).
 - c. Johns Manville; a Berkshire Hathaway company (JM Climate Pro blown-in insulation).
 - d. Knauf Insulation (Jet Stream Ultra blown-in insulation).
 - e. Owens Corning (Pro-Pink Blown-In Insulation).
2. Reflective Bubble Insulation: Fi-Foil "RetroShield System".
 - a. Multi-layer, double-bubble, reflective bubble insulation.
 - b. Thickness: 5/16-inch.
 - c. Facings: Metalized film on top surface, white on bottom surface .
 - d. Edges: Integrated tape tab.
 - e. Antioxidants: Contains antioxidants to reduce impact of ultraviolet radiation and oxidation.
 - f. Vapor retarder.
 - g. Compliance and Approvals:
 - 1) Compliance: ASTM C 1224.
 - 2) Evaluated: ICC-ES AC 02.
 - 3) Uniform Evaluation Report: IAPMO ES UER 0291.
 - h. Testing:
 - 1) Water Vapor Permeance, ASTM E 96: 0.000.
 - 2) Corrosiveness, ASTM D 3310: No evidence of cracking or pitting.
 - 3) Pliability, ASTM C 1224: No evidence of cracking or pitting.
 - 4) Bleeding and Delamination, ASTM C 1224: No evidence of bleeding or delamination.
 - 5) Mold and Mildew, ASTM C 1338: Pass.
 - 6) Thermal Performance, ASTM E 408:
 - a) Emissivity: 0.06.
 - b) Reflectivity: 94 percent.
 - 7) Service Temperature, ASTM C 447: Minus 50 degrees F to 180 degrees F.
 - 8) Surface Burning Characteristics, ASTM E 84 and E 2599:
 - a) Flame Spread Index: Less than 25.
 - b) Smoke Developed Index: Less than 450.
 - c) Classification: Class A.
 - 9) Strength Tests, ASTM D 638:
 - a) Tensile Strength, MD: 38.9 lbs/in.
 - b) Tensile Strength, TD: 27.6 lbs/in.
 - c) Tear Strength, MD: 6.9 lbf.
 - d) Tear Strength, TD: 7.3 lbf.
 - e) Compressive Strength: 279 lbf.
 - 10) R-Values, ASTM C 1224, ASTM C 1363, Include Lower Air Film. Attached to Bottom of 8-Inch Purlin:
 - a) Heat Flow Down: Reflective/Reflective – 16; Reflective/Poly - 12
 - b) Heat Flow Up: Reflective/Reflective - 4.7; Reflective/Poly - 4.0
 - c) Heat Flow Horizontal: Reflective/Reflective - 5.4; Reflective/Poly - 4.4
3. Clip-and-Pin Components:
 - a. Description: Use with tape tab, reflective bubble insulation for metal building and framing applications to provide secure mechanical connections.
 - b. Beam/Bar Joist Clips: For beams, bar joists, or Z-type purlins.

- c. C-Purlin Clips: For C-type purlins.
 - d. Angle Clips: For sidewalls and floors.
 - e. Tube Clips: For wood beams or metal tubular framing.
 - f. Locking Washers: Aluminum or white to match reflective bubble insulation facing color.
 - g. Material: Electro-galvanized steel.
 - 1) Temper: 1/4 hard.
 - 2) Thickness: 0.03 inch.
 - 3) Hardness: 30T60.
4. Aluminum Foil Tape: Fi-Foil aluminum foil tape.
- a. Description: 2-mil aluminum foil coated with cold weather acrylic adhesive.
 - b. UL Classified facing.
 - c. Width: 3 inches.
 - d. Thickness: 3.5 mils, exclusive of liner.
 - e. Adhesion: 96 oz/inch width.
 - f. Elongation: 4.4 percent.
 - g. Tensile Strength: 27 lbs/inch width.
5. Reinforced Poly Tape: Fi-Foil reinforced poly tape.
- a. Description: White, reinforced polypropylene film coated with cold weather acrylic adhesive.
 - b. UL Classified facing.
 - c. Width: 3 inches.
 - d. Thickness: 3 mils.
 - e. Adhesion: 65 oz/inch width.
 - f. Tensile Strength: 20 lbs/inch width.
6. Double Sided Tape: Fi-Foil double sided tape.
- a. Description: 0.5-mil polyester film coated on both sides with 3-mil acrylic adhesive.
 - b. Width: 3/4 inch.
 - c. Temperature Resistance: Minus 40 degrees F to 200 degrees F (minus 40 degrees C to 93 degrees C).

2.5 PRE-ENGINEERED METAL BUILDING INSULATION @ NEW BUILDINGS

- A. Refer to Section 133419 for laminated insulation system for new metal buildings.

2.6 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 - 1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.
 - 2. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
- B. Insulation Anchors, Spindles, and Standoffs: As recommended by manufacturer.
- C. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- 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. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.2 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For wood or metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
 - 1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.

3.3 INSTALLATION OF RETROFIT REFLECTIVE BUBBLE ROOF INSULATION SYSTEM

- A. Preparation for Installation:
 - 1. Do not begin installation of the system until all ceiling suspended piping, conduit, lighting and HVAC scheduled for demolition are completely removed.
 - 2. The existing underside of the roof has +/- 2" vinyl backed fiberglass insulation draped over the tops of the roof purlins at 5'-0" o.c. Prepare the underside of the roof area by slicing X-shaped scored cuts in the existing insulation vapor retarder at approximately 10' o.c. in each purlin bay. Existing purlin spacing is approximately 5'-0" o.c.
- B. Installation: Install insulation system with all components in strict accordance with system manufacturer's instructions and ASTM C 727, using only personnel experienced in installation of the system.

- C. Install reflective bubble insulation membrane to the bottom of the purlins to cover the entire building roof area and turn down to the inside face of all perimeter exterior walls.
- D. Anchor reflective bubble insulation to the bottom of purlins using the appropriate clip-and-pin anchors at spacings as recommended by the manufacturer. .
- E. Seal joints and necessary penetrations in reflective bubble insulation with integrated tape tab or with manufacturer-approved foil or poly tape.
- F. Blow in loose mass fiberglass insulation to fill the full purlin depth and all voids between the bottom bubble insulation barrier attached to the purlins and the existing top vinyl-backed insulation.
- G. Replace damaged reflective bubble insulation as directed by Architect.
- H. Protect installed reflective bubble insulation from damage during construction.

END OF SECTION 072100

SECTION 072119 - FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Open-cell spray polyurethane foam with ignition barrier.
2. Foamed-in-place masonry insulation.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Product test reports.
- C. Research reports.

PART 2 - PRODUCTS

2.1 OPEN-CELL SPRAY POLYURETHANE FOAM

- A. Open-Cell Spray Polyurethane Foam: Spray-applied polyurethane foam using water as a blowing agent. Minimum density of 0.5 lb/cu. ft. and minimum aged R-value at 1-inch thickness of 3.4 deg F x h x sq. ft./Btu at 75 deg F.
1. Basis-of-Design Product: Subject to compliance with requirements, provide BASF Corp., Enertite IB-418, or a comparable product by one of the following:
 - a. Gaco Western LLC, GacoFireStop2 F-5001.
 - b. Johns Manville, JM Corbond Open-Cell Appendix X.
 2. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 3. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly. Note: Product must be formulated with an integral "ignition barrier" in limited access attics and crawlspaces. Ignition barrier performance in accordance with ICC-ES AC377, Appendix X.

2.2 FOAMED-IN-PLACE MASONRY WALL INSULATION

- A. Plastic Injected Foam Insulation: Injected 3-part polymer foamed-in-place plastic insulation consisting of a proprietary dry powder resin mixed with a catalyst and foamed with nitrogen or compressed air.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Polymaster, R501 Foam, as manufactured by Polymaster, 10523 Lexington Dr., Knoxville, TN 37932, or a comparable product by one of the following:
 - a. <http://www.specagent.com/Lookup?uid=123456977176> Tailored Chemical Products, Core-Fill 500 TM.
 - b. Thermal Corporation of America, Thermco Foam.
 - c. Other prior approved manufacturers and products.
 - 2. Minimum Performance Standards:
 - a. Thermal Performance: ASTM C 1363: 8" CMU at 105 pcf meets R-value of 11.05.
 - b. Surface-Burning Characteristics: ASTM E 84: Flame-Spread Index: 25 or less; Smoke-Developed Index: 450 or less.
 - c. Combustion Characteristics: Must be noncombustible, Class A.
 - d. Thermal Values: "R" Value of 4.63/inch @ 25 degrees F mean; ASTM C 518.
 - e. Sound Abatement: ASTM E 413, ASTM E 90: "STC" Rating of 52 and a minimum rating of 44 for 3.5" cavity wall assembly.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Open Cell Spray Polyurethane Foam:
 - 1. Spray insulation to envelop entire area to be insulated and fill voids.
 - 2. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.
- C. Foamed-In-Place Masonry Wall Insulation:
 - 1. Fill all open cells and voids in hollow concrete masonry walls where shown on drawings. The foam insulation shall be pressure injected through a series of 5/8" to 7/8" holes drilled into every vertical column of block cells (every 8" on center) beginning at an approximate height of four (4) feet from finished floor level. Repeat this procedure at an approximate height of ten (10) feet above the first horizontal row of holes (or as needed) until the void is completely filled. Patch holes with mortar and score to resemble existing surface.

END OF SECTION 072119

SECTION 072200 - ROOF INSULATION

PART 1 - GENERAL

1.01 SUMMARY

- A. Work shall include, but is not limited to, the following:
 - 1. Preparation of existing Built-Up Roof and roof decks and all flashing substrates.
 - 2. Insulation
 - 3. Cover-board
 - 4. All related materials and labor required to complete specified roofing necessary to receive specified manufacturer's warranty.

1.02 RELATED SECTIONS

- A. Division 010000 – General Requirements
- B. Division 011000 – Summary of Work
- C. Division 075419 – Polyvinyl-Chloride (PVC) Roofing
- D. Division 076200 – Sheet Metal Flashing and Trim

1.03 DEFINITIONS

- A. ASTM D 1079-Definitions of Term Relating to Roofing and Waterproofing.
- B. The National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual, Fifth Edition Glossary.

1.04 REFERENCES

- A. AMERICAN SOCIETY OF CIVIL ENGINEERS - Reference Document ASCE 7, Minimum Design Loads for Buildings and Other Structures.
- B. AMERICAN STANDARD OF TESTING METHODS (ASTM):
 - 1. ASTM C 726 - Standard Specification for Mineral Wool Roof Insulation Board.
 - 2. ASTM C 728 - Standard Specification for Perlite Thermal Insulation Board.
 - 3. ASTM C 1177/C 1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - 4. ASTM C 1278 - Standard Specification for Fiber-Reinforced Gypsum Panel.
 - 5. ASTM C 1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Insulation Board.
 - 6. ASTM C 1325 – Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units.
 - 7. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Damp proofing, and Waterproofing.
- C. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):
 - 1. ANSI/SPRI FX-1, Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.
 - 2. ANSI/SPRI IA-1, Standard Field Test Procedure for Determining the Mechanical Uplift Resistance of Insulation Adhesives over Various Substrates.

3. ANSI/FM 4474- American National Standard for Evaluating the Simulated Wind Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures.
 - D. CANADIAN GENERAL STANDARDS BOARD (CGSB):
 1. CGSB 37-GP 56M- Standard for: Modified Bituminous, Prefabricated, and Reinforced for Roofing.
 - E. FACTORY MUTUAL (FM):
 1. FM 4450 - Approval Standard - Class I Insulated Steel Roof Decks.
 2. FM 4470 - Approval Standard - Class I Roof Covers.
 - F. FLORIDA BUILDING CODE (FBC):
 1. 2021 Florida Building Code (FBC).
 - G. INTERNATIONAL CODES COUNCIL (ICC):
 1. 2021 International Building Code (IBC).
 - H. NATIONAL ROOFING CONTRACTORS' ASSOCIATION (NRCA).
 - I. UNDERWRITERS LABORATORY (UL):
 1. UL 790 Standard Test Methods for Fire Tests of Roof Coverings.
 2. UL 1256 – Fire Test of Roof Deck Constructions.
- 1.05 ACTION SUBMITTALS
- A. Product Data Sheets: Submit manufacturer's product data sheets, installation instructions and/or general requirements for each component.
 - B. Safety Data Sheets: Submit manufacturer's Safety Data Sheets (SDS) for each component.
 - C. Sample/Specimen Warranty from the manufacturer and contractor.
 - D. Shop Drawings: Provide roof plan and applicable roof system detail drawings.
- 1.06 INFORMATIONAL SUBMITTALS
- A. Contractor Certification: Submit written certification from roofing system manufacturer certifying that the applicator is authorized by the manufacturer to install the specified materials and system.
- 1.07 CLOSEOUT SUBMITTALS
- A. Warranty: Provide manufacturers and contractor's warranties upon substantial completion of the roofing system.
- 1.08 QUALITY ASSURANCE
- A. MANUFACTURER QUALIFICATIONS:
 1. Manufacture shall have 20 years of experience manufacturing roofing materials.
 2. Trained Technical Field Representatives, employed by the manufacturer, independent of sales.

3. Provide reports in a timely manner of all site visit reports.
4. Provide specified warranty upon satisfactory project completion.

B. CONTRACTOR QUALIFICATIONS:

1. Contractor shall be authorized by the manufacturer to install specified materials prior to the bidding period through satisfactory project completion.
2. Applicators shall have completed projects of similar scope using same materials as specified herein.
3. Contractor shall provide full time, on-site superintendent or foreman experienced with the specified roof system through satisfactory project completion.
4. Applicators shall be skilled in the application methods for all materials.
5. Contractor shall maintain a daily record, on-site, documenting material installation and related project conditions.
6. Contractor shall maintain a copy of all submittal documents, on-site, available always for reference.

1.09 DELIVERY, STORAGE AND HANDLING

- A. Refer to each product data sheet or other published literature for specific requirements.
- B. Deliver materials and store them in their unopened, original packaging, bearing the manufacturer's name, related standards, and any other specification or reference accepted as standard.
- C. Protect and store materials in a dry, well-vented, and weatherproof location. Only materials to be used the same day shall be removed from this location.
- D. When materials are to be stored outdoors, store away from standing water, stacked on raised pallets or dunnage, at least 4 in or more above ground level. Carefully cover storage with "breathable" tarpaulins to protect materials from precipitation and to prevent exposure to condensation.
- E. Properly dispose of all product wrappers, pallets, cardboard tubes, scrap, waste, and debris. All damaged materials shall be removed from job site and replaced with new, suitable materials.

1.10 SITE CONDITIONS

A. SAFETY:

1. The contractor shall be responsible for complying with all project-related safety and environmental requirements.
2. Refer to NRCA CERTA recommendations, local codes and building owner's requirements for hot work operations.
3. The contractor shall review project conditions and determine when and where conditions are appropriate to utilize the specified liquid-applied, or semi-solid roofing materials. When conditions are determined by the contractor to be unsafe or undesirable to proceed, measures shall be taken to prevent or eliminate the unsafe or undesirable exposures and conditions, or equivalent approved materials and methods shall be utilized to accommodate requirements and conditions.
4. The contractor shall review project conditions and determine when and where conditions are appropriate to utilize the specified hot asphalt-applied materials. When conditions are determined by the contractor to be unsafe or undesirable to proceed, measures shall be taken to prevent or eliminate the unsafe or undesirable exposures and conditions, or

equivalent approved materials and methods shall be utilized to accommodate requirements and conditions.

5. The contractor shall refer to product Safety Data Sheets (SDS) for health, safety, and environment related hazards, and take all necessary measures and precautions to comply with exposure requirements.

B. ENVIRONMENTAL CONDITIONS:

1. Monitor substrate temperature and material temperature, as well as all environmental conditions such as ambient temperature, moisture, sun, cloud cover, wind, humidity, and shade. Ensure conditions are satisfactory to begin work and ensure conditions remain satisfactory during the installation of specified materials. Materials and methods shall be adjusted as necessary to accommodate varying project conditions. Materials shall not be installed when conditions are unacceptable to achieve the specified results.
2. Precipitation and dew point: Monitor weather to ensure the project environment is dry before, and will remain dry, during the application of roofing materials. Ensure all roofing materials and substrates remain above the dew point temperature as required to prevent condensation and maintain dry conditions.
3. Mopping asphalt application: Primer, where used, shall be fully dry before applying hot asphalt. Take all necessary measures and monitor all conditions, to ensure the specified asphalt temperature is no less than 400°F (204°C) at the point of contact with the specified membrane as it is rolled into the hot asphalt.

1.11 PERFORMANCE REQUIREMENTS

A. FIRE CLASSIFICATION:

1. Roof construction performance testing shall be in accordance with UL 1256, FM 4450, or FM 4470 to meet the specified requirements for interior flame spread and fuel contribution.
 - a. Roof construction meets requirements of UL 1256, or FM Class 1.

B. ROOF SLOPE:

1. Finished roof slope shall provide minimum positive slope for roof drainage.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. SINGLE SOURCE MANUFACTURER:** All roofing materials shall be provided by a single supplier with 20 years or more manufacturing history in the US.

1. Comply with the Manufacturer's requirements as necessary to provide the specified warranty.

- B. PRODUCT QUALITY ASSURANCE PROGRAM:** Manufacturer shall be an ISO 9001 registered company.

C. ACCEPTABLE MANUFACTURER:

1. Soprema
2. Duro-Last
3. Prior Approved Equal

2.02 THERMAL INSULATION SYSTEM

A. RIGID INSULATION

1. Tapered Polyiso Insulation: Closed cell polyisocyanurate foam core bonded on each side to a glass fiber-reinforced felt facer, tapered to provide slope.
 - a. Taper: 1/8 in with ¼ in Crickets per foot. Insulation, crickets, and saddles provided with taper as required for positive roof slope.
 - b. Dimensions: 4 x 4 ft boards
 - c. Meets or exceeds ASTM C578, Type II, Minimum 1.5 density

B. COVER-BOARD

1. GYPSUM ROOF BOARD

- a. National Gypsum Company, DEXcell FA Glass Mat Roof Board:
 - i Gypsum core, glass fiber-faced, roof board:
 - ii Thickness: ¼ in
 - iii Dimensions: 4 x 8 ft boards
 - iv Facer: Glass fiber.
 - v Meets or exceeds ASTM C1177/C1177M.
- b. Georgia Pacific Gypsum LLC, DensDeck Prime Roof Board:
 - i Gypsum core, glass fiber-faced, factory primed, roof Cover-board.
 - ii Thickness: ¼ in
 - iii Dimensions: 4 x 8 ft boards
 - iv Facer: Factory primed, glass fiber.
 - v Meets or exceeds ASTM C1177/C1177M.

C. INSULATION CANT AND TAPERED STRIP

1. TAPERED EDGE STRIP AND BOARDS:

- a. Expanded perlite, blended with binders and fibers.
 - i Dimensions: Size as required.
 - ii Meets or exceeds ASTM C728.

D. INSULATION ADHESIVE

1. POLYURETHANE FOAM INSULATION ADHESIVE

- a. SOPREMA DUOTACK 365: Two-component, polyurethane foam insulation adhesive, applied in ribbons from cartridges or two-component bulk packaging with pump-driven delivery system.
 - i Ribbon size: 1/2 in to 3/4 in wide.
 - ii Ribbon spacing: As required to meet specified wind uplift resistance performance.
 - a) Field plus Perimeter and Corners of Roof: 6 in on-centers

2.03 ACCESSORIES

A. INSULATION FASTENERS AND PLATES

1. SOPREMA #14 MP FASTENER and SOPREMA 3 IN INSULATION PLATE: Insulation system fasteners and metal stress plates.

2. SOPREMA #15 HD FASTENER and SOPREMA 3 IN INSULATION PLATE: Insulation system fasteners and metal stress plates.
3. SFS isoweld Fastener and Plate: Non-penetrating membrane fastener and plate.
4. TRUFAST Versa-Fast Fastener and Plate: Insulation system fasteners and metal stress plates.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examination includes visual observations, qualitative analysis, and quantitative testing measures as necessary to ensure conditions remain satisfactory throughout the project.
- B. Conduct qualitative insulation adhesive adhesion tests, or quantitative bonded pull tests as necessary to ensure satisfactory adhesion is achieved.
- C. The contractor shall examine all roofing substrates including, but not limited to: insulation materials, roof decks, walls, curbs, rooftop equipment, fixtures, and wood blocking.
- D. The applicator shall not begin installation until conditions have been properly examined and determined to be clean, dry and, otherwise satisfactory to receive specified roofing materials.
- E. During the application of specified materials, the applicator shall continue to examine all project conditions to ensure conditions remain satisfactory to complete the specified roofing system.

3.02 PREPARATION

- A. Before commencing work each day, the contractor shall prepare all roofing substrates to ensure conditions are satisfactory to proceed with the installation of specified roofing materials. Preparation of substrates includes, but is not limited to, substrate repairs, securement of substrates, eliminating all incompatible materials, and cleaning.
- B. Where conditions are found to be unsatisfactory, work shall not begin until conditions are made satisfactory to begin work. Commencing of work shall indicate contractor's acceptance of conditions.

3.03 INSULATION FASTENER APPLICATION

- A. Pre-secure Insulation and Cover-board to the deck using specified insulation fasteners and plates.
- B. Evenly distribute fasteners as required by the board manufacturer's published requirements.
- C. Fasten the insulation to meet the specified wind uplift resistance performance requirements and warranty requirements.
- D. Minimum insulation fastening requirement: 5 fasteners per 4x8 ft board.
- E. For insulation and Cover-boards located partially within the defined perimeter and/or corners, install fastening for the entire board as specified herein.

3.04 INSULATION ADHESIVE APPLICATION

- A. DUOTACK 365
 1. Apply the specified two-component insulation adhesive to adhere Insulation Layers and Cover-board to the deck and insulation substrate(s).
 2. Follow insulation adhesive product data sheets and published general requirements for installation requirements.

3. Apply insulation adhesive in uniform ribbons, 1/2 in to 3/4 in wide.
4. Immediately install insulation components into insulation adhesive and apply weight to ensure the materials maintain full contact with all ribbons for complete adhesion. Do not allow insulation adhesive to skin-over before placing the insulation materials into the adhesive.
5. Adhere the insulation system to meet the specified wind uplift resistance performance and specified warranty requirements.
6. Minimum insulation adhesive ribbon spacing:
 - a. Field plus Perimeter and Corners of Roof (Zone 1'): 6 in on-centers.

3.05 INSULATION SYSTEM APPLICATION

- A. Follow insulation system component product data sheets, published general requirements and, approvals.
- B. Install all insulation system components on clean, dry, uniform and, properly prepared substrates.
- C. All insulation system boards shall be carefully installed and fitted against adjoining sheets to form tight joints.
- D. Insulation system boards that must be cut to fit shall be saw-cut or knife-cut in a straight line, not broken. Chalk lines shall be used to cut insulation components. Uneven or broken edges shall not be accepted. Remove dust and debris that develops during cutting operations.
- E. Stagger successive layers of insulation 12 in vertically and laterally to ensure board joints do not coincide with joints from the layers above and below.
- F. Crickets, saddles, and tapered edge strips shall be installed before installing Cover-boards.
- G. Install tapered insulation, saddles and crickets as required to ensure positive slope for complete roof drainage.
- H. Cover-boards shall be installed to fit tight against adjacent boards. When required by the Cover-board manufacturer, a uniform gap shall be provided between Cover-boards using a uniform guide placed between board joints to form a gap between all boards during installation.
- I. The finished insulation system surface shall be tight to, and flush with, adjacent substrates to form a satisfactory substrate to install specified roof membrane and flashings.
- J. Install specified cants where required for membrane flashing transitions.

3.06 CLEAN-UP

- A. Clean-up and properly dispose of waste and debris resulting from these operations each day as required to prevent damages and disruptions to operations.

END OF SECTION

SECTION 072500 - WEATHER BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Building wrap.
 - 2. Metal roof underlayment at wood deck

1.2 SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

- A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide DuPont Building Innovations: E. I. du Pont de Nemours and Company; Tyvek CommercialWrap or a comparable product by one of the following:
 - a. Dow Chemical Company (The).
 - b. Raven Industries, Inc.
 - 2. Water-Vapor Permeance: Not less than 20 perms (1150 ng/Pa x s x sq. m) per ASTM E 96/E 96M, Desiccant Method (Procedure A).
 - 3. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.
- B. Building-Wrap Tape & Flashing: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 METAL ROOFING UNDERLAYMENT AT WOOD DECKS

- A. Refer to Specification Section 074113.16 for self-adhering waterproofing underlayment to be applied to wood/plywood roof decks.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Cover sheathing with water-resistive barrier as follows:
 - 1. Cut back barrier 1/2 inch (13 mm) on each side of the break in supporting members at expansion- or control-joint locations.
 - 2. Apply barrier to cover vertical flashing with a minimum 4-inch (100-mm) overlap unless otherwise indicated.
- B. Building Wrap: Comply with manufacturer's written instructions and warranty requirements.
 - 1. Seal seams, edges, fasteners, and penetrations with tape.
 - 2. Extend into jambs of openings and seal corners with tape.

END OF SECTION 072500

SECTION 074213.13 - FORMED METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Concealed fastener metal wall panels.
 - 2. Exposed fastener, lap-seam metal wall panels.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: 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.
- C. Warranties: Sample of special warranties.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.4 WARRANTY

- A. 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. 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 according to ASTM E 1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
 - 3. Deflection Limits: For wind loads, no greater than 1/180 of the span.

2.2 CONCEALED-FASTENER METAL WALL PANELS

- A. General: Provide factory-formed metal panels designed to be field assembled 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. Horizontal Ribbed Profile, Concealed Fastener Metal Wall Panels: Metal wall panel consisting of formed metal sheet with angled edges, shaped panel surface, installed by fastening concealed flange of panel to substrate, and lapping/hooking of next panel over concealed hook flange.
 - 1. Basis of Design: MBCI, MasterLine 16 Panel, www.mbc.com/pbr.html.
 - 2. Coverage Width: 16 inches.
 - 3. Major Rib Spacing: 4 inches on center.
 - 4. Panel Depth: 7/8 inch.
 - 5. Nominal Coated Thickness: 0.028 inch/24 gauge.
 - 6. Panel Surface: Smooth.
 - 7. Exterior Finish: Fluoropolymer system equal to KYNAR 500.
 - 8. Color: As selected by Architect from manufacturer's standard colors.
 - 9. Other Acceptable Manufacturers:
 - a. McElroy Metal, Inc.: Wave Panel.
 - b. Petersen Aluminum Corporation: PAC-CLAD Precision Series HWP 16.
- C. Flush Profile, Concealed Fastener Metal Wall Panels: Metal wall panel consisting of formed metal sheet with vertical edges, flat panel surface and two intermediate stiffening beads symmetrically placed between panel joints, installed by fastening female flange of panel to substrate, and inserting male edge of next panel into female slot of panel.
 - 1. Basis of Design: MBCI, FW120-2 with Beads Panel, www.mbc.com/pbr.html.
 - 2. Coverage Width: 12 inches.
 - 3. Major Rib Spacing: 12 inches on center.
 - 4. Panel Depth: 1-1/2 inch (and 1" with some manufacturers).
 - 5. Nominal Coated Thickness: 0.028 inch/24 gage.
 - 6. Panel Surface: Smooth.
 - 7. Exterior Finish: Fluoropolymer system equal to KYNAR 500.
 - 8. Color: As selected by Architect from manufacturer's standard colors.
 - 9. Other Acceptable Manufacturers:
 - a. McElroy Metal, Inc.: FW Series Panel with stiffening beads.
 - b. Petersen Aluminum Corporation: PAC-CLAD Flush Soffit Panel with stiffening beads.

2.3 EXPOSED-FASTENER, LAP-SEAM METAL WALL PANELS

- A. General: Provide factory-formed metal panels designed to be field assembled by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners and factory-applied sealant in side laps. Include accessories required for weathertight installation.
- B. Tapered-Rib-Profile, Exposed-Fastener Metal Roof Panels: Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs.

1. Basis-of-Design Product: Subject to compliance with requirements, provide MBCI; PBR Panel (generic R-Panel profile), or a comparable product by one of the following:
 - a. Architectural Metal Systems.
 - b. McElroy Metal, Inc.
2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Nominal Thickness: 26 gauge.
 - b. Exterior Finish: Signature 300 (Kynar).
 - c. Color: As selected by Architect from manufacturer's full range.
3. Major-Rib Spacing: 12 inches (305 mm) o.c.
4. Panel Coverage: 36 inches (914 mm).
5. Panel Height: 1.25 inches (32 mm).

2.4 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, 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, fasciae, 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 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 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; 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
 - 2. Joint Sealant: ASTM C 920; as recommended in writing by metal panel manufacturer.
 - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

2.5 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. 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.

2.6 FINISHES

- A. Panels and Accessories:
 - 1. Two-Coat Fluoropolymer: 0.2 – 0.3 mil primer with 0.7 – 0.8 mil, 70 percent PVDF resin by weight in color coat.
 - 2. Basis of Design: MBCI, Signature 300.
 - 3. Concealed Finish: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

3.2 METAL PANEL INSTALLATION

- A. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.
1. Lap ribbed or fluted sheets one full rib. 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.
 5. Flash and seal panels with weather closures at perimeter of all openings.
- B. 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.
- C. Metal Liner Panels: Install panels on [exterior side of girts, with girts exposed to the interior] [interior side of girts with flush appearance on the inside].
- D. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
- E. 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.

3.3 CLEANING

- 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.

END OF SECTION 074213.13

SECTION 074293 - SOFFIT PANELS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes metal soffit panels.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: 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.
- C. Samples: For each type of metal panel indicated.

1.3 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. Warranty Period: 20 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. 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 according to ASTM E 1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Other Design Loads: As indicated on Drawings.
 - 3. Deflection Limits: For wind loads, no greater than 1/120 of the span.
- B. 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): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METAL SOFFIT PANELS

- A. General: 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. Flush-Profile Metal Soffit Panels: Solid panels formed with vertical panel edges and intermediate stiffening "pencil" ribs symmetrically spaced between panel edges; with flush joint between panels.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide MBCI; a division of NCI Group, Inc., Artisan L12 with Beads, or a comparable product by one of the following:
 - a. McElroy Metals, Marquee-Lok, 12" panel with pencil ribs, 24 ga.
 - b. Pac-Clad, Flush Soffit, 12" panel with stiffener ribs, 24 ga.
 - c. Other prior approved products.
 2. Material: Same material and finish as metal roof panels.
 3. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Nominal Thickness: 24 gauge.
 - b. Exterior Finish: Two-coat fluoropolymer (Signature 300).
 - c. Color: As selected by Architect from manufacturer's full range.
 4. Panel Coverage: 12 inches (305 mm).
 5. Panel Height: 1.0 inch (25 mm).

2.3 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, 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; 1/8 inch (3 mm) thick.
 2. Joint Sealant: ASTM C 920; as recommended in writing by metal panel manufacturer.
 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

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. 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.

2.5 FINISHES

- A. Panels and Accessories:
 1. Two-Coat Fluoropolymer: 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: White or light-colored acrylic or polyester backer finish.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

1. Soffit Framing: Anchor wood stripping to supports, as required to comply with requirements for assemblies indicated.

3.2 METAL PANEL INSTALLATION

- A. Metal Soffit 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.
- B. 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.
- 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.
- 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 as indicated. Install work with laps, joints, and seams that are permanently watertight.

3.3 CLEANING

- 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.

END OF SECTION 074293

SECTION 075419 - POLYVINYL-CHLORIDE (PVC) ROOFING

PART 1 - GENERAL

1.01 SUMMARY

- A. Work shall include, but is not limited to, the following:
 - 1. PVC membrane, mechanically fastened.
 - 2. PVC membrane flashings, adhered.
 - 3. All related materials and labor required to complete specified roofing necessary to receive specified manufacturer's warranty.

1.02 RELATED SECTIONS

- A. Division 010000 – General Requirements
- B. Division 011000 – Summary of Work
- C. Division 072200 – Roof Insulation
- D. Division 076200 – Sheet Metal Flashing and Trim

1.03 DEFINITIONS

- A. ASTM D 1079 - Definitions of Term Relating to Roofing and Waterproofing.
- B. The National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual, Fifth Edition Glossary.

1.04 REFERENCES

- A. AMERICAN SOCIETY OF CIVIL ENGINEERS - Reference Document ASCE 7, Minimum Design Loads for Buildings and Other Structures.
- B. AMERICAN STANDARD OF TESTING METHODS (ASTM):
 - 1. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants
 - 2. ASTM D 751 - Standard Test Methods for Coated Fabrics.
 - 3. ASTM D 4434 - Standard for Polyvinyl Chloride Sheet Roofing.
 - 4. ASTM E 108 - Standard Test Methods for Fire Tests of Roof Coverings.
 - 5. ASTM E 1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
- C. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)::
 - 1. ANSI/SPRI FX-1, Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.
 - 2. ANSI/FM 4474- American National Standard for Evaluating the Simulated Wind Resistance of Roof Assemblies Using Static Positive and/or Negative Differential Pressures.
- D. COOL ROOF RATING COUNCIL (CRRC)
- E. FACTORY MUTUAL (FM):
 - 1. FM 4450 - Approval Standard - Class I Insulated Steel Roof Decks.
 - 2. FM 4470 - Approval Standard - Class I Roof Covers.
- F. INTERNATIONAL CODES COUNCIL (ICC):
 - 1. 2021 International Building Code (IBC).
- G. NATIONAL ROOFING CONTRACTORS' ASSOCIATION (NRCA).
- H. SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION INC. (SMACNA) Architectural Sheet Metal Manual.
- I. SINGLE PLY ROOFING INDUSTRY (SPRI)

- J. UNDERWRITERS LABORATORY (UL):
 - 1. UL 790 Standard Test Methods for Fire Tests of Roof Coverings.

1.05 ACTION SUBMITTALS

- A. Product Data Sheets: Submit manufacturer's product data sheets, installation instructions and/or general requirements for each component.
- B. Quality Compliance (QC)/Certificate of Analysis (COA): Submit manufacturers QC or COA signed by company's Quality Department certifying membrane materials meet the specified properties listed in the specification.
- C. Material Safety Data Sheets: Submit manufacturer's Material Safety Data Sheets (MDS) for each component.
- D. Sample/Specimen Warranty from the manufacturer and contractor.
- E. Shop Drawings: Provide roof plan and applicable roof system detail drawings.

1.06 INFORMATIONAL SUBMITTALS

- A. Contractor Certification: Submit written certification from roofing system manufacturer certifying that the applicator is authorized by the manufacturer to install the specified materials and system.

1.07 CLOSEOUT SUBMITTALS

- A. Warranty: Provide manufacturers and contractor's warranties upon substantial completion of the roofing system.

1.08 QUALITY ASSURANCE

- A. MANUFACTURER QUALIFICATIONS:
 - 1. Manufacturer shall have 20 years of experience manufacturing roofing materials.
 - 2. Trained Technical Field Representatives, employed by the manufacturer, independent of sales.
 - 3. Provide reports in a timely manner of all site visit reports.
 - 4. Provide specified warranty upon satisfactory project completion.
- B. CONTRACTOR QUALIFICATIONS:
 - 1. Contractor shall be authorized by the manufacturer to install specified materials prior to the bidding period through satisfactory project completion.
 - 2. Applicators shall have completed projects of similar scope using same materials as specified herein.
 - 3. Contractor shall provide full time, on-site superintendent or foreman experienced with the specified roof system through satisfactory project completion.
 - 4. Applicators shall be skilled in the application methods for all materials.
 - 5. Contractor shall maintain a daily record, on-site, documenting material installation and related project conditions.
 - 6. Contractor shall maintain a copy of all submittal documents, on-site, available always for reference.

1.09 DELIVERY, STORAGE AND HANDLING

- A. Refer to each product data sheet or other published literature for specific requirements.
- B. Deliver materials and store them in their unopened, original packaging, bearing the manufacturer's name, related standards, and any other specification or reference accepted as standard.

- C. Protect and store materials in a dry, well-vented, and weatherproof location. Only materials to be used the same day shall be removed from this location. During cold weather, store materials in a heated location, removed only as needed for immediate use.
- D. When materials are to be stored outdoors, store away from standing water, stacked on raised pallets or dunnage, at least 4 in or more above ground level. Carefully cover storage with "breathable" tarpaulins to protect materials from precipitation and to prevent exposure to condensation.
- E. Properly dispose of all product wrappers, pallets, cardboard tubes, scrap, waste, and debris. All damaged materials shall be removed from job site and replaced with new, suitable materials.

1.10 SITE CONDITIONS

A. SAFETY:

- 1. The contractor shall be responsible for complying with all project-related safety and environmental requirements.
- 2. Hot-air welding shall include heating the specified membrane ply using electric hot-air welding equipment. The contractor shall determine when and where conditions are appropriate to utilize hot-air welding equipment. When conditions are determined by the contractor to be unsafe to proceed, materials and methods shall be utilized to accommodate requirements and conditions.
- 3. The contractor shall refer to product Safety Data Sheets (SDS) for health, safety, and environment related hazards, and take all necessary measures and precautions to comply with exposure requirements.

B. ENVIRONMENTAL CONDITIONS:

- 1. Monitor substrate temperature and material temperature, as well as all environmental conditions such as ambient temperature, moisture, sun, cloud cover, wind, humidity, and shade. Ensure conditions are satisfactory to begin work and ensure conditions remain satisfactory during the installation of specified materials. Materials and methods shall be adjusted as necessary to accommodate varying project conditions. Materials shall not be installed when conditions are unacceptable to achieve the specified results.
- 2. Precipitation and dew point: Monitor weather to ensure the project environment is dry before, and will remain dry, during the application of roofing materials. Ensure all roofing materials and substrates remain above the dew point temperature as required to prevent condensation and maintain dry conditions.
- 3. Hot-air Welding Application: Take all necessary precautions and measures to monitor conditions to ensure all environmental conditions are safe to proceed with the use hot-air welding equipment. Combustibles, flammable liquids, and solvent vapors that represent a hazard shall be eliminated and primers shall be fully dry before proceeding with hot air welding operations.

1.11 PERFORMANCE REQUIREMENTS

A. WIND UPLIFT RESISTANCE:

- 1. Performance testing shall be in accordance with ANSI/FM 4474, FM 4450, FM 4470, UL 580 or UL 1897.
 - a. Roof System Design Pressures: Calculated by the roof system manufacturer in accordance with ASCE 7-16, or applicable standard, for the specified roof system attachment requirements:

B. FIRE CLASSIFICATION:

- 1. Performance testing shall be in accordance with UL 790, ASTM E108, FM 4450 or FM 4470 to meet the 1/4:12 roof slope requirement.
 - a. Meets requirements of UL Class A or FM Class A.

2. Performance testing shall be in accordance with UL 1256, FM 4450, or FM 4470 to meet the specified requirements for interior flame spread and fuel contribution.
 - a. Meets requirements of UL 1256, or FM Class 1.
 - C. ROOF SLOPE:
 1. Finished roof slope for PVC surfaces shall provide positive movement for roof drainage.
 - D. IMPACT RESISTANCE:
 1. Performance testing for impact resistance shall be in accordance with FM 4450, FM 4470, or ASTM D4272 to meet the specified impact resistance requirements.
 - a. Meets requirements for FM-SH (Severe Hail).
 - E. COOL ROOF RATING COUNCIL (CRRC):
 1. SOPREMA® SENTINEL® P150 smooth backed, bright white PVC membrane shall be listed by the Cool Roof Rating Council (CRRC) with the following minimum published values:

a. Solar Reflectance:	Initial: 0.85	3 Year: 0.73
b. Thermal Emittance:	Initial: 0.89	3 Year: 0.88
c. Solar Reflectance Index (SRI):	Initial: 108	3 Year: 90
- 1.12 WARRANTY
- A. Manufacturer's No Dollar Limit (NDL) Warranty. The manufacturer shall provide the owner with the manufacturer's warranty providing labor and materials to for 20-years from the date the warranty is issued.
 - B. The contractor shall guarantee the workmanship and shall provide the owner with the contractor's warranty covering workmanship for a period of 2 years from completion date.

PART 2 - PRODUCTS

2.01 MANUFACTURER

- A. PRODUCT QUALITY ASSURANCE PROGRAM: Manufacturer shall be an ISO 9001 registered company.
- B. ACCEPTABLE ROOFING SYSTEM MANUFACTURERS:
 1. Soprema
 2. Duro-Last
 3. Carlisle Syntec

2.02 PVC MEMBRANES

- A. MECHANICALLY FASTENED MEMBRANE:
 1. PVC MEMBRANE, MECHANICALLY ATTACHED
 - a. SENTINEL® P150: Polyester reinforced, thermoplastic polyvinyl chloride (PVC) membrane with a smooth back underside. Overall Thickness ASTM D4434 (ASTM D638): 60 mils minimum
 - i Manufacturer shall provide membrane at specified minimum 60 mils
 - ii ASTM D4434 +/- tolerance for membrane thickness will not be accepted.
 - iii Thickness over Scrim (ASTM D7635): 30 mils minimum
 - a) Manufacturer shall provide membrane with minimum 30 mils compound thickness above reinforcement/scrim
 - iv Width: 5 ft or 10 ft

- v Length: 100 ft (30.5 m)
 - vi Physical Properties ASTM D4434.
 - a) Breaking Strength, lbf/in: 430 (MD) 300 (XMD)
 - b) Elongation at Break - %: 25 (MD) 25(XMD)
 - c) Tear Strength, lbf: 150 (MD) 80 (XMD)
 - d) Linear Dimensional Change - %: <0.1%
 - vii Color: White
2. PVC FLASHING, ADHERED:
- a. SENTINEL® P150: Polyester reinforced, thermoplastic polyvinyl chloride (PVC) membrane with a smooth back underside. Overall Thickness ASTM D4434 (ASTM D638): 60 mils minimum
 - i Manufacturer shall provide membrane at specified minimum 60 mils
 - ii ASTM D4434 +/- tolerance for membrane thickness will not be accepted.
 - iii Thickness over Scrim (ASTM D7635): 30 mils minimum
 - a) Manufacturer shall provide membrane with minimum 30 mils compound thickness above reinforcement/scrim
 - iv Width: 10 ft (3.0 m)
 - v Length: 100 ft (30.5 m)
 - vi Physical Properties ASTM D4434.
 - a) Breaking Strength, lbf/in: 430 (MD) 300 (XMD)
 - b) Elongation at Break - %: 25 (MD) 25(XMD)
 - c) Tear Strength, lbf: 150 (MD) 80 (XMD)
 - d) Linear Dimensional Change - %: <0.1%
 - vii Color: White

2.03 ACCESSORIES

A. FLASHING ADHESIVES:

- 1. BONDING ADHESIVE: Solvent-based adhesive. Formulated to adhere smooth back PVC flashings.
 - a. VOC Content: 199.5 g/L or less.

B. SEALANTS:

- 1. Universal Sealant: Gun grade, moisture curing, polyether, elastomeric sealant for SENTINEL® PVC membrane terminations.
 - a. VOC Content: 20 g/L or less
 - b. Meets or exceeds ASTM C920, Type S, Grade NS, Class 25
 - c. Color: White

- 2. BUTYL SEALANT TAPE: Butyl rubber and polyisobutylene water resistant sealant tape for concealed sheet metal joints and water cutoff.

- C. BUTYL SEALANT: Butyl rubber and polyisobutylene water resistant sealant for concealed sheet metal joints and water cutoff.

D. MEMBRANE FASTENERS AND PLATES

- 1. SOPREMA® SOPRAPHIX® #15 HD Fastener: Membrane fastener.
- 2. SOPREMA® SOPRAPHIX® 2.4 IN STRESS PLATE: Membrane seam plate.
- 3. SFS isoweld Fastener and Plate: Non-penetrating membrane fastener and plate.

E. MEMBRANE ACCESSORIES:

- 1. 60 MIL PVC DETAILING MEMBRANE: Fiberglass reinforced, thermoplastic polyvinyl chloride (PVC) membrane with a smooth back underside.
 - a. Overall Thickness ASTM D4434 (ASTM D638): 60 mils minimum
 - i Colors: White

- ii Size: 2.5 ft x 100 ft (0.76 m x 30 m)
 - 2. T-JOINT PATCHES: 4.5 in Round T-Joint Patch
 - a. Color: White
 - 3. PVC PIPE FLASHING: Prefabricated PVC pipe flashing.
 - a. Size: Size as required.
 - b. Color: White
 - 4. PVC SPLIT PIPE BOOT: Prefabricated PVC pipe flashing.
 - a. Size: 1"-6"
 - b. Color: White
 - 5. PVC CLOSED PIPE BOOT: Prefabricated PVC pipe flashing.
 - a. Size: 1"-6"
 - b. Color: White
 - 6. PVC SPLIT PIPE BOOT: Prefabricated PVC pipe flashing.
 - a. Size: 6"-12"
 - b. Color: White
 - 7. PVC CLOSED PIPE BOOT: Prefabricated PVC pipe flashing.
 - a. Size: 6"-12"
 - b. Color: White
 - 8. WALKWAY PAD: PVC walkway protection mat.
 - a. Width: 30 in (0.762 m)
 - b. Length: 50 ft (15.24 m)
 - c. Color: Grey
- F. SHEET METAL FLASHING:
- 1. Contractor shall furnish all sheet metal flashings, counter flashings, roof edge system, and all other related sheet metal flashings and associated fasteners necessary to flash and counter flash the specified roofing system.
 - 2. Sheet metal flashing materials and fasteners shall be compatible with adjacent materials, to accommodate all project related exposures.
 - 3. Vinyl Coated Metal: 24-gauge galvanized sheet steel with a 20 mil, UV-resistant PVC coated topside.
 - a. SOPREMA® SENTINEL® VCM: PVC coated metal.
 - i Width: 4 ft (1.219 m)
 - ii Length: 10 ft (3.048 m)
 - iii Color: White
 - 4. Pre-Finished (Mill Finished) Sheet Metal Flashing Material: Aluminum or Galvanized Steel.
 - 5. Roof Edge System: Tested per ANSI/SPRI ES-1 to exceed design pressures at roof edge.
- G. LIQUID-APPLIED REINFORCED FLASHING SYSTEM:
- 1. Catalyzed polymethyl methacrylate (PMMA) resin with polyester reinforcing fleece fabric fully embedded into the resin to form fully reinforced waterproofing membrane flashings.
 - a. VOC Content: No VOC content.
 - b. Polymethyl methacrylate (PMMA) liquid resin.
 - c. CATALYST POWDER: Reactive agent added to the PMMA liquid resin to induce curing.
 - d. FLEECE: Polyester reinforcement fabric.
 - e. Color: Flash color and finish to match Field.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examination includes visual observations, qualitative analysis, and quantitative testing measures as necessary to ensure conditions remain satisfactory throughout the project.

- B. The contractor shall examine all roofing substrates including, but not limited to: insulation materials, roof decks, walls, curbs, rooftop equipment, fixtures, and wood blocking.
- C. The applicator shall not begin installation until conditions have been properly examined and determined to be clean, dry and, otherwise satisfactory to receive specified roofing materials.
- D. During the application of specified materials, the applicator shall continue to examine all project conditions to ensure conditions remain satisfactory to complete the specified roofing system.

3.02 PREPARATION

- A. Before commencing work each day, the contractor shall prepare all roofing substrates to ensure conditions are satisfactory to proceed with the installation of specified roofing materials. Preparation of substrates includes, but is not limited to, substrate repairs, securement of substrates, eliminating all incompatible materials, and cleaning.
- B. Where conditions are found to be unsatisfactory, work shall not begin until conditions are made satisfactory to begin work. Commencing of work shall indicate contractor's acceptance of conditions.

3.03 HOT-AIR WELDING

- A. The Contractor is responsible for project safety. Hot air shall be used to seal membrane side and end laps. Refer to NRCA CERTA, local codes and building owner's requirements for hot work operations.
- B. Position the membrane so that it overlaps the adjacent membrane at the required side lap width. Ensure the laps are dry, clean, and free of foreign material.
- C. Weld the laps together with an automatic welding machine or hand welder maintaining a minimum 1.5 in continuous weld. All seams shall be inspected for a continuous weld.
- D. At end-laps of bare back membranes, round the corners by cutting a radius on both corners.
- E. Fleece back membrane end laps shall be butted to one another and a 6 in membrane cover strip welded on top.
- F. SOPREMA® T-JOINT PATCHES shall be hot-air welded to the membrane at all t-joint intersections. Chamfer the welding seam prior to installing T-Joint patches using an edging tool or by heating the edge and rolling.
- G. SOPREMA® SENTINEL® PVC CUT EDGE SEALANT shall be installed at all non-factory cut edges.

3.04 MECHANICALLY FASTENED MEMBRANE APPLICATION

- A. Refer to agency approvals for fastening and other system requirements.
- B. Follow product data sheets and published detail requirements for additional installation instructions.
- C. Ensure environmental conditions are satisfactory, and will remain satisfactory, during the application.
- D. Starting at the low point of the roof, lay out the membrane to ensure the plies are installed perpendicular to the roof slope, shingled to prevent back-water laps.
- E. Remove all wrinkles from the sheet.
- F. Ensure all roofing and flashing substrates are prepared and acceptable to receive the mechanically fastened membrane.
- G. Ensure the specified side-lap and end-lap widths are maintained. End-laps should be staggered 3 ft. apart.
- H. Starting at one end of the sheet, install the mechanical fasteners in the 6 in side-lap 2 in from the edge of the sheet to the center of the fastener. Ensure spacing between fasteners in the laps meets specified wind uplift resistance requirements.
- I. Do not over-drive fasteners. Install fasteners as necessary to firmly set the fastener and seam plate tight against the sheet. Prevent wrinkles from forming in the sheet as the fasteners are installed.

- J. At the end of the sheet where it terminates at roof edges, walls, and curbs, fasten the perimeter of the membrane with appropriate fasteners and seam plates to the deck or vertical surface at the base of the upstand.
- K. Hot air weld all side and end laps.
- L. When rows of fasteners are installed through the membrane at perimeter and corner enhancements for example, a minimum 8 in wide sealing strip shall cover the fasteners. The sealing strip shall be hot air welded to the membrane with a minimum 1.5 in continuous weld on all sides.
- M. Temporary night seals are required to seal membrane and flashing terminations watertight. Temporary night seals should be removed upon resuming the installation.
- N. Probe all seams/laps once the hot air welds have thoroughly cooled.
- O. Repair all seam deficiencies the same day they are discovered.

3.05 PVC FLASHING MEMBRANE APPLICATION

- A. Follow material product data sheets and published general requirements for installation instructions.
- B. Ensure field membrane is fastened and secure to the substrate at all membrane terminations before PVC flashing is installed.
- C. Ensure PVC membrane and substrates are dry, clean, and free of asphalt and all bitumen-based products. Do not allow bare PVC to meet asphalt or bitumen-based products.
- D. Where required, cover walls and other flashing substrates using specified wood, gypsum or cement roof boards securely fastened in place.
- E. The ambient temperature shall be above 40°F (4.4°C) during adhesive application. Ensure temperature is well above the dew point temperature to prevent condensation during adhesive application.
- F. Apply SOPREMA® SENTINEL® S BONDING ADHESIVE using 3/8 in nap solvent resistant rollers to clean, dry and prepared flashing substrates, and onto the underside of the bare PVC membrane. Refer to product data sheet for application rate.
- G. Prevent adhesive from contacting the membrane at the side and end-laps that are to be hot-air welded.
- H. Allow the adhesive on both surfaces to dry to the touch. Adhesive may be tacky to-the-touch, but not wet. Adhesive should not transfer to the fingertips when touched.
- I. Mate the PVC flashing membrane to the flashing substrate. Prevent air entrapment and wrinkles. Apply pressure with hands, roller, or broom to ensure complete adhesion.
- J. Hot air weld all laps with minimum 1-1/2 in welds.
- K. Probe all seams/laps once the hot air welds have thoroughly cooled.
- L. Repair all seam deficiencies the same day they are discovered
- M. Fasten top leading edge of vertical PVC flashings. Refer to detail drawings.

3.06 LIQUID-APPLIED, PMMA MEMBRANE AND FLASHING SYSTEM APPLICATION

- A. Refer to manufacturer's details drawings, product data sheets and published general requirements for application rates and specific installation instructions.
- B. PVC membrane preparation:
 - 1. Ensure the PVC field membrane is fastened and secure to the substrate at all membrane terminations before liquid-applied flashing is installed.
 - 2. Install a welded PVC cover-strip over fasteners where applicable. Ensure cover-strip is welded tight, with no loose ends or open laps.
 - 3. Ensure PVC membrane and substrates are dry, clean, and free of asphalt and all bitumen-based products. Do not allow bare PVC to meet asphalt or bitumen-based products.
 - 4. Lightly abrade the PVC membrane surface where liquid-applied membrane is to be applied.
 - 5. Wipe PVC membrane surface clean using CLEANER and allow too fully dry.

- C. Pre-cut FLEECE polyester reinforcing fleece to conform to roof terminations, transitions and penetrations being flashed. Ensure a minimum 2 in overlap of fleece at side and end-laps. Ensure the completed liquid-applied flashing membrane is fully reinforced.
- D. Apply the base coat of catalyzed resin onto the substrate using a brush or roller, working the material into the surface for complete coverage and full adhesion.
- E. Immediately apply the FLEECE reinforcing into the wet base coat of resin. Using a brush or roller, work the FLEECE reinforcing fabric into the wet resin while applying the second coat of catalyzed resin to completely encapsulate the fleece.
- F. Refer to reinforced, PMMA specification section and application instructions, details drawings, product data sheets and published general requirements for complete installation instructions.

3.07 SHEET METAL FLASHING APPLICATION

- A. Refer to sheet metal flashing detail drawings and follow product data sheets and published general requirements for installation instructions.
- B. Follow the most recent edition of the SMACNA Architectural Sheet Metal Manual for fabrication and installation requirements.

3.08 WALKWAYS

- A. At areas outlined on the drawings, and around the perimeter of all rooftop equipment and at all door and stair landings, install walkway protection.
- B. Cut walkway from end of SOPREMA® SENTINEL® WALKWAY PAD.
- C. Hot air weld the entire perimeter of the SOPREMA® SENTINEL® WALKWAY PAD to the membrane.

3.09 CLEAN-UP

- A. Clean-up and properly dispose of waste and debris resulting from these operations each day as required to prevent damages and disruptions to operations.

END OF SECTION

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Formed low-slope roof sheet metal fabrications.
 - 2. Formed roof-drainage sheet metal fabrications.
 - 3. Formed wall sheet metal fabrications.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For sheet metal flashing and trim.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Distinguish between shop- and field-assembled work.
 - 3. Include identification of finish for each item.
 - 4. Include pattern of seams and details of termination points, expansion joints and expansion-joint covers, direction of expansion, roof-penetration flashing, and connections to adjoining work.
- C. Samples: For each exposed product and for each color and texture specified.

1.3 QUALITY ASSURANCE

- A. Fabricator Qualifications: 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. Mockups: Build mockups to verify selections made under Sample submittals to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical roof gutter, including fascia trim, approximately 12" long.

1.4 WARRANTY

- A. Special Warranty on Finishes: 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: Minimum 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.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Sheet Metal Standard for Copper: Comply with CDA's "Copper in Architecture Handbook." Conform to dimensions and profiles shown unless more stringent requirements are indicated.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Exposed Coil-Coated Finish:
 - a. 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. Equal to KYNAR 500.
 - 2. Color: As selected by Architect from manufacturer's full range. Note: Use the same product and finish as supplied by the manufacturer of adjacent metal panels.

2.3 UNDERLAYMENT MATERIALS

- A. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as

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. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - 2. Fasteners for Zinc-Coated (Galvanized) and/or Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- D. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane polymer sealant; 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. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.

2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 1. Obtain field measurements for accurate fit before shop fabrication.
 - 2. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - 3. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.
- C. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

- D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- E. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.
- F. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Roof Edge Flashing: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long sections. Furnish with 6-inch-wide, joint cover plates.
 - 1. Fabricate from the Following Materials:
 - a. Galvanized Steel: 0.028 inch thick.
 - b. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.
- B. Roof-Penetration Flashing: Fabricate from the following materials:
 - 1. Galvanized Steel: 0.028 inch thick.
 - 2. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

PART 3 - EXECUTION

3.1 UNDERLAYMENT INSTALLATION

- A. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, according to manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.

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, 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, levels, and slopes. 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 apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 - 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 - 5. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting

contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.3 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- C. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.4 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.

END OF SECTION 076200

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Manufactured units for the following applications:

1. Roof-edge specialties.
2. Counterflashing specialties.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 SUBMITTALS

- A. Product data.

- B. Shop Drawings: For roof specialties.

1. Plans, expansion-joint locations, keyed details, and attachments to other work. Distinguish between factory pre-manufactured- and field-assembled installation.
2. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
4. Details of termination points and assemblies, including fixed points.
5. Details of special conditions.

- C. Samples: For each type of roof specialty indicated with factory-applied color finishes.

- D. Product test reports.

- E. Sample warranty.

- F. Maintenance data.

1.4 WARRANTY

- A. Roofing-System Warranty: Roof specialties are included in warranty provisions in Section 075419.

- B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

- a. Color fading more than 5 Delta E 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. General Performance: Roof specialties to withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. SPRI Wind Design Standard: Manufacture and install copings and roof-edge specialties tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressures:
 1. Design Pressure: As indicated on Drawings.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 ROOF-EDGE SPECIALTIES

- A. Single-Ply Flat Canted Roof Edge Fascia: Manufactured, two-piece, canted roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 ft. (3.6 m) and a continuous 24 gauge galvanized metal waterdam, and extruded aluminum metal receiver cleat to engage fascia cover and secure PVC roof membrane. Provide matching corner units.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Metal-Era, Inc.; Anchor-Tite Extended Canted Fascia, 5½ inch height, or a comparable product by one of the following:
 - a. Johns Manville.
 - b. Hickman; an MTL Company.
 2. Metallic-Coated Steel Fascia Covers: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, nominal 24 gauge.
 - a. Surface: Smooth, flat finish.
 - b. Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
 3. Corners: Factory mitered and mechanically clinched and sealed watertight.

4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
5. Receiver: Extruded aluminum.
6. Special Fabrications: N/A.
7. Fascia Accessories: N/A.

2.3 COUNTERFLASHING SPECIALTIES

A. Surface-Mounted Counterflashings: Manufactured, two-piece, counterflashings consisting of spring-lock metal flashing cover with integral drip-edge in section lengths not exceeding 12 ft. (3.6 m) and a continuous metal surface-mounted receiver with birdsmouth top for sealant. Provide matching corner units.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Metal-Era, Inc.; "Counter-Flash", 2-piece surface-mounted version counterflashing, Model CFW2-400R, 4 inch height, or a comparable product by one of the following:
 - a. EXCEPTIONAL Metals.
 - b. Hickman; an MTL Company.
2. Metallic-Coated Steel Components: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, nominal 24 gauge.
 - a. Surface: Smooth, flat finish.
 - b. Finish: Two-coat fluoropolymer.
 - c. Color: As selected by Architect from manufacturer's full range.
3. Corners: Factory mitered and mechanically clinched and sealed watertight.
4. Splice Plates: Concealed, of same material, finish, and shape as flashing components.

2.4 SHEET METAL MATERIALS

- A. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with minimum ASTM A653/A653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with minimum ASTM A792/A792M, Class AZ50 (Class AZM150) coating designation; structural quality..
1. Exposed Coil-Coated Finish: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer Finish: AAMA 2605. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight in color coat.
 2. Concealed Finish: Pretreat with 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).

2.5 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

- B. Fasteners: Roof specialty manufacturer's recommended fasteners, designed to meet performance requirements, suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:
 - 1. Fasteners for Metallic-Coated Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel in accordance with ASTM A153/A153M or ASTM F2329/F2329M.
 - 2. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
- C. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- D. Elastomeric Sealant: ASTM C920, elastomeric polyurethane or silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.
- E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA AMP 500, "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 unacceptable. 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 INSTALLATION, GENERAL

- A. Install roof specialties in accordance with manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
 - 3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
 - 4. Torch cutting of roof specialties is not permitted.
 - 5. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous

coating or by other permanent separation as recommended by manufacturer's written installation instructions.

1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 ft. (3.6 m) with no joints within 18 inches (450 mm) of corners or intersections unless otherwise indicated on Drawings.
2. When ambient temperature at time of installation is 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.

D. Fastener Sizes: Use fasteners of sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.

E. Seal concealed joints with butyl sealant as required by roof specialty manufacturer.

F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F (4 deg C).

3.2 INSTALLATION OF ROOF-EDGE SPECIALTIES

- A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.3 INSTALLATION OF COUNTERFLASHING SPECIALTIES

- A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor counterflashings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements. Color-match all exposed fasteners to the counterflashing material.
- C. Install manufacturer's recommended sealants as detailed on the drawings.

3.4 CLEANING AND PROTECTION

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing in accordance with ASTM A780/A780M.
- B. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with Section 099113 "Exterior Painting."

- C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
- D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 077100

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in horizontal assemblies.
 - 3. Penetrations in smoke barriers.

1.2 SUBMITTALS

- A. Product Data: For each type of product, including test reports.
- B. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear UL classification marking of systems listed in the Underwriters Laboratory Fire Resistance Directory.

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Fire Protection Products.
 - b. Hilti, Inc.
 - c. RectorSeal.
 - d. Tremco, Inc.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
- E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- C. Install forming 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.
 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- D. Install fill materials by proven techniques to produce the following results:
 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.

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 the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.2 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.

3.3 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

END OF SECTION 078413

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Mildew-resistant joint sealants.
5. Latex joint sealants.

1.2 SUBMITTALS

- A. Product Data: For each joint-sealant product, along with test reports.
- B. Samples: For each kind and color of joint sealant required.

1.3 WARRANTY

- A. Warrant the work specified herein for two years against becoming unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials or workmanship.
1. Warranty Period: Two years from date of Substantial Completion.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Installer shall be experienced in building sealant installation whose work has resulted in a record of successful performance.
- B. Source Limitations: If at all possible, obtain each type of building sealant through one source from a single manufacturer.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; DOW CORNING® 786 SILICONE SEALANT -.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS1700 Sanitary.
 - c. Tremco Incorporated; Tremsil 200.
- B. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; DOW CORNING® 758 SILICONE WEATHER BARRIER SEALANT.
 - b. GE Construction Sealants; Momentive Performance Materials Inc.; SCS2350.
 - c. Sherwin-Williams Company (The); Silicone Rubber All Purpose Sealant.

2.3 URETHANE JOINT SEALANTS

- A. Urethane, M, NS, 25, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Use NT.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Corporation; Construction Systems; MasterSeal NP 2 (Pre-2014: Sonolastic NP2).
 - b. Sherwin-Williams Company (The); Stampede-2NS.

2.4 ACRYLIC LATEX MILDEW RESISTANT JOINT SEALANTS

- A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Pecora Corporation; AC-20.
 - b. Sherwin-Williams Company (The); 950A Siliconized Acrylic Latex Caulk, White.
 - c. Tremco Incorporated; Tremflex 834.

2.5 JOINT-SEALANT BACKING

- A. 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.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Corporation; Construction Systems; MasterSeal 920 & 921(Pre-2014: Sonolastic Backer Rod).
 - b. Construction Foam Products; a division of Nomaco, Inc.; SOF Bi-Cellular, HBR Closed Cell, OC Foam Open Cell as required by condition.
- B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 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 laitance and form-release agents from concrete.
 2. 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.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

3.2 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with ASTM C 1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. 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.

- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- 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 in 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 to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 1. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.3 CLEANING

- A. Clean adjacent surfaces of sealant as work progresses, using solvent or cleaning agents recommended by manufacturer. Avoid staining sealant or adjacent surfaces. Leave all finished work in a neat, clean condition.

END OF SECTION 079200

SECTION 079513.13 - EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Interior expansion joint cover assemblies.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each expansion joint cover assembly.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Furnish units in longest practicable lengths to minimize field splicing.
- B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion joint cover assemblies.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Expansion joint cover assemblies shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
- B. Fire-Resistance Ratings: Provide expansion joint cover assemblies with fire barriers identical to those of systems tested for fire resistance according to UL 2079 or ASTM E 1966 by a qualified testing agency.
 - 1. Hose Stream Test: Wall-to-wall and wall-to-ceiling assemblies shall be subjected to hose stream testing.
- C. Expansion Joint Design Criteria:
 - 1. Type of Movement: Thermal.
 - a. Nominal Joint Width: As indicated on Drawings.
 - b. Minimum Joint Width: As indicated on Drawings.
 - c. Maximum Joint Width: As indicated on Drawings.

2. Type of Movement: Seismic.
 - a. Joint Movement: As indicated on Drawings.

2.3 FLOOR EXPANSION JOINT COVERS

- A. Metal-Plate Floor Joint Cover: Metal cover plate fixed on one side of joint gap and free to slide on other.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Balco; a CSW Industries Company; floor-floor and floor-wall covers, or comparable products by one of the following:
 - a. Construction Specialties, Inc.
 - b. MM Systems Corporation.
 2. List of floor expansion joint cover types as scheduled and required:
 - a. Floor/Floor: Balco Type NBR-1x18.
 - b. Floor/Floor: Balco Type GF-2P saddle.
 - c. Floor/Wall: Balco Type NBRL-1x18.
 3. Application: Floor to floor and floor to wall.
 4. Installation: Mounted as detailed.
 5. Exposed Metal: Clear anodized aluminum.

2.4 MATERIALS

- A. Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063-T5 for extrusions; ASTM B 209 (ASTM B 209M), Alloy 6061-T6 for sheet and plate.
- B. Elastomeric Seals: Manufacturer's standard preformed elastomeric membranes or extrusions to be installed in metal frames.
- C. Fire Barriers: Any material or material combination, to comply with performance criteria for required fire-resistance rating.
- D. Moisture Barrier: Manufacturer's standard, flexible elastomeric material.
- E. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M.

2.5 ALUMINUM FINISHES

- A. Mill finish.
- B. Clear Anodic Finish: AAMA 611, [AA-M12C22A41, Class I, 0.018 mm] [AA-M12C22A31, Class II, 0.010 mm] or thicker.
- C. Color Anodic Finish: AAMA 611, [AA-M12C22A42/A44, Class I, 0.018 mm] [AA-M12C22A32/A34, Class II, 0.010 mm] or thicker.

2.6 ACCESSORIES

- A. Moisture Barriers: Manufacturer's standard continuous, waterproof membrane within joint and attached to substrate on sides of joint.
 - 1. Provide where indicated on Drawings.
- B. Manufacturer's standard attachment devices, as indicated or required for complete installations.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Prepare substrates according to expansion joint cover assembly manufacturer's written instructions.
- B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion joint cover assemblies.
- C. Comply with manufacturer's written instructions for storing, handling, and installing expansion joint cover assemblies and materials unless more stringent requirements are indicated.
- D. Metal Frames: Perform cutting, drilling, and fitting required to install expansion joint cover assemblies.
 - 1. Repair or grout block out as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
 - 2. Install frames in continuous contact with adjacent surfaces.
 - a. Shimming is not permitted.
 - 3. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
 - 4. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation.
 - 5. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
 - 6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches (75 mm) from each end and not more than 24 inches (600 mm) o.c.
- E. Seals: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.
 - 1. Provide in continuous lengths for straight sections.
 - 2. Seal transitions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
 - 3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- F. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.

- G. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.
- H. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion joint cover assembly materials and associated work so complete assemblies comply with performance requirements.
 - 1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.
- I. Moisture Barrier Drainage: If indicated, provide drainage fittings and connect to drains.

3.2 PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete.
- B. Protect the installation from damage by work of other Sections.

END OF SECTION 079513.13

DIVISION 8 – DOORS AND WINDOWS

081113	HOLLOW METAL DOORS AND FRAMES
081416	FLUSH WOOD DOORS
083313	COILING COUNTER DOORS
084113	ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS
087100	DOOR HARDWARE
088000	GLAZING
089119	FIXED LOUVERS

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes hollow-metal work.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include elevations, door edge details, frame profiles, metal thicknesses, preparations for hardware, and other details.
- C. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Amweld International, LLC.
 - 2. Ceco Door; ASSA ABLOY.
 - 3. Curries Company; ASSA ABLOY.
 - 4. Mesker Door Inc.
 - 5. MPI Group, LLC (The).
 - 6. North American Door Corp.
 - 7. Philipp Manufacturing Co (The).
 - 8. Premier Products, Inc.
 - 9. Republic Doors and Frames.
 - 10. Steelcraft; an Allegion brand.

2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

- B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 INTERIOR DOORS AND FRAMES

- A. Heavy-Duty Doors and Frames: SDI A250.8, Level 2.

1. Physical Performance: Level B according to SDI A250.4.
2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Rust-resistant treated cold-rolled steel sheet, minimum thickness of 0.042 inch.
 - d. Edge Construction: Model 1, Full Flush with joints sealed, ground smooth and filled.
 - e. Core: Mineral board or other non-combustible core fill material. Provide steel stiffener channels welded to face sheets.
 - f. NOTE FOR TORNADO SHELTER DOORS: All doors shall be a minimum 14 gauge.
3. Frames:
 - a. Materials: Rust-resistant steel sheet, minimum thickness of 0.053 inch.
 - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: Full profile welded.
 - d. NOTE FOR TORNADO SHELTER FRAMES: All frames shall be a minimum 14 gauge.
4. Exposed Finish: Factory primer applied and baked-on over rust-resistant steel, using the Bonderite or Parkerizing systems.

2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Heavy-Duty Doors and Frames: SDI A250.8, Level 2. [At locations indicated in the Door and Frame Schedule] <Insert locations>.
1. Physical Performance: Level B according to SDI A250.4.
 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch, with minimum A60 coating.
 - d. Edge Construction: Model 1, Full Flush with joints sealed, ground smooth and filled.
 - e. Core: Polyurethane foamed in-place to achieve an R-11 value.

3. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60 coating.
 - b. Construction: Full profile welded.
4. Exposed Finish: Fabricate from galvanized steel. Prime welds with Galvacron. . Factory primer applied and baked-on over rust-resistant steel, using the Bonderite or Parkerizing systems.

2.5 BORROWED LITES

- A. Hollow-metal frames of rust-resistant steel sheet, minimum thickness of 0.053 inch. Exposed finish shall be factory primer applied and baked-on over rust-resistant steel, using the Bonderite or Parkerizing systems.
- B. Construction: Full profile welded.

2.6 FRAME ANCHORS

- A. Jamb Anchors:
 1. Masonry Type: T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long.
 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
 4. Post-installed Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.053 inch, and as follows:
 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
 2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.7 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.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z 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. Power-Actuated Fasteners in Concrete: From corrosion-resistant materials.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing).
- I. Glazing: Section 088000 "Glazing."

2.8 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 metal thickness. 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. Hollow-Metal Doors:
 1. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints, grind smooth and fill all edges of doors against water penetration.
 2. Astragals (if required): Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated.
- C. 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. Sidelite 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.
 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

- b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - c. Compression Type: Not less than two anchors in each frame.
 - d. Post-installed Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
 - 6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers.
 - 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.
- D. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- E. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted hairline joints.
 - 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
 - 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 - 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 - 4. Provide loose stops and moldings on inside of hollow-metal work.
 - 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.9 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard baked-on primer using the Bonderite or Parkerizing system.
 - 1. Shop Primer: SDI A250.10.

2.10 ACCESSORIES

- A. Louvers: Provide sightproof louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of 0.020-inch-thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.

1. Fire-Rated Automatic Louvers (if required): Movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated.
- B. Mullions and Transom Bars: Join to adjacent members by welding and grinding smooth.
- C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 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-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 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 plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.
 3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
 6. In-Place Concrete or Masonry Construction: Secure frames in place with post-installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
 7. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
 8. 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, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- B. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
 - c. At Bottom of Door: 5/8 inch plus or minus 1/32 inch.
 - d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 - 3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.
- C. Glazing: Comply with installation requirements in Section 088000 "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 o.c. and not more than 2 inches o.c. from each corner.

3.2 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 Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
- E. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with plastic-laminate faces.
2. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:

1. Section 088000 "Glazing" for glass view panels in flush wood doors.

1.2 SUBMITTALS

A. Product Data: For each type of door.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Fire-protection ratings for fire-rated doors.

C. Samples: For plastic-laminate door faces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

Manufacturers listed are representative only; many others make flush wood doors. See WDMA's and AWI's Web sites for listings of door manufacturers. Retain only manufacturers offering doors complying with requirements selected for each type used, and insert other manufacturers offering suitable products. See Evaluations and manufacturers' catalogs.

1. ABS-American Building Supply- Doormerica.
2. Algoma Hardwoods, Inc.
3. Ampco Products, LLC.
4. Chappell Door Co.
5. Eggers Industries.
6. General Veneer Manufacturing Co.

7. Graham Wood Doors; an Assa Abloy Group company.
8. Haley Brothers, Inc.
9. Ipik Door Company.
10. Lambton Doors.
11. Marlite.
12. Marshfield Door Systems, Inc.
13. Mohawk Flush Doors, Inc.
14. Oregon Door.
15. Oshkosh Door Company.
16. Poncraft Door Company.
17. Vancouver Door Company.
18. VT Industries, Inc.

2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards."
- B. 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 or UL 10C.
 1. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
 2. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
 3. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
- C. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.
- 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.
- E. 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 needed to eliminate through-bolting hardware.
 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.

2.3 PLASTIC-LAMINATE-FACED DOORS

A. Interior Solid-Core Doors:

1. Grade: Custom.
2. Plastic-Laminate Faces: High-pressure decorative laminates complying with NEMA LD 3, Grade HGS.
3. Colors, Patterns, and Finishes: As selected by Architect from laminate manufacturer's full range of products.
4. Exposed Vertical Edges: Factory finished hardwood edges for staining to match faces or plastic laminate that matches faces, applied before faces.
5. Core: Particleboard.
6. Construction: Three plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before faces are applied. Faces are bonded to core using a hot press.

2.4 LIGHT FRAMES AND LOUVERS

- ### A. Metal Frames for Light Openings in Non-Rated and Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch-thick, cold-rolled steel sheet; factory primed for paint finish; and approved for use in doors of fire-protection rating indicated.

B. Metal Louvers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Louvers, Inc, a Division of the Activar Construction Products Group.
 - b. Anemostat Products; a Mestek company.
 - c. L & L Louvers, Inc.
 - d. Louvers & Dampers, Inc.; a division of Mestek, Inc.
 - e. McGill Architectural Products.
 - f. Industrial Louvers, Inc.
2. Metal and Finish: Hot-dip galvanized steel, 0.040 inch thick, factory primed for paint finish.

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 NFPA 80 requirements for fire-rated doors.
- ### B. Factory machine doors for hardware that is not surface applied.
- ### C. Openings: Factory cut and trim openings through doors.
1. Light Openings: Trim openings with moldings of material and profile indicated.
 2. Louvers: Factory install louvers in prepared openings.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Hardware: For installation, see Section 087100 "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
 - 1. Install fire-rated doors according to NFPA 80.
 - 2. Install smoke- and draft-control doors according to NFPA 105.
- 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.

END OF SECTION 081416

SECTION 083313 - COILING COUNTER DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Anodized Aluminum Counter Doors.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel supports.

1.2 SUBMITTALS

A. Product Data: For each type and size of coiling counter door and accessory.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include points of attachment and their corresponding static and dynamic loads imposed on structure.

C. Samples: For each exposed product and for each color and texture specified.

D. Maintenance data.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years of experience in the fabrication and installation of security closures.

B. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.

C. Store materials in a dry, warm, ventilated weathertight location.

1.5 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.6 COORDINATION

- A. Coordinate Work with other operations and installation of adjacent finish materials to avoid damage to installed materials.

1.7 WARRANTY

- A. Warranty: Manufacturer's limited door warranty for 2 years for all parts and components.

PART 2 - PRODUCTS

2.1 COUNTER DOOR ASSEMBLY

- A. Counter Door: Aluminum coiling counter door formed with curtain of interlocking metal slats.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. C.H.I. Overhead Doors, Inc.; Model 6544 Aluminum Counter Doors.
 - b. Cookson Company; Model CD8-1 Aluminum Counter Doors.
 - c. Cornell Iron Works, Inc; Model ESC-10 Aluminum Counter Doors.
 - d. Overhead Door Corporation; Series 652 Aluminum Counter Doors.
- B. Operation Cycles: Door components and operators capable of operating for not less than 20,000.
- C. Door Curtain Material: Aluminum.
- D. Door Curtain Slats: Flat profile slats of between 1 ¼" and 1 ½" center-to-center height. Endlocks attached to alternate slats to maintain curtain alignment and prevent lateral slat movement.
- E. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, fabricated aluminum extrusion and finished to match door.
- F. Curtain Jamb Guides: Aluminum with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.
- G. Hood: Aluminum.
 - 1. Mounting: Face of wall.
- H. Sill Configuration: No sill.
- I. Locking Devices: Equip door with two point dead locks with mortise cylinder.
- J. Manual Door Operator: Push-up operation.

- K. Curtain Accessories: Equip door with push/pull handles.
- L. Door Finish:
 - 1. Aluminum Finish: Clear anodized.
 - 2. Interior Curtain-Slat Facing: Match finish of exterior curtain-slat face.

2.2 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate coiling counter-door curtain of interlocking metal slats in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
 - 1. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.
- B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

2.3 HOODS

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

2.4 LOCKING DEVICES

- A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
 - 1. Lock Cylinders: Cylinders standard with manufacturer and keyed to building keying system.
 - 2. Keys: Three for each cylinder.

2.5 CURTAIN ACCESSORIES

- A. Astragal: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.
- B. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.

2.6 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a

spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

- B. Brackets: Manufacturer's standard mounting brackets of cold-rolled steel plate.

2.7 MANUAL DOOR OPERATORS

- A. General: Equip door with manual door operator by door manufacturer.
- B. Push-up Door Operation: Design counterbalance mechanism so that required lift or pull for door operation does not exceed 25 lbf.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify opening sizes, tolerances and conditions are acceptable.
- B. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.
- C. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.
- D. Fit and align assembly including hardware; level and plumb, to provide smooth operation.
- E. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07900.
- F. Install perimeter trim and closures.

3.4 ADJUSTING

- A. Test for proper operation and adjust as necessary to provide proper operation without binding or distortion.
- B. Adjust hardware and operating assemblies for smooth and noiseless operation.

3.5 CLEANING

- A. Clean curtain and components using non-abrasive materials and methods recommended by manufacturer.
- B. Remove labels and visible markings.
- C. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 PROTECTION

- A. Protect installed products until completion of project.

END OF SECTION 083313

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Exterior storefront façade and window framing.
 - 2. Exterior manual-swing entrance doors and door-frame units.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, full-size details, and attachments to other work.
 - 1. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.
- C. Samples: For each exposed finish required.
- D. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.
- E. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by a qualified Louisiana licensed professional engineer responsible for their preparation.
- F. Energy Performance Certificates: NFRC-certified energy performance values from manufacturer.
- G. Product test reports.
- H. Maintenance data.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Manufacturer Qualifications: A manufacturer capable of providing aluminum framed storefront system that meet or exceed performance requirements indicated and of documenting this performance by inclusion of test reports, and calculations.
- 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 change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
 1. Warranty Period: Two 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. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
 1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
 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. Structural Loads:
 1. Wind Loads: As indicated on Drawings.
- C. 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 1/175 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, whichever is less.
 2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.
 - a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.
- D. Structural: 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, or 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] <Insert number> seconds.
- E. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:
1. Fixed Framing and Glass Area:
 - a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.
 2. Entrance Doors:
 - a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
 - b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft.
- F. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.
- G. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.47 (low-e) or 0.61 (clear) Btu/sq. ft. x h x deg F 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 0.35 as determined according to NFRC 200.
 3. 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.
- H. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- 2.2 MANUFACTURERS
- A. Products Basis of Design:
1. Kawneer North America; an Alcoa company; TRIFAB VG 451T Storefront System and 500 Wide Stile Entrance System.
- B. Provide equivalent products from the following manufacturers:
1. Manko.
 2. Oldcastle BuildingEnvelope™.
 3. United States Aluminum.

2.3 STOREFRONT FRAMING (TRIFAB VG 451T Storefront)

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
 - 1. Construction: Thermally broken.
 - 2. Glazing System: Retained mechanically with gaskets on four sides.
 - 3. Glazing Plane: Center Glazed where indicated on the Drawings.
 - 4. Finish: Clear anodic finish.
 - 5. Fabrication Method: Field-fabricated stick system.
- B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Materials:
 - 1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - a. Sheet and Plate: ASTM B 209.
 - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
 - d. Structural Profiles: ASTM B 308/B 308M.
 - 2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
 - a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 - b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 - c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 ENTRANCE DOOR SYSTEM (500 Wide Stile Entrance System)

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
 - 1. Door Construction: nominal 2-inch overall thickness, with minimum 0.125-inch 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: Medium stile; 5 inch nominal width at vertical stiles and top rail. 6½ inch or optional 10 inch bottom rail as scheduled on the Drawings.
 - 3. Glazing Stops and Gaskets: Manufacturer's standard, snap-on, extruded-aluminum stops and preformed gaskets.
 - a. Provide non-removable glazing stops on outside of door.
- B. Entrance Door Hardware: Hardware not specified in this Section is specified in Section 087100 "Door Hardware."
- C. General: Provide entrance door hardware and entrance door hardware sets indicated in door and frame schedule for each entrance door to comply with requirements in this Section.

1. Entrance Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products equivalent in function and comparable in quality to named products.
 2. Sequence of Operation (if required): Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
 3. Opening-Force Requirements:
 - a. Egress Doors: Not more than 15 lbf to release the latch and not more than 30 lbf to set the door in motion and not more than 15 lbf to open the door to its minimum required width.
 - b. Accessible Interior Doors: Not more than 5 lbf to fully open door.
- D. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of entrance door hardware are indicated in "Entrance Door Hardware Sets" Article. 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.
- E. Continuous-Gear Hinges: Manufacturer's standard with stainless-steel bearings between knuckles, fabricated to full height of door and frame. Clear anodized finish.
- F. Mortise Auxiliary Locks: BHMA A156.5, Grade 1.
- G. Automatic and Self-Latching Flush Bolts: BHMA A156.3, Grade 1.
- H. Panic Exit Devices (Concealed Vertical Rod Exit Device): BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- I. Cylinders: As specified in Section 087100 "Door Hardware."
- J. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
- K. Operating Trim: BHMA A156.6. Match Kawneer Type CFN pulls.
- L. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force.
- M. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.
- N. Weather Stripping: Manufacturer's standard replaceable components.
- O. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- P. Silencers: BHMA A156.16, Grade 1.
- Q. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch.

2.5 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.

2.6 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 interior.
 - 6. 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. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
- F. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
- G. 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.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work. Verify rough opening dimensions, levelness of sill plate and operational clearances. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weather tight installation.

1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
2. Wood Frame Walls: Dry, clean, sound, well nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches (76 mm) of opening.
3. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.
4. 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. Seal perimeter and other joints watertight unless otherwise indicated.
- B. Metal Protection:
 1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
 2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
- C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.
- 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 Section 088000 "Glazing."
- G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
 1. Exterior Doors: 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.

3.3 FIELD QUALITY CONTROL

- A. Field Quality-Control: Provide periodic site visit by manufacturer's field service representative.

3.4 ADJUSTING, CLEANING, AND PROTECTION

- A. Clean aluminum surfaces immediately after installing aluminum framed storefronts. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

- B. Clean glass immediately after installation. Comply with glass manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 084113

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1. SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware
2. Electronic access control system components

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 Section "Alternates" for alternates affecting this section.
2. Division 06 Section "Rough Carpentry"
3. Division 06 Section "Finish Carpentry"
4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:
 - a. "Metal Doors and Frames"
 - b. "Flush Wood Doors"
 - c. "Stile and Rail Wood Doors"
 - d. "Interior Aluminum Doors and Frames"
 - e. "Aluminum-Framed Entrances and Storefronts"
 - f. "Stainless Steel Doors and Frames"
 - g. "Special Function Doors"
 - h. "Entrances"
6. Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
7. Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

1.02 REFERENCES

A. UL LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
 - a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
 - b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit 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.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
 - a. Wiring Diagrams: For power, signal, and control wiring and including:
 - 1) Details of interface of electrified door hardware and building safety and security systems.
 - 2) Schematic diagram of systems that interface with electrified door hardware.
 - 3) Point-to-point wiring.
 - 4) Risers.
3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.

- a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
4. Door Hardware Schedule:
 - a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
 - b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
 - c. Indicate complete designations of each item required for each opening, include:
 - 1) Door Index: door number, heading number, and Architect's hardware set number.
 - 2) Quantity, type, style, function, size, and finish of each hardware item.
 - 3) Name and manufacturer of each item.
 - 4) Fastenings and other pertinent information.
 - 5) Location of each hardware set cross-referenced to indications on Drawings.
 - 6) Explanation of all abbreviations, symbols, and codes contained in schedule.
 - 7) Mounting locations for hardware.
 - 8) Door and frame sizes and materials.
 - 9) Degree of door swing and handing.
 - 10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.
 5. Key Schedule:
 - a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
 - b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
 - c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
 - d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
 - e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
 - f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.
- C. Informational Submittals:
1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
 2. Provide Product Data:
 - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
 - b. Include warranties for specified door hardware.
- D. Closeout Submittals:
1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
 - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
 - b. Catalog pages for each product.

- c. Final approved hardware schedule edited to reflect conditions as installed.
- d. Final keying schedule
- e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
- f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:

- 1. Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
 - a. Fire door assemblies, in compliance with NFPA 80.
 - b. Required egress door assemblies, in compliance with NFPA 101.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

- 1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
- 2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
- 3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
 - a. For door hardware: DHI certified AHC or DHC.
 - b. Can provide installation and technical data to Architect and other related subcontractors.
 - c. Can inspect and verify components are in working order upon completion of installation.
 - d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.
- 4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.
- 5. Estimating Responsibility: It is the responsibility of any potential supplier to thoroughly review all project documents to insure complicity with the hardware specification and all applicable codes. Report any and all discrepancies to the architect at least 7 days prior to bid. It is the responsibility of the successful supplier to supply hardware to 100% completion of project, should a door or obviously required item of hardware be omitted from this specification or should hardware other than what is specified be required to meet code, project type requirements, or functionality, it is the supplier's sole responsibility to supply that material in the same brands and quality levels without cost to the architect, contractor or owner

B. Certifications:

- 1. Fire-Rated Door Openings:

- a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
 - b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.
 2. Smoke and Draft Control Door Assemblies:
 - a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
 - b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
 3. Electrified Door Hardware
 - a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
 4. Accessibility Requirements:
 - a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.
- C. Pre-Installation Meetings
1. Keying Conference
 - a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
 - 1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 - 2) Preliminary key system schematic diagram.
 - 3) Requirements for key control system.
 - 4) Requirements for access control.
 - 5) Address for delivery of keys.
 2. Pre-installation Conference
 - a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - b. Inspect and discuss preparatory work performed by other trades.
 - c. Inspect and discuss electrical roughing-in for electrified door hardware.
 - d. Review sequence of operation for each type of electrified door hardware.
 - e. Review required testing, inspecting, and certifying procedures.
 - f. Review questions or concerns related to proper installation and adjustment of door hardware.
 3. Electrified Hardware Coordination Conference:
 - a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.
- C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
- D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- F. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

1.06 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

1.07 WARRANTY

- A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.
 - 1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
 - 2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
 - a. Mechanical Warranty
 - 1) Locks
 - a) Schlage L Series: 3 years
 - b) Schlage ND Series: 10 years
 - 2) Exit Devices
 - a) Von Duprin: 3 years
 - 3) Closers
 - a) LCN 4000 Series: 30 years
 - b) LCN 4050 Series: 25 years

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. The Owner requires use of certain products for their unique characteristics and project suitability to ensure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."
 - 1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.
- B. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.
- C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
- D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

- A. Fabrication
 - 1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer's recognized installation standards for application intended.
 - 2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
 - 3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.
- B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
 - 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.
- C. Cable and Connectors:
 - 1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
 - 2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.

3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. Ives 5BB series
2. Acceptable Manufacturers and Products:
 - a. Hager BB1191/1279 series
 - b. McKinney TB series
 - c. Stanley FBB series

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
 - a. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
4. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
5. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
6. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
 - a. Steel Hinges: Steel pins
 - b. Non-Ferrous Hinges: Stainless steel pins
 - c. Out-Swinging Exterior Doors: Non-removable pins
 - d. Out-Swinging Interior Lockable Doors: Non-removable pins
 - e. Interior Non-lockable Doors: Non-rising pins

2.04 CONTINUOUS HINGES

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives
2. Acceptable Manufacturers:
 - a. Select
 - b. Gallery

B. Requirements:

1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.

5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
7. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.
8. Door manufacturer recommended continuous hinge type, 112 or 224, to be used in all instances.

2.05 ELECTRIC POWER TRANSFER

A. Manufacturers:

1. Scheduled Manufacturer and Product:
 - a. Von Duprin EPT-10
2. Acceptable Manufacturers and Products:
 - a. ABH PT1000
 - b. Securitron CEPT-10
 - c. Security Door Controls PTM

B. Requirements:

1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2. Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

2.06 FLUSH BOLTS

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives
2. Acceptable Manufacturers:
 - a. Burns
 - b. Trimco

B. Requirements:

1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.07 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. Schlage L9000 series
2. Acceptable Manufacturers and Products:
 - a. No Substitute

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
2. Indicators: Where specified, provide indicator window measuring a minimum 2-inch x 1/2 inch with 180-degree visibility. Provide messages color-coded with full text and/or symbols, as scheduled, for easy visibility.
3. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
4. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
5. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless steel.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches.
7. Provide motor based electrified locksets that comply with the following requirements:
 - a. Universal input voltage – single chassis accepts 12 or 24VDC to allow for changes in the field without changing lock chassis.
 - b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case.
 - c. Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.
 - d. Low holding current – maximum 0.01 amps to produce minimal heat, eliminate “hot levers” in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
 - e. Connections – provide quick-connect Molex system standard.
 - f. Electrified lockset final switch requirements to be determined in access control coordination meeting. Switching requirements will not exceed specified material.
8. Lock functions are suggestions – final function to be selected in hardware coordination or keying meeting.
9. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
 - a. Lever Design: 06N

2.08 THREE POINT LOCK

A. Manufacturer and Product:

1. Scheduled Manufacturer and Product:
 - a. Schlage LM9300

2. Acceptable Manufacturers and Products:
 - a. No Substitute

B. Requirements:

1. Provide three-point locking system as part of integrated assembly including door, frame, and hardware.
2. Tornado Applications: Provide assembly UL approved to FEMA 361 and FEMA 320 guidelines for inswing and outswing single or pair doors. Must be used with tested and approved door and frame system.
3. Security Applications: Provide inswing and outswing single or pair doors. Must be used with tested and approved door.
4. Units to comply with life safety requirements outlined in NFPA 80 and NFPA 101 and approved for use on up to 3-hour fire rated openings.
5. Latchbolt Construction:
 - a. Top Bolt: 5/8-inch (16 mm) Stainless Steel square bolt with 3/4-inch (19 mm) projection. 1/2 inch (13 mm) thick steel top plate. Stainless steel sill strike and fasteners.
 - b. Mortised Center Latchbolt: Stainless Steel latch. Fully wrapped, 12-gauge plated steel lock case. 2-3/4 inches (70 mm) backset. ANSI/BHMA curved lip strike 1-1/4 inches (32 mm) x 4-7/8 inches (124 mm) with dust box, non-handed.
 - c. Bottom Bolt: 5/8-inch (16 mm) Stainless Steel square bolt with 5/8-inch (16 mm) projection. Stainless steel sill strike and fasteners.
6. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses or escutcheon as scheduled and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
 - a. Lever Design: 06N.

2.09 CYLINDRICAL LOCKS – GRADE 1

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. Schlage ND series
2. Acceptable Manufacturers and Products:
 - a. No Substitute

B. Requirements:

1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Electrified lockset final switch requirements to be determined in access control coordination meeting. Switching requirements will not exceed specified material.
8. Lock functions are suggestions – final, like priced lock function to be selected in hardware coordination or keying meeting.

9. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
 - a. Lever Design: Rhodes.

2.10 DEADBOLTS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. Schlage B600/B700/B800 Series
2. Acceptable Manufacturers and Products:
 - a. No Substitute

B. Requirements:

1. Provide grade 1 deadbolt series conforming to ANSI/BHMA A156.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide deadbolts with standard 2-3/4 inches (70 mm) backset. Provide 2-3/8 inches (60 mm) where noted or if door or frame detail requires. Provide deadbolt with full 1-inch (25 mm) throw, constructed of steel alloy.
4. Provide manufacturer's standard strike.

2.11 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. Von Duprin 98/35A series
2. Acceptable Manufacturers and Products:
 - a. Detex Advantex series
 - b. Falcon 24/25 series

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to "KEYING" article, herein.
3. Provide smooth touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer's approved strikes.
9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder or hex-key dogging as specified at non fire-rated openings.

12. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
13. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
14. Electrified exit device final switch requirements to be determined in access control coordination meeting. Switching requirements will not exceed specified material.
15. Device functions are suggestions – final function to be selected in hardware coordination meeting.
16. Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
17. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.
18. Special Options:
 - a. SI
 - 1) Provide dogging indicators for visible indication of dogging status.
 - b. QM
 - 1) Rim Exit Devices: provide devices with damper-controlled re-latching to reduce operational noise. Where lever trim is specified, provide damper controlled lever return.
 - c. WS
 - 1) Provide wind and impact rated hurricane exit devices and mullions certified to comply UL-FEMA 361, Florida Building Code (FBC) TAS 201, 202, 203 and ASTM E1996; ANSI/ICC 500.

2.12 POWER SUPPLIES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. Schlage/Von Duprin PS900 Series
2. Acceptable Manufacturers and Products:
 - a. No Substitute

B. Requirements:

1. Provide power supplies approved by manufacturer of supplied electrified hardware.
2. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
4. Provide power supplies with the following features:
 - a. 12/24 VDC Output, field selectable.
 - b. Class 2 Rated power limited output.
 - c. Universal 120-240 VAC input.
 - d. Low voltage DC, regulated and filtered.
 - e. Polarized connector for distribution boards.
 - f. Fused primary input.
 - g. AC input and DC output monitoring circuit w/LED indicators.
 - h. Cover mounted AC Input indication.
 - i. Tested and certified to meet UL294.
 - j. NEMA 1 enclosure.

- k. Hinged cover w/lock down screws.
- l. High voltage protective cover.

2.13 CYLINDERS

A. Manufacturers and Products:

- 1. Scheduled Manufacturer and Product:
 - a. Schlage Everest 29 Primus XP
- 2. Acceptable Manufacturers and Products:
 - a. No Substitute

B. Requirements:

- 1. Provide cylinders/cores, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.
- 2. Provide cylinders in the below-listed configuration(s), distributed throughout the Project as indicated.
 - a. High Security: dual-locking cylinder with permanent core requiring restricted, patented keyway. Dual-locking mechanism with interlocking finger pin(s) to check for patented features on keys.
- 3. Patent Protection: Cylinders/cores requiring use of restricted, patented keys, patent protected.
- 4. Nickel silver bottom pins.

2.14 KEYING

A. Scheduled System:

- 1. Existing factory registered system:
 - a. Provide cylinders/cores keyed into Owner's existing factory registered keying system. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

- 1. Construction Keying:
- 2. Permanent Keying:
 - a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
 - 1) Master Keying system as directed by the Owner.
 - b. Forward biting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
 - c. Provide keys with the following features:
 - 1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
 - 2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
 - d. Identification:
 - 1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
 - 2) Identification stamping provisions must be approved by the Architect and Owner.

- 3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
- 4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
- 5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
- e. Quantity: Furnish in the following quantities.
 - 1) Change (Day) Keys: 3 per cylinder/core.
 - 2) Permanent Control Keys: 3.
 - 3) Master Keys: 6.

2.15 KEY CONTROL SYSTEM

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Telkee
2. Acceptable Manufacturers:
 - a. HPC
 - b. Lund

B. Requirements:

1. Provide 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% of number of locks required for Project.
 - a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
 - b. Provide hinged-panel type cabinet for wall mounting.

2.16 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
 - a. LCN 4040XP series
2. Acceptable Manufacturers and Products:
 - a. Corbin-Russwin DC8000 series
 - b. Sargent 281 series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter piston with 5/8-inch (16 mm) diameter double heat-treated pinion journal. QR code with a direct link to maintenance instructions.

4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards. Provide snap-on cover clip, with plastic covers, that secures cover to spring tube.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck. Provide graphically labelled instructions on the closer body adjacent to each adjustment valve. Provide positive stop on reg valve that prevents reg screw from being backed out.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.17 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives
2. Acceptable Manufacturers:
 - a. Trimco
 - b. Burns

B. Requirements:

1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

2.18 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives
2. Acceptable Manufacturers:
 - a. Burns
 - b. Trimco

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.19 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:
 - a. Glynn-Johnson
2. Acceptable Manufacturers:
 - a. Rixson
 - b. ABH

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.
2. Provide friction type at doors without closer and positive type at doors with closer.

2.20 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives
2. Acceptable Manufacturers:
 - a. Trimco
 - b. Burns

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button or thumb turn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.21 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Zero International
2. Acceptable Manufacturers:
 - a. National Guard
 - b. Reese

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.

2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.22 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:
 - a. Ives
2. Acceptable Manufacturers:
 - a. Burns
 - b. Rockwood
 - c. Trimco

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.23 FINISHES

A. FINISH: BHMA 626/652 (US26D); EXCEPT:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Latch Protectors: BHMA 630 (US32D)
9. Weatherstripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

- B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

- A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
 - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
 - 2. Custom Steel Doors and Frames: HMMA 831.
 - 3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
 - 4. Installation Guide for Doors and Hardware: DHI TDH-007-20
- B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.
- C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.
- I. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:
 - 1. Conduit, junction boxes and wire pulls.
 - 2. Connections to and from power supplies to electrified hardware.
 - 3. Connections to fire/smoke alarm system and smoke evacuation system.
 - 4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
 - 5. Connections to panel interface modules, controllers, and gateways.
 - 6. Testing and labeling wires with Architect's opening number.
- J. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

- K. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
- L. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- M. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
- N. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- O. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
- P. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- Q. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- R. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.03 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
 - 2. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
 - 3. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.04 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items per manufacturer's instructions to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.05 DOOR HARDWARE SCHEDULE

- A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.
- B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.
- C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.
- D. Hardware Sets:

Abbreviation	Name
GLY	Glynn-Johnson Corp
IVE	H.B. Ives
LCN	Lcn Commercial Division
SCH	Schlage Lock Company
VON	Von Duprin
ZER	Zero International Inc

Note: Hardware Schedule will be issued in Addendum No. 1.

END OF SECTION

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Glass for windows, doors, interior borrowed lites and storefront framing.
2. Glazing sealants and accessories.

1.2 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches (300 mm) square.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.4 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
1. Warranty Period: Five years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
1. Warranty Period: Five years from date of Substantial Completion.
- C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass

breakage or to 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. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. AGC Glass Company North America, Inc.
 2. Guardian Glass; SunGuard.
 3. Oldcastle BuildingEnvelope™.
 4. Pilkington North America.
 5. Other prior approved manufacturers.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the International Building Code and ASTM E 1300.
 1. Design Wind Pressures: As indicated on Drawings.
 2. Thickness of Patterned Glass: Base design of patterned glass on thickness at thinnest part of the glass.
 3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- B. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
 1. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
 2. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 3. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
 2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
 3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
 4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass. Where fully tempered float glass is indicated, provide fully tempered float glass.
- 2.4 GLASS PRODUCTS GENERAL (apply as scheduled on the Drawings)
- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.
- B. Tinted Annealed Float Glass: ASTM C 1036, Type I, Class 2 (tinted), Quality-Q3.
- C. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- D. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- 2.5 INSULATING GLASS
- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
1. Sealing System: Dual seals.
- 2.6 GLAZING SEALANTS
- A. General:
1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
 3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Bostik, Inc.
 - b. Dow Corning Corporation.
 - c. GE Construction Sealants; Momentive Performance Materials Inc.
 - d. Pecora Corporation.
 - e. Sika Corporation.
 - f. Tremco Incorporated.

2.7 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; 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; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
1. AAMA 804.3 tape, where indicated.
 2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
 3. 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; and complying with AAMA 800 for the following types:
1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.8 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

- E. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.9 SAFETY AND SECURITY FILM

- A. Refer to Section 088723 for specifications regarding interior-mounted safety and security film and sealant.

PART 3 - EXECUTION

3.1 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. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. 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.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
- G. 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.

3.2 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, then to jambs. Cover horizontal framing joints by applying tapes to jambs, 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. Apply heel bead of elastomeric sealant.
- F. 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.
- G. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.3 GASKET GLAZING (DRY)

- A. Cut compression gaskets to 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. Installation with Drive-in Wedge Gaskets: 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. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- E. Install gaskets so they protrude past face of glazing stops.

3.4 SEALANT GLAZING (WET)

- A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.5 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. 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.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

- C. Remove and replace glass that is damaged during construction period.

3.6 MONOLITHIC GLASS SCHEDULE (apply as scheduled on the Drawings)

- A. Glass Type : Clear float glass.

1. Minimum Thickness: $\frac{1}{4}$ " nominal, or as indicated on the Drawings.

- B. Glass Type : Clear fully tempered float glass.

1. Minimum Thickness: $\frac{1}{4}$ " nominal, or as indicated on the Drawings.
2. Safety glazing required.

- C. Glass Type : Tinted fully tempered float glass.

1. Tint Color: As indicated on the Drawings.
2. Minimum Thickness: $\frac{1}{4}$ " nominal, or as indicated on the Drawings.
3. Safety glazing required.

3.7 INSULATING GLASS SCHEDULE

- A. Glass Type : Low-E-coated, tinted insulating glass.

1. Overall Unit Thickness: 1 inch at Storefront Systems and Aluminum Windows.
2. Minimum Thickness of Each Glass Lite: $\frac{1}{4}$ " nominal.
3. Outdoor Lite: Tinted fully tempered float glass.
4. Tint Color: As indicated on the Drawings.
5. Interspace Content: Argon.
6. Indoor Lite: Clear fully tempered float glass.
7. Low-E Coating: Pyrolytic or sputtered on second or third surface.
8. Safety glazing as required by application.

3.8 POLYCARBONATE GLAZING SCHEDULE

- A. Glazing Type : Clear "Lexan" polycarbonate.

1. Minimum Thickness: $\frac{3}{8}$ " nominal, or as indicated on the Drawings.

END OF SECTION 088000

SECTION 089119 - FIXED LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes fixed, extruded-aluminum louvers.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For louvers and accessories.
- C. Samples: For each type of metal finish required.
- D. Product Test Reports: Based on tests performed according to AMCA 500-L.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
 - 1. Wind Loads: Determine loads based on a uniform pressure of 25 lbf/sq. ft., acting inward or outward.

2.2 FIXED, EXTRUDED-ALUMINUM LOUVERS

- A. Horizontal, Drainable-Blade Louver and Narrow Line Louver :
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Industrial Louvers Inc. ; Fixed, Extruded Aluminum, Horizontal, Drainable Blade Louvers. or a comparable product by one of the following:
 - a. Airolite Company, LLC (The).
 - b. Construction Specialties, Inc.
 - c. Nystrom, Inc.
Reliable Products, Inc.
 - 2. Louver Depth: 4 inches at typical louver, narrow depth at round porthole louvers.
 - 3. Frame and Blade Nominal Thickness: Not less than 0.080 inch.
 - 4. Mullion Type: Exposed.

5. Louver Performance Ratings:
 - a. Free Area: Not less than 8.0 sq. ft. for 48-inch-wide by 48-inch-high louver.
 - b. Point of Beginning Water Penetration: Not less than 950 fpm.
 - c. Air Performance: Not more than 0.10-inch wg static pressure drop at 800-fpm free-area intake velocity.
6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.3 LOUVER SCREENS

- A. General: Provide screen at each exterior louver.
 1. Screen Location for Fixed Louvers: Interior face.
 2. Screening Type: Bird screening.
- B. Louver Screen Frames: Same type and form of metal as indicated for louver to which screens are attached.
- C. Louver Screening for Aluminum Louvers:
 1. Bird Screening: Aluminum, 1/2-inch-square mesh, 0.063-inch wire.

2.4 MATERIALS

- A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.
- B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Fasteners: Use types and sizes to suit unit installation conditions.
 1. Use tamper-resistant screws for exposed fasteners unless otherwise indicated.
 2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
 3. For color-finished louvers, use fasteners with heads that match color of louvers.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.5 FABRICATION

- A. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
- B. Join frame members to each other and to fixed louver blades with fillet welds concealed from view, threaded fasteners, or both, as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.6 ALUMINUM FINISHES

- A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 50 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: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- D. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

3.2 ADJUSTING

- A. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

END OF SECTION 089119

DIVISION 9 - FINISHES

092216	NON-STRUCTURAL METAL FRAMING
092900	GYPSUM BOARD
093013	CERAMIC TILING
095123	ACOUSTICAL CEILINGS
096513	RESILIENT BASE AND ACCESSORIES
096519	RESILIENT TILE FLOORING
097623	FLUID APPLIED RESINOUS FLOORING
099113	EXTERIOR PAINTING
099123	INTERIOR PAINTING
099600	HIGH-PERFORMANCE COATINGS

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior partitions.
2. Suspension systems for interior and exterior ceilings and soffits.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Evaluation reports for firestop tracks.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- 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.
1. Construct fire-resistance rated partitions in compliance with tested assembly requirements indicated on drawings.
 2. Rated assemblies to be substantiated from applicable testing using proposed products, by Contractor.
- 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.
- C. Design framing systems in accordance with American Iron and Steel Institute Publication "S220 - North American Specification for the Design of Cold-Formed Steel Framing - Nonstructural Members", except as otherwise shown or specified.
- D. Design loads: As indicated on the Architectural Drawings or 5 PSF minimum as required by the International Building Code.

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: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40, hot-dip galvanized unless otherwise indicated.
- B. Basis-of-Design Manufacturer: ClarkDietrich Building Systems. Specific products as listed below.
- C. Other Acceptable Manufacturers/Products: Subject to compliance with requirements, provide comparable products by one of the following manufacturers:
1. Marino\WARE, non-structural steel framing products and systems.
 2. Telling Industries, non-structural steel framing products and systems.
- D. Studs and Tracks: ASTM C 645.
1. Non-Structural Steel Studs ("EQ" 65 ksi Studs Not Acceptable):
 - a. Basis-of-Design Product: ClarkDietrich Building Systems, ProSTUD products.
 - b. Flange Size: 1 ¼ inch minimum.
 - c. Web Depth: As indicated on Drawings. Available depths are 1 5/8 inches, 2 ½ inches, 3 5/8 inches, 4 inches, 6 inches and 8 inches.
 - d. Member Description: ProSTUD 33 mil (20 STR) 33 ksi.
 - 1) Minimum Base-Steel Thickness: 0.0329 inches (0.8382 mm).
 - 2) Minimum Design Thickness: 0.0346 inches (0.8788 mm).
 2. Non-Structural Steel Track:
 - a. Basis-of-Design Product: ClarkDietrich Building Systems, ProTRAK products.
 - b. Flange Size: 1 ¼ inch minimum. Deep flange at surfaces receiving spray fireproofing.
 - c. Web Depth: Track web to match stud web size.
 - d. Minimum Base-Steel Thickness: Track thickness to match wall stud thickness or as per design.
- E. Slip-Type Head Joints: Where indicated, provide one of the following:
1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to runners while allowing 2-inch (51-mm) minimum vertical movement.
 - a. Basis-of-Design Product: ClarkDietrich Building Systems; Fast Top Clip FTC3.
 2. 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 cold-formed channel with clip angles located within 12 inches of the top of studs to provide lateral bracing.
 - a. Basis-of-Design Product: ClarkDietrich Building Systems; BlazeFrame DL Deflection Track.
 3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Basis-of-Design Product: ClarkDietrich Building Systems; MaxTrak Slotted Deflection Track.
- F. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of 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. Basis of Design Product: ClarkDietrich Building Systems; BlazeFrame DSL Slotted Deflection Track.
- G. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Basis-of-Design Product: ClarkDietrich Building Systems; Backing Plate.
 2. Minimum Base-Metal Thickness: 0.0179 inch.
- H. Cold-Rolled Channel Bridging: Steel, 0.0538-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.
1. Basis-of-Design Product: ClarkDietrich Building Systems; Cold-Formed U-Channel and EasyClip U-Series Angle U543.
 2. Depth: 1-1/2 inches.
 3. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.0538-inch-thick, galvanized steel.
- I. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
1. Basis-of-Design Product: ClarkDietrich Building Systems ; Furring Channel.
 2. Minimum Base-Metal Thickness: 0.0179 inch (25 ga.), or 0.0296 inch (20 ga.) as indicated on the Drawings.
 3. Depth: 7/8 inch or 1-1/2 inches as indicated on the Drawings.
- J. Resilient Furring Channels: 1/2-inch-deep, steel sheet members designed to reduce sound transmission.
1. Basis-of-Design: ClarkDietrich Building Systems; RC Deluxe (RCSD) Resilient Channel
 2. Configuration: Asymmetrical.
- K. Cold-Rolled Furring Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges.
1. Depth: As indicated on Drawings.
 2. Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329 inch.
 3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.
- L. Radius Framing: Steel sheet runner for non-load-bearing curves, bends, variable radii and arches using expandable ribbon technology.
1. Basis-of-Design Product: ClarkDietrich Building Systems; Interior Contour Track [CNTB] [CETB].
 2. Minimum Base-Steel Thickness: 0.0179 inch or 0.0259 inch, as indicated on the Drawings..
 3. Depth: As indicated on Drawings.
- 2.3 SUSPENSION SYSTEMS (in lieu of drywall grid system specified in 095123)
- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.
- B. Hanger Attachments to Concrete:

1. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488/E 488M conducted by a qualified testing agency.
 2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch and minimum 1/2-inch-wide flanges.
1. Depth: As indicated on Drawings.
- E. Furring Channels (Furring Members):
1. Cold-Rolled Channels: 0.0538-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
 2. Steel Studs and Runners: ASTM C 645.
 - a. Minimum Base-Metal Thickness: As indicated on Drawings.
 - b. Depth: As indicated on Drawings.
 3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base-Metal Thickness: As indicated on Drawings.
 4. Resilient Furring Channels: 1/2-inch-deep members designed to reduce sound transmission.
 - a. Configuration: Asymmetrical.

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.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
1. Asphalt-Saturated Organic Felt: ASTM D 226/D 226M, Type I (No. 15 asphalt felt), nonperforated.
 2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C 841 that apply to framing installation.

2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C 1063 that apply to framing installation.
 3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C 844 that apply to framing installation.
 4. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
 - C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
 - D. Install bracing at terminations in assemblies.
 - E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.2 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. 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 that penetrate 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 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 o.c.

E. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Z-Shaped Furring Members:

1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped 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 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 from corner and cut insulation to fit.

- G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.3 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- 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. 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 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Texture finishes.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each texture finish indicated on same backing indicated for Work.

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, GENERAL - MANUFACTURER

- A. Basis-of-Design Product: Subject to compliance with requirements, provide National Gypsum Company; Gold Bond Brand Gypsum Board, or comparable product by one of the following:
1. CertainTeed Corporation.
 2. Georgia-Pacific Building Products.
 3. Temple-Inland Building Products by Georgia-Pacific.
 4. United States Gypsum Company.
- B. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 FIRE RESISTANCE RATED GYPSUM BOARD WITH ENHANCED MOLD AND MILDEW RESISTANCE (Above 10' at contractor's option)

- A. Basis of Design: Gold Bond BRAND XP® Fire-Shield® Gypsum Board
1. Type X, Panel Physical Characteristics
 - a. Core: Mold and moisture resistant, fire-resistance rated gypsum core
 - b. Surface paper: 100 percent recycled content moisture/mold/mildew resistant paper on front, back and long edges
 - c. Long Edges: Tapered
 - d. Overall thickness: 5/8 inch
 - e. Panel complies with Type X requirements of ASTM C 1396
 - f. Surface Abrasion Resistance: Classification Level 3 in accordance with ASTM C 1629
 - g. Mold/Mildew Resistance: score of 10 when tested in accordance with ASTM D 3273.

2.4 ABUSE & FIRE RESISTANT GYPSUM BOARD (All surfaces up to 10')

A. Basis of Design: Gold Bond BRAND Hi-Abuse® XP® Gypsum Board

1. Panel Physical Characteristics

- a. Core: Fire-resistance rated gypsum core, with additives to enhance surface indentation resistance and impact resistance
- b. Surface paper: Abrasion resistant, 100 percent recycled content moisture/mold/mildew resistant paper on front, back and long edges
- c. Long Edges: Tapered
- d. Overall thickness: 5/8 inch
- e. Panel complies with Type X requirements of ASTM C 1396
- f. Surface Abrasion Resistance: Classification Level 3 in accordance with ASTM C 1629
- g. Indentation Resistance: Classification Level 1 in accordance with ASTM C 1629.
- h. Soft Body Impact Resistance: Classification Level 2 in accordance with ASTM C 1629
- i. Hard Body Impact Resistance: Classification Level 1 in accordance with ASTM C 1629.
- j. Mold/Mildew Resistance: score of 10 when tested in accordance with ASTM D 3273.

2.5 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.
3. Specialty Shapes:
 - a. Radiused bullnose and other specialty shapes as indicated on the Drawings, by Gordon, Fry or other approved equal.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Exterior Gypsum Soffit Board: Paper.
3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
4. 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, rounded or beveled panel edges, 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 or drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
- C. 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.
- D. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."
- E. Vapor Retarder: As specified in Section 072600 "Vapor Retarders."

2.8 TEXTURE FINISHES

- A. Primer: As recommended by textured finish manufacturer.
- B. Non-Aggregate Finish: Premixed, vinyl texture finish for spray application.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corporation; ProRoc Easi-Tex Spray Texture.
 - b. National Gypsum Company; ProForm Brand All Purpose Joint Compound, drying type, or ProForm BRAND Perfect Spray EM.
 - c. United States Gypsum Company; BEADEx FasTex Wall and Ceiling Spray Texture.
 2. Texture: Orange peel or as selected by Architect.

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS

- A. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- B. Comply with ASTM C 840.

- C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-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.
- D. 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.
- E. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- F. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- G. 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.
 - 3. Level 3: Where indicated on Drawings.
 - 4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
 - 5. Level 5: Where indicated on Drawings.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

3.2 APPLYING TEXTURE FINISHES

- A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.
- B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture matching approved mockup and free of starved spots or other evidence of thin application or of application patterns.

3.3 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, and mold damaged.

END OF SECTION 092900

SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ceramic mosaic tile.
2. Glazed wall tile.
3. Waterproof membrane shower pan.

1.2 SUBMITTALS

A. Product Data: For each type of product.

B. Samples:

1. Each type and composition of tile and for each color and finish required.

1.3 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 2 percent of amount installed for each type, composition, color, pattern, and size indicated.

1.4 QUALITY ASSURANCE

A. Installer Qualifications:

1. Company specializing in performing the work of this section with minimum two years' experience.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide Standard-grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108/ A118/ A136.1, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.

2.2 TILE PRODUCTS

- A. Ceramic Tile Type CT-1: Unglazed porcelain tile (Walls).
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide American Olean Union, or comparable product by one of the following:
 - a. Atlas Concorde USA Cove.
 - b. Milestone Core.
 - 2. Composition: Porcelain.
 - 3. Certification: Porcelain tile certified by the Porcelain Tile Certification Agency.
 - 4. Module Size: 12 by 24 inch.
 - 5. Thickness: 5/16 inch.
 - 6. Face: Rectified edges.
 - 7. Dynamic Coefficient of Friction: Not less than 0.42.
 - 8. Tile Color and Pattern: As selected by Architect from manufacturer's full range. Pattern as indicated on drawings.
 - 9. Grout Color: As selected by Architect from manufacturer's full range.
 - 10. Trim Units: Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Tile Trim:
 - 1) 3x12 Bullnose from same tile series.
 - b. Metal Edge Trim:
 - 1) Cap trim to match depth of tile, in locations as indicated on drawings. Provide Schluter Jolly, or approved equal, in height and depth as required. Provide inside and outside corner trim as required. Satin anodized aluminum finish.
- B. Ceramic Tile Type CT-2: Glazed Accent Wall Tile (Walls).
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide American Olean "Color Story", or comparable product by one of the following:
 - a. Dal-tile Semi-Gloss
 - b. Prior approved equals.
 - 2. Module Size: Nominal ½ by 12 and 2x8 inches as indicated on drawings.
 - 3. Face Size Variation: Rectified.
 - 4. Thickness: 5/16 inch.
 - 5. Face: Plain with modified square edges.
 - 6. Finish: Bright, opaque glaze.
 - 7. Tile Color and Pattern: Scarlett.
 - 8. Grout Color: As selected by Architect from manufacturer's full range.
 - 9. Schedule: In sizes and locations as indicated on drawings.

2.3 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 - 1. Non-Ceramic Trim: style and dimensions to suit application, for seating using tile mortar or adhesive: use in the following locations:
Transition between sealed concrete and ceramic tile. Schluter RENO-U, or approved equal, in height as required. Satin anodized aluminum.

2.4 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Latex-Portland Cement Waterproof Mortar: Flexible, waterproof mortar consisting of cement-based mix and latex additive.
- C. Waterproofing and Tile-Setting Adhesive: One-part, fluid-applied product intended for use as both waterproofing and tile-setting adhesive in a two-step process.

2.5 SETTING MATERIALS

- A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.
- B. Dry-Set Portland Cement Mortar (Thinset): ANSI A118.1.
 - 1. For wall applications, provide nonsagging mortar.
- C. Latex-Portland Cement Mortar (Thinset): ANSI A118.4.
 - 1. Provide prepackaged, dry-mortar mix to which only water must be added at Project site.
 - 2. For wall applications, provide nonsagging mortar.
- D. For wall applications, provide nonsagging mortar. Dry Set Mortar for Large and Heavy Tile (LHT Mortar): ANSI A118
 - 1. For Large Format Tiles with at least one side greater than 15".
 - 2. Not to be used in truing or leveling underlying substrates or the work of other but to install tile per ANSI A108.5.
- E. Water-Cleanable, Tile-Setting Epoxy: ANSI A118.3.
- F. Organic Adhesive: ANSI A136.1, Type I.

2.6 GROUT MATERIALS

- A. Water-Cleanable Epoxy Grout: ANSI A118.3.

2.7 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Floor Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or appearance of grout.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with bonded mortar bed and thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for walls installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 CERAMIC TILE INSTALLATION

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation 2023" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors in wet areas.
 - b. Tile floors consisting of tiles 12x24 or larger.
 - c. Tile floors consisting of rib-backed tiles.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Where accent tile differs in thickness from field tile, vary setting bed thickness so that tiles are flush.
- F. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
- G. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Porcelain Tile: 1/8 inch.
- H. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- I. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- J. Floor Sealer: Apply floor sealer to cementitious grout joints in tile floors according to floor-sealer manufacturer's written instructions. As soon as floor sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.
- K. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated. Use latex-portland cement mortar for bonding material unless otherwise directed in manufacturer's written instructions.
- L. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
- M. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.

3.4 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Wall Installations:
 - 1. Ceramic Tile Installation: Concrete or Masonry TCNA W2021-23.
 - a. Ceramic Tile Type: CT-1.
 - b. Mortar: Dry-Set or Latex LHT mortar.
 - c. Grout: Water-Cleanable Epoxy Grout.

END OF SECTION 093013

SECTION 095123 - ACOUSTICAL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes acoustical tiles and grid suspension systems for ceilings.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.
- C. Maintenance data.

PART 2 - PRODUCTS

2.1 SUSPENDED CEILINGS, GENERAL

- A. Acoustical Tile Standard: Comply with ASTM E 1264.
- B. Metal Suspension System Standard: Comply with ASTM C 635.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

2.2 ACOUSTICAL TILES & BOARD

- A. Basis-of-Design Product (General): Subject to compliance with requirements, provide Armstrong World Industries, Inc; Lay-In Ceiling Tiles as scheduled, or a comparable product by one of the following:
 - 1. United States Gypsum Company.
 - 2. Other prior approved manufacturers and products.
- B. Drywall Ceiling Board: Painted Drywall Ceiling Board attached to drywall suspension system as shown on the drawings.
 - 1. 5/8" Abuse-Resistant Gypsum Board, Type X core. Refer to Section 092900.

2. Drywall Trim Accessories: Provide manufacturer's standard trim accessories for drywall work, formed of galvanized steel unless otherwise indicated, with either knurled and perforated or expanded flanges for nailing or stapling, and beaded for concealment of flanges in joint compound. Provide corner beads, L-type, U-type and kerf-type edge trim beads as required, and one piece control joint beads.
- C. Fissured Mineral Fiber Ceiling Tile: FINE FISSURED # 1728, Square-Edge, high-density mineral fiber, coarse texture, 15/16 inch grid.
1. Color: White.
 2. LR: 0.85.
 3. NRC: 0.55.
 4. CAC: 33.
 5. Fire Resistance/Flame Spread: Class A (UL).
 6. Humidity Resistance: HumiGuard Plus
 7. Anti-Microbial: BioBlock
 8. Edge/Joint Detail: Square-Edge for 15/16 inch grid.
 9. Thickness: 5/8 inch (19 mm).
 10. Modular Size: 24 inches x 24 inches.
 11. Warranty: 30 Year Guarantee against visible sag; against mold/mildew & bacteria.
- D. Service Area Mineral Fiber Ceiling Tile: CLEAN ROOM VL # 868, Square-Edge, mineral fiber, unperforated vinyl-faced membrane, smooth texture, 15/16 inch grid.
1. Color: White.
 2. LR: 0.80.
 3. NRC: N/A
 4. CAC: 40.
 5. Fire Resistance/Flame Spread: Fire Resistive.
 6. Humidity Resistance: HumiGuard Plus
 7. Anti-Microbial: BioBlock
 8. Edge/Joint Detail: Square-Edge for 15/16 inch grid.
 9. Thickness: 5/8 inch (19 mm).
 10. Modular Size: 24 inches x 24 inches.
 11. Warranty: 30 Year Guarantee against visible sag; against mold/mildew & bacteria.
- E. Fine Textured Mineral Fiber Ceiling Tile: DUNE #1772 Square Edge, mineral fiber, medium texture, 15/16 inch grid.
1. Color: White.
 2. LR: 0.83.
 3. NRC: 0.50.
 4. CAC: 30.
 5. Fire Resistance/Flame Spread: Class A (UL).
 6. Humidity Resistance: HumiGuard Plus
 7. Anti-Microbial: BioBlock+
 8. Edge/Joint Detail: Square Edge.
 9. Thickness: 5/8 inch (19 mm).
 10. Modular Size: 24 inches x 24 inches.
 11. Warranty: 30 Year Guarantee against visible sag; against mold/mildew & bacteria.

2.3 METAL SUSPENSION SYSTEMS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong World Industries, Inc; <product name or designation> or a comparable product by one of the following:
 - 1. United States Gypsum Company.
 - 2. Chicago Metallic.
 - 3. Other prior approved manufacturers and products.
- B. 15/16" Standard Grid: PRELUDE XL 15/16" Exposed Tee, 24" x 24".
 - 1. Material: Hot-dipped galvanized steel.
 - 2. Color: White, baked-on polyester paint.
 - 3. Face Dimension: 15/16 inch.
 - 4. Profile Type: Exposed Tee.
 - 5. Components: Manufacturer's standard beams, tees and 7/8 inch edge molding.
 - 6. Structural Classification: Intermediate-duty system.
- C. Drywall Suspension System: HD & XL 1-1/2" Drywall Tee, 24" x 48".
 - 1. Material: Hot-dipped galvanized steel.
 - 2. Color: None.
 - 3. Face Dimension: 1-1/2 inch.
 - 4. Profile Type: Exposed Tee. Use HD 8906, 12' Main Tees and XL 8945P, 4' Cross Tees, LAM or KAM Series Edge Molding, or equal components.
 - 5. Accessories: Min. 12 gauge hangwires at 48" o.c., and manufacturer's standard clips as required for a complete system.

2.4 INSULATION ABOVE SUSPENDED CEILINGS

- A. Batt Insulation: Provide fiberglass Acoustic Batt Insulation above ceilings where scheduled, 3-1/2" thick, as indicated on the Drawings. Refer to Section 072100 for material description.

2.5 MISCELLANEOUS COMPONENTS (as required)

- A. Furring Channels: Hat profile, galvanized 7/8" x 2-9/16" roll-formed Metal Furring Channels, DWC-25, as manufactured by USG, or approved equal.
 - 1. Material: Hot-dipped galvanized steel.
 - 2. Color: White, baked-on polyester paint.
 - 3. Face Dimension: 15/16 inch.
 - 4. Profile Type: Exposed Tee.
 - 5. Components: Manufacturer's standard beams, tees and 7/8 inch edge molding.
 - 6. Structural Classification: Intermediate-duty system.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install acoustical tile ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders, and comply with layout shown on reflected ceiling plans.
- C. Arrange directionally patterned acoustical tiles as indicated on reflected ceiling plans.

3.2 SCHEDULE OF CEILING SYSTEMS

- A. Provide the following Ceiling Systems as scheduled on the Reflected Ceiling Plans for each Building:
 - 1. Ceiling System TYPE D: Fine Textured (DUNE) Mineral Fiber Ceiling Tile in 15/16" Standard Suspension Grid System.
 - 2. Ceiling System TYPE E: Fissured (FINE FISSURED) Mineral Fiber Ceiling Tile in 15/16" Standard Suspension Grid System.
 - 3. Ceiling System TYPE F: Service Area (CLEAN ROOM) Mineral Fiber Ceiling Tile in 15/16" Standard Suspension Grid System.
 - 4. Ceiling System TYPE G: Painted Drywall Ceiling Board (rated or non-rated system) on Drywall Suspension System.

END OF SECTION 095123

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Resilient base.
 - 2. Resilient molding accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

PART 2 - PRODUCTS

2.1 THERMOPLASTIC-RUBBER BASE

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Burke Mercer Flooring Products, or comparable product by one of the following:
 - 1. Armstrong World Industries, Inc.
 - 2. Flexco.
 - 3. Johnsonite; A Tarkett Company.
 - 4. Roppe Corporation, USA.
- B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).
 - 1. Group: I (solid, homogeneous)
 - 2. Style and Location:
 - a. Style A, Straight: Provide in areas with carpet.
 - b. Style B, Cove: Provide in areas with resilient flooring.
 - c. Style C, Butt to: Provide in areas indicated.
- C. Thickness: 0.125 inch.
- D. Height: 4 inches as indicated on Drawings.
- E. Lengths: Cut lengths 48 inches (1219 mm) long or coils in manufacturer's standard length.
- F. Outside Corners: Job formed or preformed.

- G. Inside Corners: Job formed or preformed.
- H. Colors: As selected by Architect from full range of industry colors.

2.2 VINYL OR RUBBER MOLDING ACCESSORY

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Burke Mercer Flooring Products, or comparable product by one of the following:
 - 1. Armstrong World Industries, Inc.
 - 2. Flexco.
 - 3. Johnsonite; A Tarkett Company.
 - 4. Roppe Corporation, USA.
- B. Description: Rubber cap for cove carpet, cap for cove resilient flooring, carpet edge for glue-down applications, nosing for carpet, nosing for resilient flooring, reducer strip for resilient flooring, joiner for tile and carpet, and transition strips.
- C. Profile and Dimensions: As indicated on drawings.
- D. Locations: Provide rubber molding accessories as required by condition.
- E. Colors and Patterns: As selected by Architect from full range of industry colors.

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.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are the same temperature as the space where they are to be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.2 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. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.
 - a. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.
 - a. Miter or cope corners to minimize open joints.

3.3 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.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid vinyl floor tile (Luxury Vinyl Tile).

1.2 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.

1. Show details of special patterns.

C. Samples: Full-size units of each color and pattern of floor tile required.

D. Closeout:

1. Maintenance data.
2. Warranty information.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 LUXURY VINYL FLOOR TILE

A. Basis-of-Design Luxury Vinyl Tile Type LVT-1: Subject to compliance with requirements, provide Mohawk Group, Matuto Stone Plus LVT, 12 inches x 24 inches x 2.5 mm thick; or a comparable product by one of the following:

1. Tarkett, ID Latitude Abstract, 12 inches x 24 inches x 2.5 mm thick.
2. Mannington Commercial, Color Anchor Groove, 12 inches x 24 inches x 2.5 mm thick.
3. ShawContract, Mindset #4124V, 12 inches x 24 inches x 2.5 mm thick.

- a. Three colors selected from manufacturer's full color line.

- B. Tile Standard: ASTM F1700.
 - 1. Class: Class III, Printed Film Vinyl Tile.
 - 2. Type: Matte Surface.
- C. Thickness: minimum 0.100 inch (2.5 mm).
- D. Size: 12 inches x 24 inches as offered by manufacturer.
- E. Wear Layer: Minimum 20 mil.
- F. Colors and Patterns: Color as selected by architect.
- G. Transition: Style and dimensions to suit application, for seating using adhesive: use in the following locations:
 - 1. Transition between LVT and sealed concrete or epoxy floor, Schluter VINPRO-U, or approved equal, in height as required. Brushed nickel anodized aluminum.
 - 2. Transition between Stair Tread and Riser, Schluter VINPRO-STEP-R, or approved equal, in height as required. Brushed nickel anodized aluminum.

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 floor tile manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 10 pH.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile 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 MVER shall not exceed 5 lbs./1000 sq. ft./24 hrs in 24 hours.
- b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 80 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 floor tiles until they are the same temperature as the space where they are to be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.2 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles square with room axis.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 - 1. Lay LVT tiles in pattern as recommended by manufacturer.
 - 2. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern).
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.3 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.
- B. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096723 - FLUID APPLIED RESINOUS FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. High-performance coatings including the following:
 - 1. Cleaners and patch/repair specialty products.
 - 2. Seal-Krete high performance flooring systems.

1.2 RELATED SECTIONS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 07 90 00 - Joint Sealants.

1.3 REFERENCES

- A. ASTM F 1869: Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- B. ASTM F 2170: Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- C. SSPC: The Society for Protective Coatings:
 - 1. SSPC-SP 1 - Solvent Cleaning.
 - 2. SSPC-SP 2 - Hand Tool Cleaning.
 - 3. SSPC-SP 3 - Power Tool Cleaning.
 - 4. SSPC-SP 13 / NACE No. 6 Surface Preparation for Concrete.
- D. ICRI: International Concrete Repair Institute
 - 1. CSP Concrete Surface Preparation Standards
- E. Safety Data Sheets: Per manufacturer's SDS for specific VOCs (calculated per 40 CFR 59.406). VOCs may vary by base and sheen.

1.4 DEFINITIONS

- A. LEED as used in this Section refers to Leadership in Energy and Environmental Design. Products listed meet LEED criteria for environmentally safe interior primers, paints and coatings.
- B. VOC as used in this Section refers to Volatile Organic Compounds found in primers, paints, sealers and stains. The level of VOCs appears after each product listed in the Schedule in grams per liter (g/L).
- C. Rust-Oleum Seal-Krete High Performance Systems are referred to as SKHP.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Coordinate with Section 01 30 00 - Administrative Requirements.
- C. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Submit descriptive data and specific recommendations for mixing, application, curing including any precautions of special handling instructions required to comply with the Occupational Safety and Health Act.

2. Prepare instructions and recommendations.
 3. Submit storage and handling requirements and recommendations.
- D. Selection Samples: For each finish product specified, submit maximum of three samples, 6 inches by 6 inches for each color and type of coating available from manufacturer's full range.
- E. Verification Samples: For each finish product specified, submit maximum of three samples, 6 inches by 6 inches for each color and type of coating as specified.
- F. Maintenance Literature: Submit two copies of manufacturer's maintenance recommendations.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Materials used in the floor surfacing shall be the products of a single manufacturer.
- B. Installer Qualifications:
1. Installer shall be acceptable to Architect and manufacturer.
 2. Installation shall be performed by an applicator with a minimum of 3 years experience in work of similar nature and scope. Installer shall be approved by the manufacturer of the floor surfacing materials. The Contractor shall furnish a written statement from the manufacturer that the installer is acceptable.
 3. Contractor shall have proven experience with specified system.
- C. Certification:
1. Manufacturer shall furnish statement attesting that materials meet specification requirements.
 2. Manufacturer shall furnish properly labeled material and Technical/Safety Data Sheets which comply with current state and federal requirements.
- D. Pre-Construction Meeting:
1. Pre-job meeting between Contractor, Architect, and installer shall be held to discuss concrete substrate, location of joints and/or saw cuts to minimize sub-floor cracking.
- E. Mock-Up: Provide an installed mock-up for evaluation of surface preparation techniques and application workmanship.
1. Finish areas designated by Architect.
 2. Mock-up size shall not be less than 50 square feet.
 3. Acceptable mock-up to be standard of quality for installed work.
 4. Unacceptable installed work to be removed and replaced or refinished until acceptable.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacturer's name, label, and the following list of information:
1. Product name and type (description).
 2. Application and use instructions.
 3. Surface preparation.
 4. VOC content.
 5. Environmental issues.
 6. Batch date.
 7. Color number.
- B. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

- C. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing.
- D. Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

1.8 PROJECT CONDITIONS

- A. Maintain the ambient room and floor temperature at 60 degree F (15 degrees C) or above for a period extending from 72 hours before or per manufacturer's technical data sheet, during and after floor installation. Concrete to receive surfacing shall have cured for at least 28 days and be free of all curing compounds.
- B. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- C. When using polyureas or moisture cured urethane products, pay special attention to humidity levels. At higher humidity levels, these products will have a shorter working time.

1.9 WARRANTY

- A. The technical data and suggestions of use are correct to the best of our knowledge, and offered in good faith. The statements of this specification do not constitute a warranty, expressed, or implied, as to the performance of these products. As conditions and use of our materials are beyond our control, we can guarantee these products only to conform to our standards of quality, and our liability, if any, will be limited to replacement of defective materials. All technical information is subject to change without notice.
- B. Special written project warranties may be issued on a request basis at the discretion of the Rust-Oleum Corporation Technical and Legal Departments and would not be contained within this specification document.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Product: Subject to compliance with requirements, provide Rust-Oleum®, Seal-Krete HP Poly Shell 8000 Polyaspartic Decorative Flake Double Lift System High Performance Flooring; Email:; Web: <https://www.rustoleum.com>, or a comparable flooring system by one of the following:
 - 1. Stonhard Stonetec ERF
 - 2. Armor-Poxy ArmorClad Full Flake Broadcast
- B. Specification and product questions should be directed to Rust-Oleum Technical Service at technicalservice@rustoleum.com.
- C. Requests for substitutions will be considered in accordance with provisions of Section 012513.

2.2 CLEANERS AND PATCH/REPAIR SPECIALTY PRODUCTS

- A. Patch/Repair Products:
 - 1. Rust-Oleum Seal-Krete HP Fast Cure Concrete Repair.
 - 2. Rust-Oleum Concrete Saver Flexible Joint Sealant.

- B. Moisture Mitigating Vapor Barriers (Optional if required by testing):
 - 1. Rust-Oleum Seal-Krete HP Vapor Shell Epoxy.
 - a. Use for up to 25 lbs MVT

2.3 SEAL-KRETE HIGH PERFORMANCE FLOOR SYSTEMS (SKHP)

- A. High Performance Floor Systems (SKHP):
 - 1. Rust-Oleum Seal-Krete HP Poly Shell 8000 Polyaspartic Decorative Flake Double Lift System.
 - a. Primer: RO SKHP Poly Shell 8000 tinted and applied at 10-12 mils DFT. Broadcast decorative flake to rejection.
 - b. Base Coat: RO SKHP Poly Shell 8000 tinted and applied at 10-12 mils DFT. Broadcast decorative flake to rejection.
 - c. Grout Coat: RO SKHP Poly Shell 8000 Clear and applied at 10-12 mils DFT.
 - d. Seal Coat: RO SKHP Poly Shell 8000 Clear applied at 8-10 mils DFT.

PART 3 EXECUTION

3.1 EXAMINATION

- A. The Contractor shall review the product manufacturer's special instructions for surface preparation, application, temperature, re-coat times, and product limitations.
- B. The Contractor shall review product health and safety precautions listed by the manufacturer.
- C. The Contractor shall be responsible for enforcing on site health and safety requirements associated with the Work.
- D. Ensure that surfaces to receive coating are dry immediately prior to application.
- E. Ensure that moisture-retaining substrates to receive coating have moisture content within tolerances allowed by coating manufacturer.
- F. Examine areas to receive coatings for:
 - 1. Concrete surfaces shall be in sound condition and properly prepared prior to flooring system installation.
 - 2. Defects in existing work that affect proper execution of coating work.
 - 3. Deviations beyond allowable tolerances for the concrete slab work.
- G. Correct conditions that could impair performance or appearance of coatings in accordance with specified surface preparation procedures before proceeding with coating application.
- H. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 SURFACE PREPARATION

- A. All cleaning and surface preparations specified herein are minimums. Prepare substrate to receive coating in accordance with manufacturer's recommendations.
- B. All surfaces to be coated shall be free of cracks, pits, fins, projections, or other imperfections that would interfere with the formation of a uniform, unbroken coating film.
- C. Substrate shall be free of dirt, waxes, curing agents, and other foreign materials prior to mechanical surface preparation.

- D. New concrete shall have cured for a minimum 30 days prior to coating application. If a cure and seal agent was added to the concrete or applied after initial cure, the concrete must be abrasive blast cleaned or mechanically abraded to remove the sealer and expose fresh concrete.
- E. Acceptable Substrates:
 - 1. Level tolerance: Concrete sub-floor shall be level with a maximum variation from level of 1/4 inch (6 mm) in 10 feet (3048 mm). Any irregularity of the surface requiring patching and/or leveling shall be done using material approved by the manufacturer.
 - 2. Concrete floor shall have a steel trowel finish.
 - 3. Concrete shall be cured a minimum of 28 days. No curing agents shall be used in areas to receive coating.
 - 4. Concrete slab shall have an efficient moisture barrier of minimum 10 mils (.2540 mm) placed directly under the concrete slab. Do not use vapor barrier manufactured with recycled content. Testing shall be done to verify that the moisture vapor emission rate of the slab does not exceed that as recommended by the manufacturer at time of installation of the epoxy coating flooring. Moisture vapor emission and moisture content testing shall conform with the requirements of ASTM F 1869 (Calcium Chloride Test) and ASTM F 2170 (Relative Humidity Probe Test). If test results show excessive levels of moisture content or vapor emission rate above that recommended by the manufacturer, apply manufacturer's recommended moisture vapor emission control material.
 - 5. Saw cutting of control joints shall be done between 12 and 24 hours after placement of the structural concrete.
- F. Concrete, SSPC-SP13 or NACE 6: This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems. The requirements of this standard are applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces. An acceptable prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.
- G. Concrete surfaces shall be mechanically abraded, or abrasive blast cleaned to remove all laitance to provide a uniform surface profile with a profile depth recommended by the fluid applied resinous system selected per ICRI CSP Standards. **ICRI CSP Level required for this project is CSP-2.** Contact Manufacturer's technical service department for specific surface preparation questions.
- H. The coating contractor is to examine the substrate to determine if it is in satisfactory condition to receive the specified floor system. Obtain coating contractor's written report listing conditions detrimental to performance of work in this specification. Do not proceed with the application of specified floor coating until unsatisfactory conditions have been corrected.

3.3 MIXING AND THINNING

- A. Mixing:
 - 1. The base component and activator must be combined with power mixing. Hand mixing is not adequate.
 - 2. Scrape out the container of the activator to transfer as much material as possible.
 - 3. Use a suitable mixing blade which will not entrain air. Mix at 500-750 RPM for 1-3 minutes.
 - 4. Application must begin as soon as the material has been completely mixed.

- B. Thinning: Thinning is not required. Do not thin.

3.4 APPLICATION

A. Weather Conditions:

1. Apply when air and surface temperatures are between 60-80 degrees F (15-27 degrees C) and surface temperature is at least 5 degrees F (3 degrees C) above the dew point.
2. The relative humidity should not be greater than 85 percent.

B. Coating Application:

1. Do not attempt to work out of the container. Immediately after mixing material, pour out the activated material in a long thin stripe across the top of the work section of floor. Use only the material that flows naturally out of the container.
2. Do not scrape out the container of activated material or turn buckets upside down on floor to drain. Doing so may result with transfer of un-activated material to the floor which will result with soft spots in the coating.
3. Install in accordance with manufacturer's instructions.
4. Locate all flexible joints required.
5. Provide accessories necessary for complete installation.

C. Protection of Surfaces:

1. The Coating Contractor shall be responsible for protecting all adjacent surfaces from spills, drips, or any other form of coating damage.
2. The coating contractor and its subcontractors shall be responsible for removing spots or repairing damaged surfaces to the satisfaction of the Architect.

3.5 CLEAN-UP

- A. Clean-up shall be done to remove all spills, drips, overspray, or other unwanted coating from all surfaces not intended to be coated.
- B. All used rags, brushes, roller covers, and other application related materials shall be removed from the work site and disposed in a proper manner and in accordance with local waste regulations.
- C. All equipment, staging, ladders, and other contractor materials brought onto the jobsite by the contractor shall be remove at the conclusion of the job in a timely manner.

3.6 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on exterior substrates as included in the Drawings.
 - 1. Concrete.
 - 2. Concrete masonry units (CMU).
 - 3. Steel.
 - 4. Galvanized metal.
 - 5. Aluminum (not anodized or otherwise coated).
 - 6. Wood.
 - 7. Exterior gypsum board.
- B. Related Requirements:
 - 1. Section 051200 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.
 - 2. Section 099600 "High-Performance Coatings" for special-use coatings.
 - 3. Section 099123 "Interior Painting" for surface preparation and the application of paint systems on interior substrates.
 - 4. Section 099300 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on exterior wood substrates.

1.2 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523, a matte flat finish.
- 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, a high-side sheen flat, velvet-like finish.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523, an eggshell finish.
- 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, a satin-like finish.
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523, a semi-gloss finish.
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523, a gloss finish.

1.3 SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.

- B. 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. VOC content.
- C. Coating Maintenance Manual: Provide coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used, product data pages, material safety data sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.4 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.

1.5 QUALITY ASSURANCE

- A. Mockups: Apply mockups 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. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. 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.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Handling: Deliver products to Project site in an undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacture's label with the following information:
 - 1. Product name and type (description).
 - 2. Batch date.
 - 3. Color number.

4. VOC content.
5. Environmental handling requirements.
6. Surface preparation requirements.
7. Application instructions.

B. 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.

1.7 FIELD 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams Company products indicated or comparable product from one of the following:

1. Benjamin Moore & Co.
2. Duron, Inc.
3. Glidden Professional, Division of PPG Architectural Finishes, Inc.
4. M.A.B. Paints.
5. PPG Architectural Finishes, Inc.
6. Other prior approved manufacturers.

B. Source Limitations: Obtain paint materials from single source from single listed manufacturer.

1. Manufacturer's designations listed on a separate color schedule are for color reference only and do not indicate prior approval.

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. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

- C. Colors: As selected by Architect from manufacturer's full range.
 - 1. 20 percent of surface area will be painted with deep tones.

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. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers. Where acceptability of substrate conditions is in question, apply samples and perform in-situ testing to verify compatibility, adhesion, and film integrity of new paint application.
 - 1. Report, in writing, conditions that may affect application, appearance, or performance of paint.
- B. Substrate Conditions:
 - 1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - a. Concrete: 12 percent.
 - b. Masonry (Clay and CMU): 12 percent.
 - c. Wood: 15 percent.
 - d. Portland Cement Plaster: 12 percent.
 - e. Gypsum Board: 12 percent.
 - 2. Portland Cement Plaster Substrates: Verify that plaster is fully cured.
 - 3. Exterior Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- C. Proceed with coating application only after unsatisfactory conditions have been corrected; 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 and paint 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.
- 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. 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. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Existing Steel, Unprimed Steel or Incompatible Coatings: 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."
 - 2. SSPC-SP 3, "Power Tool Cleaning."
 - 3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
 - 4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
- G. 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.
- H. 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 paints.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. Wood Substrates:
 - 1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
 - 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.
- K. Plastic Trim Fabrication Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
 - 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.
 - 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 - 4. Paint entire exposed surface of steel window frames and sashes.
 - 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats at deep colors with the same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. 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 to view:
 - a. Equipment, including panelboards.
 - 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.

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 EXTERIOR PAINTING SCHEDULE

A. Concrete, Portland Cement Plaster (Stucco), Cementitious Siding, Nontraffic Surfaces:

1. Latex System:

- a. Prime Coat: Primer sealer, latex, exterior: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300, at 8.0 mils wet, 3.2 mils dry.
- b. Intermediate Coat: Latex, exterior, matching topcoat.
- c. Topcoat: Latex, exterior, low-sheen: S-W A-100 Exterior Latex Flat, A6 Series or Low Sheen, A12 Series, at 4.0 mils wet, 1.5 mils dry, per coat.

2. Latex Aggregate/Latex System:

- a. Prime Coat: Block Filler, Latex, Interior/Exterior: S-W Loxon Block Surfacer, A24W200, at 50 to 100 sq. ft. per gal (1.2 to 2.4 sq. m per l).
- b. Topcoat: Latex, exterior flat, fine, medium or coarse texture as selected: S-W UltraCrete Textured Masonry Topcoat, A44-800 Series, at 50 to 80 sq ft./gal. 50 to 100 sq. ft. per gal.

B. CMU Substrates:

1. Latex System:

- a. Block Filler: Block filler, latex, interior/exterior: S-W PrepRite Block Filler, B25W25, at 75 to 125 sq. ft. per gal (1.8 to 3.1 sq. m per l).
- b. Intermediate Coat: Latex, exterior, matching topcoat.
- c. Topcoat: Latex, exterior, satin: S-W A-100 Exterior Latex Satin, A82 Series, at 4.0 mils wet, 1.5 mils dry, per coat.

C. Ferrous Metal, Galvanized-Metal, and Aluminum Substrates:

1. Water-Based Light Industrial Coating System:

- a. Prime Coat: Primer, water-based, anti-corrosive for metal: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, 5.0 to 10.0 mils wet, 2.0 to 4.0 mils dry. Spot prime any damaged shop primer if steel is already shop primed.
- b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
- c. Topcoat: Light industrial coating, exterior, water based, semi-gloss: S-W Pro Industrial Acrylic Semi-Gloss Coating, B66-650 Series, at 2.5 to 4.0 mils dry, per coat.

D. Wood Substrates: Including exposed wood items not indicated to receive shop-applied finish.

1. Latex System:

- a. Prime Coat: Primer, latex for exterior wood.
- a. Intermediate Coat: Latex, exterior, matching topcoat.
- b. Topcoat: Latex, exterior, satin: S-W A-100 Exterior Latex Satin, A82 Series, at 4.0 mils wet, 1.5 mils dry, per coat.

E. Exterior Gypsum Board Substrates:

1. Latex System:

- a. Prime Coat: Primer, bonding, water-based: S-W PrepRite ProBlock Latex Primer/Sealer.
- b. Intermediate Coat: Latex, exterior, matching topcoat.
- c. Topcoat: Latex, exterior, satin: S-W A-100 Exterior Latex Satin, A82 Series, at 4.0 mils wet, 1.5 mils dry, per coat.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on interior substrates as included in the Drawings.
 - 1. Concrete.
 - 2. Clay masonry.
 - 3. Concrete masonry units (CMU).
 - 4. Steel.
 - 5. Cast iron.
 - 6. Galvanized metal.
 - 7. Aluminum (not anodized or otherwise coated).
 - 8. Wood.
 - 9. Gypsum board.
 - 10. Plaster.
 - 11. Cotton or canvas insulation covering.
- B. Related Requirements:
 - 1. Section 051200 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.
 - 2. Section 099600 "High-Performance Coatings" for high-performance and special-use coatings.
 - 3. Section 099113 "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.
 - 4. Section 099300 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.

1.2 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523, a matte flat finish.
- 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, a high-side sheen flat, velvet-like finish.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523, an eggshell finish.
- 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, a satin-like finish.
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523, a semi-gloss finish.
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523, a gloss finish.

1.3 SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. 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.
- C. 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. VOC content.
- D. Coating Maintenance Manual: Provide coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used, product data pages, material safety data sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.4 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.

1.5 QUALITY ASSURANCE

- A. Mockups: Apply mockups 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. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. 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.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Handling: Deliver products to Project site in an undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacturer's label with the following information:
 1. Product name and type (description).
 2. Batch date.
 3. Color number.
 4. VOC content.
 5. Environmental handling requirements.
 6. Surface preparation requirements.
 7. Application instructions.
- B. 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.

1.7 FIELD 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 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. Lead Paint: It is not expected that lead paint will be encountered in the Work.
 1. If suspected lead paint is encountered, do not disturb; immediately notify Architect and Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams Company products indicated or comparable product from one of the following:
 1. Benjamin Moore & Co.
 2. Duron, Inc.
 3. Glidden Professional, Division of PPG Architectural Finishes, Inc.
 4. PPG Architectural Finishes, Inc.
 5. Pratt & Lambert.

6. Other prior approved manufacturers.

B. Source Limitations: Obtain paint materials from single source from single listed manufacturer.

1. Manufacturer's designations listed on a separate color schedule are for color reference only and do not indicate prior approval.

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. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.

C. Colors: As selected by Architect from manufacturer's full range.

1. 20 percent of surface area will be painted with deep tones.

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. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers. Where acceptability of substrate conditions is in question, apply samples and perform in-situ testing to verify compatibility, adhesion, and film integrity of new paint application.

1. Report, in writing, conditions that may affect application, appearance, or performance of paint.

B. Substrate Conditions:

1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

- a. Concrete: 12 percent.
- b. Masonry (Clay and CMU): 12 percent.
- c. Wood: 15 percent.
- d. Gypsum Board: 12 percent.
- e. Plaster: 12 percent.

2. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

3. Plaster Substrates: Verify that plaster is fully cured.

4. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.

- C. Proceed with coating application only after unsatisfactory conditions have been corrected; 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. 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.
 - 1. Concrete Floors: Remove oil, dust, grease, dirt, and other foreign materials. Comply with SSPC-SP-13/NACE 6 or ICRI 03732.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.
- F. Existing Steel, Unprimed Steel or Incompatible Coatings: 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."
 - 2. SSPC-SP 3, "Power Tool Cleaning."
 - 3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
 - 4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
- G. 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.
- H. 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.
- I. Aluminum Substrates: Remove loose surface oxidation.
- J. 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.

- K. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

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 at deep colors with a lighter shade of the topcoat 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 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.

2. 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. Concrete Substrates, Nontraffic Surfaces and Clay Masonry:
 1. Latex System:
 - a. Prime Coat: Primer sealer, latex, interior: S-W Loxon Concrete & Masonry Primer Sealer, A24W8300, at 8.0 mils wet, 3.2 mils dry.
 - b. Intermediate Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series.
 - c. Topcoat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series, at 6.0-10.0 mils wet, 2.5-4.0 mils dry per coat.
- B. CMU Substrates:
 1. Latex System:
 - a. Block Filler: S-W Heavy Duty Block Filler, B42W46, 18.0-34.0 mils wet, 10.0-18.0 mils dry.
 - b. Intermediate Coat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series.
 - c. Topcoat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series, at 6.0-10.0 mils wet, 2.5-4.0 mils dry per coat.

2. Epoxy System:
 - a. Block Filler: S-W Heavy Duty Block Filler, B42W46, 18.0-34.0 mils wet, 10.0-18.0 mils dry.
 - b. Intermediate Coat: S-W Pro Catalyzed Epoxy Primer B66W620.
 - c. Topcoat: S-W Pro Industrial Waterborne Catalyzed Epoxy Semi-Gloss, B73-260 Series, 2 coats.
- C. Metal Substrates (Aluminum, Steel, Galvanized Steel):
 1. Alkyd System (Water Based):
 - a. Prime Coat: Primer, rust-inhibitive, water based: S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, at 5.0 to 10 mils wet, 2.0 to 4.0 mils dry.
 - b. Intermediate Coat: Water-based acrylic, interior, matching topcoat.
 - c. Topcoat: S-W Pro Industrial Acrylic Semi-Gloss Coating, B66-650 Series or Gloss Coating, B66-660 Series, at 2.5 to 4.0 mils dry, per coat.
- D. Wood Substrates: Including exposed wood items not indicated to receive shop-applied finish.
 1. Latex System:
 - a. Prime Coat: Primer sealer, latex, interior: S-W Premium Wall & Wood Primer, B28W08111, at 4.0 mils wet, 1.8 mils dry.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66-650 Series, at 6.0-12.0 mils wet, 2.1-4.2 mils dry, per coat.
- E. Gypsum Board, Plaster and Spray-Texture Ceiling Substrates:
 1. Latex System:
 - a. Prime Coat: Primer, latex, interior: S-W ProMar 200 Zero VOC Latex Primer, B28W2600, at 4.0 mils wet, 1.5 mils dry.
 - b. Intermediate Coat: Latex, interior, matching topcoat.
 - c. Topcoat: S-W Pro Industrial DTM Acrylic Semi-Gloss, B66 Series, at 6.0-10.0 mils wet, 2.5-4.0 mils dry, per coat.
 2. Epoxy System:
 - a. Prime Coat: Primer S-W Pro Industrial Acrylic Dryfall Primer B42W47.
 - b. Intermediate Coat: Epoxy, interior, matching topcoat.
 - c. Topcoat: S-W Pro Industrial Waterborne Catalyzed Epoxy Semi-Gloss, B73-260.
- F. Structural Glazed Tile (SGT):
 1. Latex System:
 - a. Prime Coat: Primer, latex, interior: S-W Loxon Concrete & Masonry Primer/ Sealer A24W8300 at 8.0 mils wet, 3.2 mils dry.
 - b. Topcoat: S-W Bond-Plex Waterborne Acrylic Coating, B70W600 series.- 2 coats.
 2. Procedure:
 - a. Clean surfaces with detergent and water, rinse thoroughly.
 - b. Lightly abrade glossy tile surfaces to promote adhesion where approved by manufacturer.

- c. Repair cracks and defective grout joints as directed.
- d. Apply primer and finish coats as specified.
- e. Verify adhesion of coating system by tape test (ASTM D3359).
- f. Repaint areas that fail to achieve acceptable adhesion or appearance.

END OF SECTION 099123

SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of high-performance coating systems on the following substrates:
 - 1. Exterior Substrates:
 - a. Shop primed steel.
 - b. Galvanized metal.

1.2 SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples: For each type of coating system and in each color and gloss of topcoat indicated.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Tnemec Inc.; high performance coating systems, or comparable products by one of the following:
 - 1. Benjamin Moore & Co.
 - 2. Devoe Paint Company; Akzo Nobel.
 - 3. Dulux (formerly ICI Paints); a brand of AkzoNobel.
 - 4. Sherwin-Williams Company (The).
- B. Products: Subject to compliance with requirements, provide product listed in the Exterior High-Performance Coating Schedule for the coating category indicated.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

- A. 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.

- B. 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. Concrete: 12 percent.
 - 2. Fiber-Cement Board: 12 percent.
 - 3. Masonry (Clay and CMUs): 12 percent.
 - 4. Wood: 15 percent.
 - 5. Gypsum Board: 12 percent.
 - 6. Plaster: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers. The contractor shall provide a test sample of the proposed primer coat on a section of shop-primed steel to verify proper adhesion of coating system to the primed substrate.
- 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 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.

3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions and recommendations.
- B. 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 EXTERIOR HIGH-PERFORMANCE COATING SCHEDULE

- A. Shop-Primed Steel Substrates (Exposed Building Structure & Miscellaneous Metal Surfaces):
 - 1. Pigmented Polyurethane over High-Build Epoxy Primer:
 - a. Prime Coat: Tnemec Series 135 Chembuild modified epoxy primer, DFT 4.0 to 6.0 mils, tinted slightly lighter than finish topcoat.
 - b. Topcoat: Tnemec Series 1075U Endura-Shield II semi-gloss, acrylic polyurethane, DFT 3.0 to 5.0 mils.
- B. Galvanized-Metal Substrates (Hot-Dipped Handrails/Guardrails):
 - 1. Fluoropolymer over High-Build Epoxy Primer:
 - a. Prime Coat: Tnemec Series 66 Hi-Build Epoxoline epoxy primer, DFT 2.0 to 3.0 mils, tinted slightly lighter than finish topcoat.
 - b. Topcoat: Tnemec Series 1071 Fluoronar semi-gloss, high-solids fluoropolymer, DFT 2.5 to 3.0 mils.

END OF SECTION 099600

DIVISION 10 - SPECIALTIES

101416	PLAQUES
101419	DIMENSIONAL LETTER SIGNAGE
101423.16	ROOM-IDENTIFICATION PANEL SIGNAGE
102113.17	PHENOLIC-CORE TOILET COMPARTMENTS
102800	TOILET AND BATH ACCESSORIES
103113	METAL ATHLETIC LOCKERS
104413	FIRE PROTECTION CABINETS
104416	FIRE EXTINGUISHERS
107301.13	EXTRUDED ALUMINUM CANOPIES

SECTION 101416 - PLAQUES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes plaques.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For plaques.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show plaque mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each plaque.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Plaque Schedule (if more than one plaque): Use same designations specified or indicated on Drawings or in a plaque or sign schedule.
- E. Sample warranty.
- F. Maintenance data.

1.3 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of plaques that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

1.4 ALLOWANCE

- A. Plaque Allowance: Contractor shall provide an **allowance of \$3,500 in his bid for one (1) building plaque**. Installation cost shall be borne by the Contractor outside the allowance amount.

PART 2 - PRODUCTS

2.1 PLAQUES

- A. Cast Plaque: Plaque with background texture, border, and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide Gemini Incorporated; cast aluminum plaques, or a comparable product by one of the following:
 - a. A.R.K. Ramos.
 - b. Metallic Arts.
 - c. Southwell Company (The).
 - 2. Plaque Material: Cast aluminum.
 - 3. Plaque Thickness: $\frac{3}{4}$ ".
 - 4. Finish: Integral Aluminum Finish: Manufacturer's standard horizontal brushed grain aluminum.
 - 5. Background Texture: Leatherette.
 - 6. Integrally Cast Border Style: Plain bevel, brushed.
 - 7. Mounting: Rosette-head through fasteners.

2.2 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of plaques, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. For exterior exposure, furnish nonferrous-metal devices to match plaque finish as recommended by manufacturer, unless otherwise indicated.
 - 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - 4. Plaque Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of plaque, screwed into back of plaque, or screwed into tapped lugs cast integrally into back of plaque, unless otherwise indicated.
 - b. Through Fasteners: Exposed metal fasteners matching plaque finish, with type of head indicated, installed in predrilled holes.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 FABRICATION

- A. General: Provide manufacturer's standard plaques according to requirements indicated.

1. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 2. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 3. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match plaque finish.
 4. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.
- B. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted plaques to suit plaque construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.
1. Aluminum Brackets: Factory finish brackets with baked-enamel or powder-coat finish to match plaque-background color unless otherwise indicated.
 2. Stainless-Steel Brackets: Factory finish brackets to match plaque background finish unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install plaques using mounting methods indicated and according to manufacturer's written instructions.
1. Install plaques level, plumb, true to line, and at locations and heights indicated, with plaque surfaces free of distortion and other defects in appearance.
 2. Install plaques so they do not protrude or obstruct according to the accessibility standard.
 3. Before installation, verify that plaque surfaces are clean and free of materials or debris that would impair installation.
 4. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Methods:
1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of plaque. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place plaque in position and push until flush to surface, embedding studs in holes. Temporarily support plaque in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place plaque in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.

2. Through Fasteners: Drill holes in substrate using predrilled holes in plaque as template. Countersink holes in plaque if required. Place plaque in position and flush to surface. Install through fasteners and tighten.
3. Brackets: Remove loose debris from substrate surface and install bracket supports in position so that plaque is correctly located and aligned.
4. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of plaque and of suitable quantity to support weight of plaque after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as plaque is applied and to prevent visibility of cured adhesive at plaque edges. Place plaque in position, and push to engage adhesive. Temporarily support plaque in position until adhesive fully sets.

C. Remove temporary protective coverings and strippable films as plaques are installed.

END OF SECTION 101416

SECTION 101419 – DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast dimensional characters.

1.2 SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign.

C. Samples: For each exposed product and for each color and texture specified.

D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

E. Sample warranty.

F. Maintenance data.

1.3 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 DIMENSIONAL CHARACTERS

A. Cast Aluminum Characters: Characters with uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:

1. Basis-of-Design Product: Subject to compliance with requirements, provide A.R.K. Ramos; cast aluminum letters or a comparable product by one of the following:

- a. ASI Sign Systems, Inc.
- b. Gemini Incorporated.
- c. Southwell Company (The).
2. Character Material: Cast aluminum, flat faced profile.
3. Character Height & Font:
 - a. Gymnasium Entrance: 12 inch GARAMOND BOLD as indicated on the drawings, or as selected from manufacturer's full line of standard fonts.
4. Finishes: Manufacturer's Kynar or Powdercoat finish on cast aluminum.
5. Mounting: Projecting spacer studs (PM-1).

2.2 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
 1. Use concealed fasteners and anchors unless indicated to be exposed.
 2. For exterior exposure, furnish nonferrous-metal or stainless-steel devices as recommended by the manufacturer unless otherwise indicated.
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 3. Sign Mounting Fasteners:
 - a. Projecting Studs at Cast Aluminum Letters: Threaded studs with or without sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
- B. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.3 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 1. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 2. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 4. Internally brace signs for stability and for securing fasteners.
 5. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
 6. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff

castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
 - 3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Methods:
 - 1. Projecting Studs at Cast Aluminum Characters: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten. Provide solid, stable blocking behind thin substrate as required at all stud anchors.
- C. Remove temporary protective coverings and strippable films as signs are installed.
- D. Schedule of Letter and Logo Signage:
 - 1. Cast Letter Sign at Gymnasium Entrance: 12" high cast letters, GARAMOND BOLD font, Kynar or Powdercoat painted. Wording: GYMNASIUM

END OF SECTION 101419

SECTION 101423.16 - ROOM-IDENTIFICATION PANEL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes room-identification signs that are directly attached to the building.
- B. Related Requirements:

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For room-identification signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign.
- C. Samples: For each exposed product and for each color and texture specified.

1.3 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1.

2.2 ROOM-IDENTIFICATION SIGNS

- A. Room-Identification Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Best Sign Systems, Inc.; HC300 ADA Series Graphic Blast room identification signage, or a comparable product by one of the following:
 - a. ASI Sign Systems, Inc.
 - b. Mohawk Sign Systems.
- B. Fabrication:
 1. HC 300 ADA System with a four-in-one construction style having the following characteristics:
 - a. Tactile characters/symbols shall be raised 1/32 inch from sign plate face. Signs shall be of one-piece construction; added-on and/or engraved characters are unacceptable.
 - b. Text shall be accompanied by Grade 2 braille.
 - c. 3/8" wide, 1/32" raised perimeter border with 1/8" inside radius typical.
 - d. All letters, numbers and/or symbols shall contrast with their background – either light characters on a dark background or dark characters on a light background. Characters and background shall have matte finish.
- C. Interior Signage:
 1. Plaque material shall consist of melamine plastic laminate, approximately 1/8" thick (1/4" thick for slot signs), with background painted a contrasting color and rated non-static, fire-retardant and self-extinguishing. Plastic laminate will be impervious to most acids, alkalies, alcohol, solvents, abrasives and boiling water.
 2. Lettering style shall be Standard Medium, upper case, or other sans serif or simple serif typeface.
 3. Sizes of letters and numbers shall be as follows:
 - a. Room numbers shall be 5/8" high.
 - b. Lettering for room usage and directional identification shall be 5/8" high.
 - c. Lettering for restroom identification shall be 5/8" high, corresponding symbols shall be 3" high.
 4. Letters and numbers shall be centered on sign.
 5. Grade 2 braille shall be placed directly below last line of letters or numbers, except for room number signs, where they shall be placed directly behind the last number.
- D. Sign Size:
 1. Restroom signs shall be 6" x 8".
 2. Room identification signs shall be 6" x 6", 8" x 6", 8" x 8" or 10" x 3".
 3. Room name/number signs shall be 4 1/2" x 2 3/4".
- E. Sign Schedule:
 1. Provide the following types of interior room identification signs where shown on the drawings:
 - a. Pictogram 10 total sign allowance
 - b. Room Name 7 total sign allowance
 - c. "EXIT" sign 5 total sign allowance

F. Accessories:

1. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape with adhesive on both sides.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.

1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
2. Install signs so they do not protrude or obstruct according to the accessibility standard.
3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.

B. Mounting Methods:

1. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
2. Signs located on glass substrates shall be furnished with a matching size blank sign on the opposite side of the glass to hide the mounting tape.

C. Remove any temporary protective coverings and strippable films as signs are installed.

END OF SECTION 101423.16

SECTION 102113.17 - PHENOLIC-CORE TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Phenolic-core toilet compartments configured as toilet enclosures and urinal screens.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachment details.
- C. Color samples for phenolic panel material.
- D. Product certificates.
- E. Maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 450 or less.
- B. Regulatory 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 toilet compartments designated as accessible.

2.2 PHENOLIC-CORE TOILET COMPARTMENTS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Columbia Partitions, Series 72833, Class B Fire Rated Solid Phenolic Toilet Compartments, or a comparable product by one of the following:
1. ASI Accurate Partitions.
 2. AMPCO by AJW.

- B. Toilet-Enclosure Style: Overhead braced.
- C. Urinal-Screen Style: Floor anchored and wall braced.
- D. Door, Panel, Screen, and Pilaster Construction: Solid phenolic-core panel material with melamine facing on both sides fused to substrate during panel manufacture (not separately laminated), and with eased and polished edges. Provide minimum 3/4-inch- (19-mm-) thick doors and divider panels and minimum 1-inch- (13-mm-) thick pilasters.
- E. Pilaster Shoes: Formed from stainless-steel sheet, not less than 0.031-inch (0.79-mm) nominal thickness and 3 inches (76 mm) high, finished to match hardware.
- F. Urinal-Screen Post: Manufacturer's standard post design of material matching the thickness and construction of pilasters; with shoe matching that on the pilaster.
- G. Brackets (Fittings):
 - 1. Full-Height (Continuous) Type: Manufacturer's heavy duty design; extruded aluminum.
- H. Phenolic-Panel Finish:
 - 1. Facing Sheet Finish: One color and pattern in each room.
 - 2. Color and Pattern: As selected by Architect from manufacturer's full range, with manufacturer's standard dark color core.
 - 3. Edge Color: Manufacturer's standard.

2.3 HARDWARE AND ACCESSORIES

- A. Hardware and Accessories: Manufacturer's heavy-duty stainless steel operating hardware and accessories. Provide continuous hinges at all doors.
 - 1. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
- B. Overhead Bracing: Manufacturer's heavy duty continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless-steel, hot-dip galvanized-steel, or other rust-resistant, protective-coated steel compatible with related materials.

2.4 FABRICATION

- A. Fabrication, General: Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters to suit floor conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.

- C. Urinal-Screen Posts: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at bottoms of posts. Provide shoes at posts to conceal anchorage.
- D. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels: 1/2 inch (13 mm).
 - b. Panels and Walls: 1 inch (25 mm).
 - 2. Full-Height (Continuous) Brackets: Secure panels to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.

3.2 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113.17

SECTION 102800 – TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Public-use washroom accessories.
 - 2. Private-use bathroom accessories.
 - 3. Custodial accessories.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Maintenance data.

1.3 WARRANTY

- A. Manufacturer's Standard Sample Warranty.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PUBLIC-USE TOILET, BATH & CUSTODIAL ACCESSORIES

- A. Product Manufacturers:
 - 1. Basis-of-Design Manufacturer: Subject to compliance with requirements, provide Bobrick Washroom Equipment, Inc. and other specific product call-outs, or a comparable product by one of the following:
 - a. American Specialties, Inc.
 - b. Bradley Corporation.
 - c. Other prior approved manufacturers.

B. Grab Bar Set GB1 (1 – 42" & 1 – 36" Grab Bar Set):

1. Bobrick Series 5806, length as scheduled.
2. Mounting: Flanges with concealed fasteners.
3. Material and Finish: Stainless steel, 0.05 inch (1.3 mm) thick, No. 4 finish (satin).
4. Outside Diameter: 1-1/4 inches (32 mm).

C. Mirror Unit M1:

1. Bobrick Model 165 (18 x 36)
2. Frame: Stainless-steel channel.
 - a. Corners: Manufacturer's standard.
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
4. Size: 18" wide x 36" high.

D. Mirror Unit M2:

1. Bobrick Model 165 (24 x 36)
2. Frame: Stainless-steel channel.
 - a. Corners: Manufacturer's standard.
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
4. Size: 24" wide x 36" high.

E. Mirror Unit M2:

1. Bobrick Model 165 (24 x 60)
2. Frame: Stainless-steel channel.
 - a. Corners: Manufacturer's standard.
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
4. Size: 24" wide x 60" high.

F. Coat Hook CH:

1. Bobrick Model B-682.
2. Description: Single-prong Hat and Coat Hook unit.
3. Material and Finish: Stainless steel, No. 7 finish (polished).

G. Mop and Broom Holder MR:

1. Bobrick Model B223 x 36.
2. Description: Unit with mop holders.
3. Length: 36 inches.
4. Mop/Broom Holders: Minimum three, spring-loaded, rubber hat, cam type.
5. Material and Finish: Stainless steel, Type 304 finish (satin).

H. Owner Furnished Accessories (Installed by Contractor):

1. T1 Paper Towel Dispenser
2. TP Toilet Tissue Dispenser
3. SD Soap Dispenser

2.3 FABRICATION

- A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to ASTM F 446.

END OF SECTION 102800

SECTION 10 51 13 - METAL ATHLETIC LOCKERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. DESCRIPTION: Furnish and install Heavy-Duty MIG-Welded Metal Lockers, complete, as shown and specified per contract documents.

1.2 RELATED WORK SPECIFIED ELSEWHERE:

- A. Rough Carpentry: Section 061000

1.3 SUBMITTALS

- A. GENERAL: Refer to Section 01 30 00 ADMINISTRATIVE REQUIREMENTS - SUBMITTALS
- B. SHOP DRAWINGS: Submit drawings showing locker types, sizes, quantities, including all necessary details relating to anchoring, trim installation and relationship to adjacent surfaces.
- C. COLOR CHARTS: Provide color charts showing manufacturer's available colors (minimum 24). Provide metal samples if requested.
- D. NUMBERING: Locker numbering sequence will be provided by the approving authority and noted on approved shop drawings returned to the locker contractor.

1.4 QUALITY ASSURANCE

- A. MANUFACTURING STANDARD: Provide metal lockers that are standard products of a single manufacturer, with interchangeable like parts. Include necessary mounting accessories, fittings, and fastenings.
- B. FABRICATOR QUALIFICATIONS: Firm experience (minimum 5 years) in successfully producing the type of metal lockers indicated for this project, with sufficient production capacity to produce required units without causing delay in the work.
- C. INSTALLER QUALIFICATIONS: Engage an experienced (minimum 2 years) installer who has successfully completed installation of the type of metal lockers and extent to that indicated for this project.

1.5 PRODUCT HANDLING

- A. GENERAL: All work shall be fabricated in ample time so as to not delay construction process.
- B. DELIVERY: All materials shall be delivered to the site at such a time as required for proper coordination of the work. Materials are to be received in the manufacturer's original, unopened packages and shall bear the manufacturer's label.
- C. STORAGE: Store all materials in a dry and well ventilated place adequately protected from the elements.

1.6 WARRANTY

- A. All-Welded Lockers are covered against all defects in materials and workmanship excluding finish, damage resulting from deliberate destruction and vandalism under this section for the lifetime of the facility.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide LIST All-Star Sport Lockers Model ASBF and PE Lockers as scheduled, or a comparable product by one of the following:
1. Penco Stadium Lockers
 2. ASI Storage Solutions PRO Collection Lockers
 3. Other prior approved manufacturer's products

2.2 SPORT LOCKER TYPE

- A. GENERAL: Lockers shall be "SUPERIOR ALL-STAR OPEN FRONT SPORT LOCKERS" as manufactured by List industries Inc. or approved equal.
1. Type: Open front
 2. Size: 24 inches wide x min. 22 inches deep x 72 inches high with no base
- B. ALL-STAR OPEN FRONT SPORT LOCKERS:
1. Box Doors: 14 gauge non-perforated sheet steel, side hinged with finger pull latch
 2. Seat/Foot Locker: 14 gauge sheet steel, Security Plus ventilated front panel
 3. Sides: Fully-framed 13 gauge 1/2" flattened expanded metal or min. 16 gauge diamond perforated metal
 4. Tops, Bottoms, Shelves: 16 gauge solid galvaneal sheet steel
 5. Backs: 18 gauge solid sheet steel

2.3 P.E. LOCKER TYPE

- A. GENERAL: Lockers shall be "SUPERIOR TEAM and PE LOCKERS" as manufactured by List industries Inc. or approved equal.
1. Type: Six Tier
 2. Size: 12 inches wide x 12 inches deep x 72 inches high
- B. TEAM AND PE LOCKERS:
1. Box Doors: 14 gauge perforated sheet steel, top hinged with single-point spring bolt latching
 2. Sides: Fully-framed 13 gauge 1/2" flattened expanded metal or min. 16 gauge diamond perforated metal.
 3. Tops, Bottoms, Shelves: 16 gauge solid sheet steel
 4. Backs: 18 gauge solid sheet steel

2.4 FABRICATION

A. MATERIALS:

1. Steel Sheet: All sheet steel used in fabrication shall be prime grade free from scale and imperfections and capable of taking a heavy coat of custom blend powder coat.
2. Fasteners: Cadmium, zinc or nickel plated steel; bolt heads, slot less type; self-locking nuts or lock washers.
3. Hardware: Hooks of cadmium plated, zinc plated steel or cast aluminum. Coat rods of stainless steel tube.
4. Handle: Zinc plated, cold rolled steel finger pull.
5. Number Plates: To be aluminum with not less than 3/8" high etched numbers attached to door with two aluminum rivets.

B. CONSTRUCTION: Lockers shall be "SUPERIOR ALL-STAR OPEN FRONT FULLY-FRAMED ALL-WELDED ATHLETIC SPORT LOCKERS" as manufactured by List Industries Inc. or approved equal. All lockers shall be factory-assembled, of all MIG welded construction, in multiple column units to meet job conditions. Assembly of locker bodies by means of bolts, screws, or rivets will not be permitted. Welding of knockdown locker construction is not acceptable. Grind exposed welds and metal edges flush and make safe to touch.

1. FRAME / VERTICAL SIDE PANELS: Shall be of 13 gauge 1/2" flattened expanded metal framed by 16 gauge Hollow "T" tubular sections and channel frame members designed to enclose all four edges of the side panel with the entire assembly MIG welded to form a rigid frame for each locker. The channel frame members are welded to the front and rear vertical frame members to create and anchor bearing surface of 1-1/4 inches wide x the depth of the locker at each side panel. Note: Diamond perforated 16 gauge sheet steel by other manufacturers is acceptable.
2. INTEGRAL FRAME LOCKER BASE: Not required. A separate base will be installed by others. Lockers will be mounted to the base by others.
3. FLAT TOPS: Shall be formed of one piece of 16 gauge cold rolled sheet steel and shall be an integral part MIG welded to each vertical side panel frame member and be continuous to cover the full width of a multiple framed locker unit.
4. HAT SHELVES AND BOTTOMS: Shall be 16 gauge galvanized sheet steel, have double bends at front and shall engage slots in the Hollow "T" vertical frame members at all four corners and be securely welded to the frame and side. Locker bottom shelf located less than 2" above floor level will not be acceptable.
5. BACKS: Shall be 18 gauge cold rolled sheet steel, be continuous to cover a multiple framed unit and be welded to each vertical side panel frame member.
6. SPORT LOCKER UPPER SECURITY COMPARTMENT:
 - a. 12" Wide Security Box: To be formed of 14 gauge cold rolled sheet steel and securely MIG welded in place. The Door to be 14 gauge cold rolled sheet steel with plain (non-ventilated) door. Two heavy-duty 13 gauge 7-knuckle 3-1/2" hinges are to be MIG welded to the door and riveted to the side of the security box. Door to have a projecting friction catch, and a built-in keyless lock as specified..

7. SPORT LOCKER LOWER FOOT LOCKER

- a. Optional Foot Locker: Seat shall be formed of 14 gauge cold rolled sheet steel with stiffener sections for reinforcement and be prepared for padlock. Foot Locker front panel shall be 14 gauge cold rolled sheet steel with Security-Plus ventilation. A rubber bumper is to be mounted to locker back to cushion seat in the open position. Padlock Strike Plates are optional.
8. P.E. LOCKER LATCH: The latching mechanism shall be finger lift control type constructed of 14 gauge (minimum) steel with a nylon cover that has a generous finger pull. Spring activated nylon slide latches shall be completely enclosed in the lock channel allowing doors to close with the lock in the locked position. Locking device shall be designed for use with either built-in combination locks or padlocks. Latch hooks shall be 11 gauge (minimum) with riveted bumpers and shall be MIG welded to vertical frame member. Provide three latch hooks for doors 48" and over and two for doors under 48".
9. P.E. GYM DOORS 12" HIGH AND UNDER: Doors 12" high and under to be top hinged and be fabricated from single sheet prime 14 gauge with single bend at top and sides with a double bend at latch point (bottom). A spring loaded galvanized latch assembly shall be securely welded to the inside of the door. The latch shall be a minimum of 11 gauge, be equipped with a stainless steel spring and shall automatically engage when door is closed. Rubber bumpers shall be riveted to return bends on doors. Locking device shall be designed for use with both a padlock and built-in lock. Padlock Strike Plates are optional. Doors to be perforated with 7/16" x 15/16" diamonds.

2.5 LOCKER ACCESSORIES:

A. LOCKS:

1. Built-In Combination Locks: Built-in combination locks equal to "KEYLESS1" to be installed.

B. EQUIPMENT: Furnish each locker with one galvanneal hat shelf, two single prong hooks at back of underside of shelf and one 1" O.D. stainless steel tube coat rod factory attached below upper hat shelf.

1. Finished End Panels (at exposed ends of locker banks): Shall be "Boxed" type formed from 16 gauge cold rolled steel with 1" O.D. double bends on sides and a single bend at top and bottom with no exposed holes or bolts. If lockers have slope tops, end panels must be formed with slope at top to cover the ends of the slope tops. Finished to match lockers. Provide at all exposed ends.
2. Fillers (as required at ends and corners): Provide where indicated, of not less than 16 gauge sheet steel, factory fabricated and finished to match lockers.

C. FINISHING: All locker parts to be cleaned and coated after fabrication with a seven stage hot-spray washing process and coated with a zirconium-based nanotechnology providing a green alternative to traditional iron phosphate followed by a coat of high grade custom blend powder electrostatically sprayed and baked at 350 degrees Fahrenheit for a minimum of 20 minutes to provide a tough durable finish. Color to be selected from manufacturer's standard list of colors. Two-Tone Color Combination: Shall be at no additional cost with the locker body, frame and trim chosen from one color and the door and foot locker seat may be one of any other color chosen from manufacturers standard selection.

D. Lockers shall be GREENGUARD GOLD Certified.

PART 3 EXECUTION

3.1 INSTALLATION

- A. GENERAL: Installation shall be in strict conformance with referenced standards, the manufacturer's written directions, as shown on the drawings and as herein specified.
- B. PLACEMENT: Lockers shall be set in place, plumb, level, rigid, flush and securely attached to the wall (or bolted together if back-to-back) and anchored to the floor or base according to manufacturer's specifications.
- C. ANCHORAGE: About 48" O.C., unless otherwise recommended by manufacturer, and apply where necessary to avoid metal distortion, using concealed fasteners. Friction cups are not acceptable.
- D. TRIM: Sloping tops, metal fillers and end panels shall be installed using concealed fasteners. Provide flush, hairline joints against adjacent surfaces.

3.2 ADJUSTMENT

- A. GENERAL: Upon completion of installation, inspect lockers and adjust as necessary for proper door operation. Touch-up scratches and abrasions to match original finish.

END OF SECTION

SECTION 104413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes fire-protection cabinets for portable fire extinguishers.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For fire-protection cabinets.
- C. Maintenance data.

1.3 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 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: If required by the project, provide fire-rated cabinets listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

2.2 FIRE-PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide JL Industries, Inc.; a division of the Activar Construction Products Group; Academy #1027V10 & #1029V10 (non-rated) and #1827G10FX2 (1 or 2 HR fire-rated) cabinets, or a comparable product by one of the following:
 - a. Kidde Residential and Commercial Division.
 - b. Larsens Manufacturing Company.
- B. Cabinet Construction: Nonrated, or 1-hour or 2-hour, semi-recessed steel cabinets with hinged door. Choose non-rated or rated cabinet by their locations in non-rated or rated partitions.

- C. Cabinet Material: Cold-rolled steel sheet.
- D. Semi-recessed Cabinet (where scheduled): One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
 - 1. Rolled-Edge Trim: 3 inch backbend depth.
- E. Surface-Mounted Cabinet (where scheduled): One-piece combination trim and perimeter door frame with rolled edge corners
- F. Cabinet Trim Material: Aluminum sheet and die-formed aluminum corners.
- G. Door Material: Aluminum sheet.
- H. Door Style: Vertical duo panel with frame.
- I. Door Glazing: Acrylic sheet.
 - 1. Acrylic Sheet Color: Clear transparent acrylic sheet.
- J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
- K. Accessories:
 - 1. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate on door of cabinet.
 - a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Decals.
 - 3) Lettering Color: Red.
 - 4) Orientation: Vertical.
- L. Materials:
 - 1. Cold-Rolled Steel: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
 - a. Finish: Baked enamel or powder coat.
 - b. Color: White.
 - 2. Aluminum: ASTM B 221 (ASTM B 221M), with strength and durability characteristics of not less than Alloy 6063-T5 for aluminum sheet. ASTM B 221 (ASTM B 221M) for extruded shapes.
 - a. Finish and Color: Clear anodic.
 - 3. Transparent Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), standard thickness, with Finish 1 (smooth or polished).

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.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Prepare recesses for semi-recessed fire-protection cabinets as required by type and size of cabinet and trim style.
- B. Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
- C. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
- D. Identification: Apply decals at locations indicated.
- E. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

END OF SECTION 104413

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Warranty: Sample of special warranty.
- C. Operation and maintenance data.

1.3 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.4 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. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- 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.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers (General): Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

1. Basis-of-Design Product: Subject to compliance with requirements, provide J. L. Industries, Inc.; Activar Construction Products Group, Inc.; Cosmic Multipurpose Dry Chemical ABC, and Saturn Class K, or comparable products by one of the following:
 - a. Kidde; Carrier Global Corporation.
 - b. Larsen's Manufacturing Company.
 2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.
- B. Multipurpose Dry-Chemical Type: UL-rated 5 lb. nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's heavy duty steel cylinder with metal valve and siphon tube, O-ring seal, replaceable valve stem seal, visual pressure gauge, pull pin and upright squeeze grip. Factory powder-coated RED finish. For Class A, B & C fires.
1. Model Identification and UL Rating: COSMIC 5E; 3A-40BC.
 2. Mounting Bracket at Surface Mounted Extinguishers: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers scheduled.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine fire extinguishers for proper charging and tagging.
 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Install fire extinguishers in cabinets or with mounting brackets as scheduled in locations indicated and in compliance with requirements of authorities having jurisdiction.
 1. Mounting Brackets: 54 inches (1372 mm) above finished floor to top of fire extinguisher.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

SECTION 107301.13 – EXTRUDED ALUMINUM CANOPIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Extruded aluminum post-supported canopies.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings & Calculations:
 - 1. Include plans, elevations, sections, mounting heights, and attachment details.
 - 2. Shop drawings and calculations shall be engineered, stamped and sealed by a registered professional engineer currently licensed in Louisiana.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Sample warranty.

1.3 WARRANTY

- A. Special Warranty: Manufacturer and fabricator agree to repair or replace components of canopies that fail in materials or workmanship within the specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis-of-Design Product: Subject to compliance with requirements, provide East Texas Canopy, Inc., Post-Supported Extruded Aluminum Canopies, or a comparable product by one of the following:
 - 1. Peachtree Protective Covers.
 - 2. Tennessee Valley Metals.
 - 3. Mapes Canopy.

2.2 MATERIALS

- A. Post-Supported Canopy Components (member sizes are subject to requirements of design calculations):
 - 1. Decking: 2-3/4 inches x .078 inches thick, extruded aluminum.
 - 2. Beams: Standard 4 inches x 6 inches drainable beam.
 - 3. Posts: 4 inches x 4 inches x min. .125 inches thick.
 - 4. Framing Members: Extruded aluminum, alloy 6063-T6, in profile and thickness as required by engineering design.
 - 5. Brackets and miscellaneous components shall be of matching finish to canopy.
 - 6. Fasteners: Aluminum, 18-8 stainless steel, or 300 series stainless steel.
 - 7. Fascia shall be standard extruded 6 inch C style.
 - 8. Finish: Kynar 500 finish on aluminum, or powdercoat finish. 20 year finish warranty.

2.3 FABRICATION

- A. Extruded Aluminum Canopies shall be shipped with the materials pre-cut and pre-fitted to size for ease of field assembly.
- B. All connections shall be mechanically assembled utilizing 3/16 inch fasteners with a minimum shear stress of 350 pounds. Pre-weld or factory-welded connections are not acceptable.
- C. Decking shall be designed with interlocking roll-formed aluminum members.
- D. Support columns and gutter beams shall be designed such that the columns will be notched to create a "saddle" that will receive and secure the gutter beams.
- E. Post and beams shall be mechanically assembled utilizing 3/16 inch fasteners with a minimum shear stress of 350 lb. Pre-welded or factory-welded connections are not acceptable.
- F. Concealed Drainage at Post-Supported Canopies: Water shall drain from covered surfaces into beam trough and be directed to standard post drains.
- G. Aluminum Flashing: Canopy manufacturer shall provide flashing between canopy and masonry wall as detailed.

PART 3 - EXECUTION

3.1 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. Weld frame connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.

- C. Anchoring to In-Place Construction: Use anchors, fasteners, fittings, hardware, and installation accessories where necessary for securing awnings to structural support and for properly transferring load to in-place construction.
- D. 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.

END OF SECTION 107313

DIVISION 11 - EQUIPMENT

116143	STAGE CURTAINS
116623	GYMNASIUM EQUIPMENT

SECTION 116143 - STAGE CURTAINS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Stage curtains.
 - 2. Draw-curtain tracks.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Delegated-Design Submittal: For stage-curtain systems and attachments to structure, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- E. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, and coordinated with each other, using input from installers of the items involved.
- F. Product certificates.
- G. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer of stage curtains.

1.6 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of stage-curtain systems that fail in materials or workmanship within specified warranty period.

- 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 STAGE-CURTAIN SYSTEMS

- A. Description: Complete stage-curtain systems, including stage curtains and tracks; with necessary accessories for support and operation.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Georgia Stage LLC.
- b. Stagecraft Industries, Inc.
- c. Texas Scenic Co.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stage-curtain systems, including comprehensive engineering analysis and attachments to building structure, using performance requirements.
- B. Structural Performance: Stage-curtain systems and attachments to structure shall withstand the effects of gravity and operational loads.
- C. Fire-Test-Response Characteristics: Provide stage curtains meeting the following requirements as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

- 1. Flame-Propagation Resistance: Passes NFPA 701.
 - a. Permanently attach label to each fabric of curtain assembly indicating whether fabric is inherently and permanently flame resistant or is treated with flame-retardant chemicals and whether it requires retreatment after cleaning or after a designated time period of use.
 - b. Permanently attach 12-inch- (300 mm-) square swatch of same fabric and dye lot for each fabric of a curtain assembly to the back of assembly for use as fire-resistance test strip.

2.3 CURTAIN FABRICS

- A. General: Provide fabrics inherently and permanently flame resistant or chemically flame resistant by immersion treatment according to performance requirements indicated. Provide fabrics of each type and color from same dye lot.

- B. Polyester Velour: Napped fabric of 100 percent polyester weighing not less than 22 oz./linear yd. (683 g/linear m), with pile height approximately 75 mils (1.9 mm); inherently and permanently flame resistant; 54-inch (1372-mm) minimum width.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Dazian LLC.
- b. Fred Krieger & Co., Inc.
- c. Other prior approved manufacturer.

2. Color/Texture/Pattern: As selected by Architect from manufacturer's full range.

- C. Polyester: 100 percent polyester yarn woven fabric weighing not less than 13 oz./linear yd. (400 g/linear m); inherently and permanently or durably flame resistant; 72-inch (1829-mm) minimum width.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Dazian LLC.
- b. Fred Krieger & Co., Inc.
- c. Other prior approved manufacturer.

2. Color/Texture/Pattern: As selected by Architect from manufacturer's full range.

2.4 LINING

- A. Polyester Lining (if required by manufacturer): 100 percent polyester fabric; inherently and permanently flame resistant; 54-inch (1372-mm) minimum width; black.

2.5 CURTAIN FABRICATION

- A. General: Affix permanent label, stating compliance with requirements of authorities having jurisdiction, in accessible location on fabric not visible to audience. Provide vertical seams unless otherwise indicated. Arrange vertical seams so they do not fall on faces of pleats. Do not use fabric cuts less than one-half width.

- B. Vertical and Top Hems: Machine sew hems as follows unless otherwise indicated:

1. Vertical Hems: Minimum 2 inches (50 mm) wide, with not less than a 1-inch (25-mm) tuck and with no selvage material visible from front of curtain. Sew open ends of hems closed.
2. Turnbacks: Provide leading- and trailing-edge turnbacks for traveler curtains, formed by folding back not less than 12 inches (300 mm) of face fabric, with not less than a 1-inch (25-mm) tuck, and vertically secured by sewing.
3. Top Hems: Reinforced by double-stitching 3-1/2-inch- (89-mm-) wide, heavy, jute or laminated synthetic webbing to top edge on back side of curtain with not less than 2 inches (50 mm) of face fabric turned under.

- C. Fullness:
 - 1. 50 Percent Fullness: Provide fullness, exclusive of turnbacks and hems, by sewing additional material into 3-inch (75-mm) double-stitched, flat, box pleats spaced at 12 inches (300 mm) o.c. along top hem reinforcement.
- D. Grommets: Brass, No. 3, or No. 4. For black curtains, provide brass or aluminum grommets with black finish.
- E. Bottom Hems: Machine sew hems as follows unless otherwise indicated:
 - 1. For curtains with fullness:
 - a. Curtains That Do Not Hang to Floor: Hems not less than 3 inches (75 mm) deep, and with open ends of hems sewn closed.
 - b. Floor-Length Curtains: Hems not less than 6 inches (150 mm) deep, with 1-inch (25-mm) weight tape sewn to top seam of the bottom hem, clear of the finished bottom edge, and with open ends of hems sewn closed.

2.6 STEEL CURTAIN TRACK

- A. Steel Track: Roll-formed, galvanized, commercial-quality, zinc-coated steel sheet, ASTM A653/A653M; G60 (Z180) coating designation; with continuous bottom slot and with each half of track in one continuous piece; black paint finish; complete with necessary accessories for support and operation.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide H & H Specialties Inc; steel curtain track system, or a comparable product by one of the following:
 - a. Automatic Devices Company.
 - b. Tru-Roll Theatrical Rigging & Hardware.
 - 2. Steel Thickness: As recommended by manufacturer for loads and operation.
 - a. Medium Duty: Minimum 0.064 inch (1.63 mm).
- B. Clamp and Bracket Hangers: Steel clamps and brackets of sufficient strength required to support loads for attaching track to overhead support.
- C. Track-Lap Clamp: Metal to match track channel for attaching two tracks at center overlap.
- D. Curtain Rails: Provide end stops for track rails.
- E. Curtain Carriers: Standard carriers, with a quantity of curtain carriers sufficient for track length, to suit curtain fabrication. Include one master carrier for each leading curtain edge.
- F. Manual Cord Operation: Provide with cord operating line, 3/8-inch- (9-mm-) diameter, stretch-resistant operating cord of braided synthetic-fiber jacket over solid, synthetic-fiber, linear filaments.

2.7 CURTAIN RIGGING

- A. Battens: Fabricated from steel pipe with a minimum number of joints. Connect pipe at joints with a drive-fit pipe sleeve not less than 18 inches (450 mm) long, and secure with four flush rivets, plug welds, threaded couplings, or another equally strong method.
 - 1. Steel Pipe: ASTM A53/A53M, Grade A, standard weight (Schedule 40), black, NPS 1-1/2 (DN 40) nominal diameter unless otherwise indicated.
 - 2. Finish: Shop painted black, with a 1-inch- (25-mm-) wide yellow stripe at center of each batten.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Install stage-curtain system according to curtain and track manufacturer's written instructions.
- B. Battens: Install battens by suspending with supports spaced to support load, except do not exceed 10 feet (3 m) between supports.

3.2 TRACK INSTALLATION

- A. Batten-Hung Track: Install track by suspending from pipe batten with manufacturer's track clamp hangers attached to batten pipe clamps at track-support spacing, according to manufacturer's written instructions.
- B. Install track for center-parting curtains with not less than 24-inch (600-mm) overlap of track sections at center, supported by track lap clamps.

3.3 CURTAIN INSTALLATION

- A. Track Hung: Secure curtains to track carriers with S-hooks.
- B. Batten Hung: Secure curtains to pipe battens with S-hooks or ties as recommended by the system manufacturer.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain stage curtains and tracks.

3.5 CURTAIN SCHEDULE

- A. Stage Curtain: As indicated on Drawings and as follows:
 - 1. Type: Manually-operated Proscenium Stage System consisting of a Main Valance, Front Bi-Parting Traveler panels, Borders and Bi-Parting Cyclorama.
 - 2. Horizontal Accessory Curtain: Main Valance.

3. Size and Arrangement: As indicated on Drawings.
4. Fabric: Polyester velour.
5. Lining (if required by mfr.): Polyester.
6. Fullness: 50 percent.
7. Bottom Weights: Weight tape.
8. Hanging Accessories: S-hooks.
9. Battens: As recommended by manufacturer.
10. Track: Medium-duty steel or Heavy-duty steel with single-curtain capacity.
11. Track Shape: Straight and Curved.
12. Operation: Manual cord (pulley rope).

END OF SECTION 116143

SECTION 116623 - GYMNASIUM EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. L-shaped safety pads for Stage edge.
 - 2. Wall corner safety pads.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For gymnasium equipment.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each exposed product and for each item and color specified.
- D. Coordination Drawings: Court layout plans, drawn to scale, and coordinated with floor inserts, game lines, and markers applied to finished flooring.
- E. Product certificates.
- F. Sample warranty.
- G. Operation and maintenance data.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

1.4 WARRANTY

- A. Warranty: Manufacturer agrees to repair or replace components of gymnasium equipment that fail in materials or workmanship within the contractor's warranty period.

PART 2 - PRODUCTS

2.1 SAFETY PADS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Porter Athletic Equipment Company; Model #960570 custom SuperSafe FR Stage Pad panels, Wall Attachment Clips and Stor-Strip for securing tops of stage pads, or a comparable product by one of the following:
 - 1. Draper Inc.
 - 2. Other prior approved manufacturers.
- B. Safety Pad Surface-Burning Characteristics: ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.
- C. Pad Coverings: Provide safety pad fabric covering that is fabricated from puncture- and tear-resistant, PVC-coated polyester or nylon-reinforced PVC fabric, not less than 14-oz./sq. yd (475-g/sq. m) and treated with fungicide for mildew resistance; with surface-burning characteristics indicated.
- D. L-Shaped "Stage" Safety Pads: Custom L-shaped padded wall wainscot panels designed to be attached in a continuous row; each panel section consisting of fill laminated to backer board with visible surfaces fully covered by seamless fabric covering, free of sag and wrinkles and firmly attached to back of backer board.
 - 1. Backer Board: Not less than 7/16-inch- (9.5-mm-) thick plywood, mat formed, or composite panel.
 - 2. Fire-Resistive Fill: Manufacturer's standard, 2 inches thick, bonded to backer board.
 - 3. Size: Each panel section, 48 inches (600 mm) wide by not less than 70 inches (1800 mm) long, plus custom lengths as required at corners and ends of runs. Refer to drawings for sizes and locations. Provide panels without nailing margins.
 - 4. Number of Modular Panel Sections: As indicated.
 - 5. Installation Method: Manufacturer's standard for L-shaped pads.
 - 6. No exposed sewn joints allowed on pads.
 - 7. Fabric Covering Color(s): As selected by Architect from manufacturer's full range for two color(s).
- E. Wall Corner Safety Pads: Padded wall wainscot panels designed to be attached on an outside wall corner of a wall; each panel section consisting of fill laminated to backer board with visible surfaces fully covered by seamless fabric covering, free of sag and wrinkles and firmly attached to back of backer board.
 - 1. Backer Board: Not less than 3/8-inch- (9.5-mm-) thick plywood, mat formed, or composite panel.
 - 2. Fire-Resistive Fill: Manufacturer's standard, 2 inches thick.
 - 3. Size: Each panel section, 24 inches (600 mm) wide by scheduled length per drawings. Provide panels without nailing margins.
 - 4. Number of Modular Panel Sections: As indicated.
 - 5. Installation Method: Manufacturer's standard.
 - 6. Fabric Covering Color(s): As selected by Architect from manufacturer's full range for two color(s).

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions and competition rules indicated for each type of gymnasium equipment. Complete equipment field assembly where required.
- B. Permanently Placed Gymnasium Equipment and Components: Install rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relation to adjacent construction; and aligned with court layout.

3.2 CLEANING

- A. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.

END OF SECTION 116623

DIVISION 12 - FURNISHINGS

123623.13 PLASTIC-LAMINATE-CLAD COUNTERTOPS

SECTION 123623.13 - PLASTIC-LAMINATE-CLAD COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes plastic-laminate-clad countertops.

1.2 SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For plastic-laminate-clad countertops.
- C. Samples: Plastic laminates in each type, color, pattern, and surface finish required.

PART 2 - PRODUCTS

2.1 FABRICATORS

- 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. Bayou Wood Products, 1315 Hwy. 15, West Monroe, LA 71291, (318) 397-0000.
 - 2. Other prior approved acceptable millwork/casework manufacturers.

2.2 PLASTIC-LAMINATE-CLAD COUNTERTOPS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-clad countertops indicated for construction, finishes, installation, and other requirements.
- B. Grade: Custom.
- C. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Abet Laminati, Inc.
 - b. Formica Corporation.
 - c. Pionite: a Panolam Industries International, Inc. brand.
 - d. Wilsonart International Holdings, Inc.
 - e. Nevamar brand.

- D. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As selected by Architect from manufacturer's full range in the following categories:
 - a. Solid colors, matte finish.
 - b. Solid colors with core same color as surface, matte finish.
 - c. Wood grains, matte finish with grain running parallel to length of countertop.
 - d. Patterns, matte finish.
- E. Edge Treatment: Same as laminate cladding on horizontal surfaces.
- F. Core Material: Min. 45 lb. density Particleboard made with exterior glue.
- G. Core Material at Sinks: Particleboard made with exterior glue.
- H. Core Thickness: 3/4 inch (19 mm).
- I. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.

2.3 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard unless otherwise indicated.
 - 1. Wood Moisture Content: 8 percent maximum.
- B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of countertop and quality grade specified unless otherwise indicated.
 - 1. MDF: Medium-density fiberboard, ANSI A208.2, Grade 130.
 - 2. Particleboard: ANSI A208.1, Grade M-2-Exterior Glue.
 - 3. Softwood Plywood: DOC PS 1.

2.4 ACCESSORIES

- A. Wire-Management Grommets: Circular, molded-plastic grommets and matching plastic caps with slot for wire passage.
 - 1. Outside Diameter: 2 inches (51 mm).
 - 2. Color: Black,

2.5 MISCELLANEOUS MATERIALS

- A. Adhesive for Bonding Plastic Laminate: As selected by fabricator to comply with requirements.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive or adhesive specified above for faces.

2.6 FABRICATION

- A. Fabricate countertops to dimensions, profiles, and details indicated. Provide front and end overhang of 1 inch (25 mm) over base cabinets. Ease edges to radius indicated for the following:
 - 1. Solid-Wood (Lumber) Members: 1/16 inch (1.5 mm) unless otherwise indicated.
- B. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Grade: Install countertops to comply with same grade as item to be installed.
- B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
 - 1. Provide cutouts for appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately, and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
 - 2. Seal edges of cutouts by saturating with varnish.
- C. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.
 - 1. Secure field joints in countertops with concealed clamping devices located within 6 inches (150 mm) of front and back edges and at intervals not exceeding 24 inches (600 mm). Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.
- D. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Countertop Installation: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 1. Install countertops level and true in line. Use concealed shims as required to maintain not more than a 1/8-inch-in-96-inches (3-mm-in-2400-mm) variation from a straight, level plane.
 - 2. Secure backsplashes to walls with adhesive.
 - 3. Seal joints between countertop and backsplash, if any, and joints where countertop and backsplash abut walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.

- F. Protection: Provide Kraft paper or other suitable covering over countertop surfaces, taped to underside of countertop at a minimum of 48 inches (1220 mm) o.c. Remove protection at Substantial Completion.

END OF SECTION 123623.13

DIVISION 14 – CONVEYING SYSTEMS

144250 VERTICAL WHEELCHAIR LIFTS

SECTION 144250 - VERTICAL WHEELCHAIR LIFTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Unenclosed Vertical Wheelchair Lift.

1.2 RELATED SECTIONS

- A. Section 033000 - Cast-In-Place Concrete: Concrete shaftway and anchor placement.
- B. Section 061000 - Rough Carpentry: Blocking in framed construction for lift attachment.
- C. Division 16 - Electrical: Dedicated telephone service and wiring connections.
- D. Division 16 - Electrical: Lighting and wiring connections at top of shaft.
- E. Division 16 - Electrical: Electrical power service and wiring connections.

1.3 REFERENCES

- A. ASME A17.1 - Safety Code for Elevators and Escalators.
- B. ASME A17.5 - Elevator and Escalator Electrical Equipment.
- C. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.
- D. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities.
- E. NFPA 70 - National Electric Code.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Submit manufacturer's installation instructions, including preparation, storage and handling requirements.
 - 2. Include complete description of performance and operating characteristics.
 - 3. Show maximum and average power demands.
- C. Shop Drawings:
 - 1. Show typical details of assembly, erection and anchorage.
 - 2. Include wiring diagrams for power, control, and signal systems.
 - 3. Show complete layout and location of equipment, including required clearances and coordination with shaftway.
- D. Selection Samples: For each finished product specified, provide two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finished product specified, two samples, minimum size 1-3/4 inch by 2-1/4 inches, representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm with minimum 10 years experience in manufacturing of vertical platform lifts, with evidence of experience with similar installations of type specified.
- B. Installer Qualifications: Licensed to install equipment of this scope, with evidence of experience with specified equipment. Installer shall maintain an adequate stock of replacement parts, have qualified people available to ensure fulfillment of maintenance and callback service without unreasonable loss of time in reaching project site.

1.6 REGULATORY REQUIREMENTS

- A. Provide platform lifts in compliance with:
 - 1. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.
 - 2. ASME A17.1 - Safety Code for Elevators and Escalators.
 - 3. ASME A17.5 - Elevator and Escalator Electrical Equipment.
 - 4. NFPA 70 - National Electric Code.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store components off the ground in a dry covered area, protected from adverse weather conditions.

1.8 PROJECT CONDITIONS

- A. Do not use wheelchair lift for hoisting materials or personnel during construction period.

1.9 WARRANTY

- A. Warranty: Provide a two-year limited warranty for wheelchair lift materials and workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Garaventa Lift (GENESIS OPAL); United States - P.O. Box 1769, Blaine, WA 98231-1769. Canada - 18920 - 36th Ave., Surrey, BC V3Z 0P6. ASD. Toll Free: 800-663-6556. Web: www.garaventalift.com.
- B. Savaria V-1504 or approved equal per Section 012513.

2.2 UNENCLOSED VERTICAL WHEELCHAIR LIFT

- A. Capacity: 750 lbs (340 kg) rated capacity.
- B. Mast Height:
 - 1. Model GVL-OP-42; 45 inches (1143 mm) maximum lifting height.
- C. Nominal Clear Platform Dimensions:
 - 1. Standard: 36 inches (914 mm) by 48-7/8 inches (1242 mm).
- D. Platform Configuration:
 - 1. Straight Through Entry/Exit: Front and rear openings.

- E. Landing Openings: Gates shall be self-closing type.
 - 1. Gate Height: 42-1/8 inches (1070 mm)/
 - 2. Platform Gate: Travels with platform and opens at lower landing.
 - 3. Upper Landing Gate: Installed at upper landing.
- F. Power Gate Operators:
 - 1. Location:
 - a. Platform Gate: Travels with platform and opens lower landing.
 - b. Upper Landing Gate.
 - 2. Automatically opens the gate when platform arrives at a landing. Will also open at landing by pressing call button.
 - 3. ADA Compliant and obstruction sensitive.
 - 4. Low voltage, 24 VDC with all wiring concealed.
- G. Lift Components:
 - 1. Machine Tower: Aluminum extrusion.
 - 2. Base Frame: Structural steel.
 - 3. Platform Side Wall Panels: 16 gauge (1.5 mm) galvanized steel sheet.
 - 4. Platform Access Ramp: 12 gauge (2.5 mm) galvanized steel plates; slip resistant surfaces.
 - a. Ramp: Automatic folding type.
 - 5. Side Guard Panels: 42-1/8 inches (1070 mm) high mounted on platform.
- H. Base Mounting at Lower Landing:
 - 1. Floor Mount: Base of lift shall be mounted on the floor surface of the lower landing. For access onto the platform provide a ramp of 16 gauge (1.5 mm) galvanized steel sheet with a slip resistant surface.
- I. Leadscrew Drive:
 - 1. Drive Type: Self-lubricating acme screw drive.
 - 2. Emergency Operation: Manual handwheel device to raise or lower platform.
 - 3. Battery Powered Emergency Lowering: Battery powered platform lowering device that automatically activates in the event of power failure. Allows passenger to drive platform downward to lower landing. Does not operate lift in up direction.
 - 4. Safety Devices:
 - a. Integral safety nut assembly with safety switch.
 - 5. Travel Speed: 10 fpm (3.0 m/minute).
 - 6. Motor: 2.0 hp (560 W).
 - 7. Power Supply:
 - a. 120 VAC single phase; 60 Hz on a dedicated 15-amp circuit.
 - b. Powered by continuous building mains converted to 24 VDC, equipped with auxiliary power system capable of running lift up and down for a minimum of 5 trips with rated load.
- J. Platform Controls: 24 VDC control circuit with the following features.
 - 1. Direction Control: Illuminated tactile and continuous pressure elevator-style buttons with dual platform courtesy lights and safety light.
 - 2. Illuminated and audible emergency stop switch shuts off power to lift and activates audio alarm with battery backup.
 - 3. Keyless operation.
- K. Call Station Controls: 24 VDC control circuit with the following features.
 - 1. Direction Control:
 - a. Illuminated tactile and continuous pressure elevator-style buttons with dual

- platform courtesy lights and safety light.
- 2. Keyless operation.
- 3. Call Station Mounting:
 - a. Lower:
 - 1) Wall mounted surface.
 - b. Upper:
 - 1) Wall mounted surface.
- L. Safety Devices and Features:
 - 1. Grounded electrical system with upper, lower, and final limit switches.
 - 2. Tamper resistant interlock to electrically monitor that the gate is in the closed position and the lock is engaged before lift can move from landing.
 - 3. Electrical disconnect shall shut off power to the lift.
 - 4. Under platform safety pan with five waterproof safety switches to detect obstruction under platform.
- M. Finishes
 - 1. Extruded aluminum electrostatically applied baked powder finish, semi matte.
 - a. Color: As selected from manufacturer's full color line.
 - 2. Ferrous Components: Electrostatically applied baked powder finish, semi matte.
 - a. Color: As selected from manufacturer's full color line.
 - 3. Lift Finish: Baked powder coat finish as selected by the Architect from manufacturer's optional RAL color chart.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Verify shaft and machine space are of correct size and within tolerances.
- C. Verify required landings and openings are of correct size and within tolerances.
- D. Verify electrical rough-in is at correct location.
- E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install lifts in accordance with applicable regulatory requirements including ASME A 17.1, ASME A 18.1 and the manufacturer's instructions.
- B. Install lifts in accordance with applicable regulatory requirements including CSA B355, and manufacturer's instructions.
- C. Install system components and connect to building utilities.

- D. Accommodate equipment in space indicated.
- E. Startup equipment in accordance with manufacturer's instructions.
- F. Adjust for smooth operation.

3.4 FIELD QUALITY CONTROL

- A. Perform tests in compliance with ASME A 17.1 or A18.1 and as required by authorities having jurisdiction.
- B. Perform tests in compliance with CSA B355 and required by authorities having jurisdiction.
- C. Schedule tests with agencies and Architect, Owner, and Contractor present.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

DIVISION 22 – PLUMBING

220000	PLUMBING GENERAL PROVISIONS
220523	GENERAL DUTY VALVES FOR PLUMBING
220529	HANGERS AND SUPPORTS FOR PLUMBING, PIPING, AND EQUIPMENT
220719	PLUMBING PIPING INSULATION
221113	FACILITY WATER DISTRIBUTION PIPING
221116	DOMESTIC WATER PIPING
221119	DOMESTIC WATER PIPING SPECIALTIES
221219	NATURAL GAS DISTRIBUTION AND PIPING
221316	SANITARY WASTE AND VENT PIPING
221319	SANITARY WASTE PIPING SPECIALTIES
221413	FACILITY STORM DRAINAGE PIPING
221423	STORM DRAINAGE PIPING SPECIALTIES
223300	ELECTRIC, DOMESTIC-WATER HEATERS
224200	PLUMBING FIXTURES

SECTION 22 00 00 – PLUMBING GENERAL PROVISIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. The General Conditions of the Architectural Specifications, along with the supplementary conditions, special conditions, information to bidders, and any other pertinent information and documents shall apply the same as if repeated herein.

1.2 SCOPE OF WORK

- A. Furnish all labor and material necessary to provide and install the complete mechanical portion of this Contract, including plumbing systems as called for herein and on accompanying drawings. Parts of the mechanical division may be bid separately or in combination, at the Contractor's option; however, it shall be the responsibility of the General Contractor to assure himself that all items covered in this Division have been included if he chooses to accept separate bids.
- B. This Contractor shall refer to the Architectural and Structural drawings and install equipment, piping, etc. to meet building and space requirements. No equipment shall be bid on or submitted for approval if it will not fit in the space provided.
- C. It is the intention of these Specifications that all mechanical systems shall be furnished complete with all necessary valves, controls, insulation, piping, devices, equipment, etc. necessary to provide a satisfactory installation in working order.
- D. Contractor shall visit the site and acquaint himself thoroughly with all existing facilities and conditions that would affect his portion of the work. Failure to do so shall not relieve the Contractor from the responsibility of installing his work to meet the conditions.
- E. This Contractor shall protect the entire system and all parts thereof from injury throughout the project and up to acceptance of the work. Failure to do so shall be sufficient cause for the Architect to reject any piece of equipment.

1.3 DEMOLITION

- A. The contractor shall visit the site prior to bid to determine the extent of work required to complete the project.
- B. Contractor shall coordinate demolition with owner. The Owner shall have "First Right of Refusal" regarding salvage of all equipment and materials to be removed. Locate equipment as directed by owner. All equipment and materials not salvaged by the owner shall be removed from the site and discarded at the contractor's expense.



- C. Contractor shall coordinate all work with general contractor and phase work as required by project.
- D. All equipment piping, etc. required to be removed to accommodate the modifications shall be removed.
- E. Contractor shall maintain services to existing facilities which shall remain during and after construction is complete.
- F. Contractor shall coordinate any shutdown of services with the owner. It is intended that the building will remain occupied during construction. Contractor shall schedule shut down of services with the owner in order to prevent disruption of building occupancy.
- G. Contractor shall be responsible for draining down of existing systems to complete demolition. All work shall be scheduled with the owner. Contractor shall also be responsible for refilling system and removing all air in order to return the systems to proper operating conditions.
- H. All shut down of services shall be done at night or during a time period approved by the owner. The systems shall be required to be back up and running each morning unless otherwise approved by the owner.

1.4 GROUND AND CHASES

- A. This Contractor shall see that all required chases, grounds, holes and accessories necessary for the installation of his work are properly built in as the work progresses; otherwise, he shall bear the cost of providing them.

1.5 CUTTING AND PATCHING

- A. Initial cutting and patching shall be the responsibility of the General Contractor, with the Mechanical Contractor being responsible for laying out and marking any and all holes required for the reception of his work. No structural beams or joists shall be cut or thimble without first receiving the approval of the Architect. After initial surfacing has been done, any further cutting, patching and painting shall be done at this Contractor's expense.

1.6 FILL AND CHARGES FOR EQUIPMENT

- A. Fill and charge with materials or chemicals all those devices or equipment as required to comply with the manufacturer's guarantee or as required for proper operation of the equipment.

1.7 MACHINERY GUARDS

- A. This Contractor shall provide v-belt guards for each v-belt drive or other hazardous drive. The guard shall enclose the drive entirely and shall have a hole for taking a tachometer reading.
- B. Provide protective guard for belts, pulleys, gears, couplings, projecting set screws, keys and other rotating parts which are located such that a person might come in close proximity. Construct protective guard around angle iron frame, securely bolted to apparatus; comply with

safety requirements. Install guard to completely enclose drives and pulleys and not interfere with lubrication of equipment. Provide 2 inch minimum diameter opening in fan belt guards housing for tachometer.

1.8 REPAIRING ROADWAYS AND WALKS

- A. Where this Contractor cuts or breaks roadways or walks, in order to lay piping, he shall repair or replace these sections to meet the Architect's approval.

1.9 EXCAVATION AND BACKFILL

- A. Contractor shall perform all excavating necessary to lay the specified services. Perform excavation of every description and of whatever substance encountered to depths indicated or specified. Pile materials suitable for backfilling a sufficient distance from banks of trenches to prevent slides or cave-ins. Comply with OSHA requirements for excavation, trenching and shoring. Waste excavation materials, rubbish, etc. shall be carted away from the premises, as indicated. Remove water from trenches by pumping or other approved method, discharge at a safe distance from the excavation.
- B. Provide trenches of necessary width for proper laying of pipe and comply with latest publication of OSHA 2226 Excavating and Trenching Operations. Coordinate trench excavation with pipe installation to avoid open trenches for prolonged periods. Accurately grade bottoms of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil or the required thickness of bedding material at every point along its entire length.
- C. Provide minimum 12 inches between outer surfaces and embankment or shoring, which may be used, when excavating for manholes and similar structures. Remove unstable soil that is incapable of supporting the structure in the bottom of the excavation to the depth necessary to obtain design bearing.
- D. Material to be excavated is "unclassified". No adjustment in the contract price will be made on account of the presence or absence of rock, shale, masonry, or other materials.
- E. Protect existing utility lines that are indicated or the locations of which are made known prior to excavating and trenching and that are to be retained. Protect utility lines encountered during excavating and trenching operations, from damage during excavating, trenching and backfilling; if damaged, repair lines as directed by utilities, owner and A/E. Issue notices when utility lines that are to be removed are encountered within the area of operations in ample time for the necessary measures to be taken to prevent interruption of the service.
- F. Provide trenches for utilities of a depth that will provide the following minimum depths of cover from existing grade or from indicated finished grades, or depths of cover in accordance with the manufacturer's recommendations, whichever is lower:
 - 1. 1-Foot Minimum Cover: Sanitary sewer, storm drainage, industrial waste, acid waste.
 - 2. 3-Foot Minimum Cover: Domestic water, fire line.
- G. Underground domestic water piping and fire line piping shall have a 6" bed of sand below the piping and backfilled with sand to 6" above the top of piping. Select fill may be used above the sand layer.

- H. Backfill trenches after piping, fittings and joints have been tested and approved. Backfill trenches with sand to provide 6 inches of sand below piping and 12 inches of sand cover above piping.
- I. Backfill remainder of trenches with satisfactory material consisting of earth, loam, sandy clay, sand and gravel or soft shale, free from large clods of earth and stones not over 1-1/2 inches in size. Deposit backfill material in 9 inch maximum layers, loose depth as indicated or as specified. Take care not to damage utility lines.
- J. Deposit the remainder of backfill materials in the trench in 1 foot maximum layers and compact by mechanical means. Refer to architectural for minimum density for compaction (Minimum 85 percent of maximum soil density as determined by ASTM D 698). Re-open trenches and excavation pits improperly backfilled or where settlement occurs to the depth required to obtain the specified compaction, the refill and compact with the surface restored to the required grade and compaction.
- K. Backfill utility line trench with backfill material, in 6 inch layers, where trenches cross streets, driveways, building slabs, or other pavement. Moisten each layer and compact to 95 percent of the maximum soil density as determined by ASTM D 698. Accomplish backfilling in such a manner as to permit the rolling and compaction of the filled trench with the adjoining material to provide the required bearing value so that paving of the area can proceed immediately after backfilling is complete.

1.10 NOISE AND VIBRATION

- A. Provide the plumbing system and its associated components, items, piping, and equipment free of objectionable vibration or noise. Statically and dynamically balance rotating equipment and mount or fasten so that no vibration is transmitted to or through the building structure by equipment, piping, ducts or other parts of work, rectify such conditions at no additional compensation.

1.11 PAINTING

- A. All painting shall be by the General Contractor's Painting Sub-Contractor. All pipe, pipe covering, equipment, supports, hangers, etc. exposed in the building or equipment room shall be painted. This Contractor shall prepare the surface of the material to receive the first coat of paint.
- B. All subsequent coatings shall be prepared by the Painting Sub-Contractor. Requirements covering paints, workmanship and preparation of surfaces as stated in the Architectural Specifications shall govern. Colors shall be approved by the Architect. All piping shall be color-coded. All subsequent coatings shall be prepared by the Painting Sub-Contractor. Requirements covering paints, workmanship and preparation of surfaces as stated in the Architectural Specifications shall govern. Colors shall be approved by the Architect. All piping shall be color-coded.
- C. All piping shall be color coded per the following:
 - 1. Storm Drain Piping (Exposed in Building) Black
 - 2. Sanitary Sewer Waste & Vent (Exposed in Building) Black
 - a. Thermoplastic pipe and fittings shall be painted using latex(water base) paint .

- b. Pipe should be cleaning to remove moisture, dirt and oil; then wiped with a clean, dry cloth.
- c. Do not use petroleum based paints.

1.12 CLEANING AND ADJUSTING

- A. Upon completion of his work, the Contractor shall clean and adjust all equipment, controls, valves, etc.; clean all piping, ductwork, etc.; and leave the entire installation in good working order.

1.13 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Provide the Owner with three (3) copies of printed instructions indicating various pieces of equipment by name and model number, complete with parts lists, maintenance and repair instructions and test and balance report.
- B. COPIES OF SHOP DRAWINGS WILL NOT BE ACCEPTABLE AS OPERATION AND MAINTENANCE INSTRUCTIONS BUT MUST BE INCLUDED IN SUBMITTAL PACKAGE.
- C. This information shall be bound in plastic hardbound notebooks with the job name permanently embossed on the cover. Rigid board dividers with labeled tabs shall be provided for different pieces of equipment. Submit manuals to the Architect for approval.
- D. In addition to the operation and maintenance brochure, the Contractor shall provide a separate brochure which shall include registered warranty certificates on all equipment, especially any pieces of equipment which carry warranties exceeding one (1) year.
- E. The operation and maintenance brochure shall be furnished with a detailed list of all equipment furnished to the project, including the serial number and all pertinent nameplate data such as voltage, amperage draw, recommended fuse size, rpm, etc. The Contractor shall include this data on each piece of equipment furnished under this contract.

1.14 GUARANTEE

- A. The Contractor shall guarantee all materials, equipment and workmanship for a period of one (1) year from the date of final acceptance of the project. This guarantee shall include furnishing of all labor and material necessary to make any repairs, adjustments or replacement of any equipment, parts, etc. necessary to restore the project to first class condition. This guarantee shall exclude only the changing or cleaning of filters. Warranties exceeding one (1) year are hereinafter specified with individual pieces of equipment.

1.15 LOCAL CONDITIONS

- A. The location and elevation of all utility services is based on available surveys and utility maps and are reasonably accurate; however, these shall serve as a general guide only, and the Contractor shall visit the site and verify the location and elevation of all services to his satisfaction in order to determine the amount of work required for the execution of the Contract.

- B. The Contractor shall contact the various utility companies, determine the extent of their requirements and he shall include in his bid all lawful fees and payments required by these companies for complete connection and services to the building, including meters, connection charges, street patching, extensions from meters to main, etc.
- C. In case major changes are required, this fact, together with the reasons therefor, shall be submitted to the Architect, in writing, not less than seven (7) days before the date of bidding. Failure to comply with this requirement will make the Contractor liable for any changes, additions and expenses necessary for the successful completion of the project.

1.16 PERMITS, INSPECTIONS AND TESTS

- A. All permits, fees, etc. for the installation, inspections, plan review, service connections locations, and/or construction of the work which are required by any authority and/or agencies having jurisdiction, shall be obtained and paid for by the Contractor. This shall be verified during the bidding process.
- B. The Contractor shall make all tests required by the Architect, Engineer or other governing authorities at no additional cost to the Owner.
- C. The Contractor shall notify the Architect and local governing authorities before any tests are made, and the tests are not to be drawn off a line covered or insulated until examined and approved by the authorities. In event defects are found, these shall be corrected and the work shall be retested.
- D. Prior to requesting final inspection by the Architect, the Contractor shall have a complete coordination and adjustment meeting of all of his sub-contractors directly responsible for the operation of any portion of the system. At the time of this meeting, each and every sequence of operation shall be checked to assure proper operation. Notify the Architect in writing ten (10) days prior to this meeting, instructing him of the time, date and whom you are requesting to be present.
- E. This project shall not be accepted until the above provisions are met to the satisfaction of the Architect.

1.17 CODES AND STANDARDS

- A. The entire mechanical work shall comply with the rules and regulations of the City, Parish, County and the State in which this project is being constructed, including the State Fire Marshal and the State Department of Health. Modifications required by these authorities shall be made without additional charge to the Owners. The Contractor shall report these modifications to the Architect and secure his approval before work is started.
- B. In addition to the codes heretofore mentioned, mechanical work and equipment shall conform to the applicable portions of the following specifications, codes and/or regulations:
 - 1. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - 2. National Electrical Code (NEC)
 - 3. National Fire Protection Association (NFPA)
 - 4. American Society of Mechanical Engineers (ASME)

5. American Gas Association (AGA)
6. International Building Code (IBC)
7. International Mechanical Code (IMC)
8. International Plumbing Code (IPC)
9. International Fuel Gas Code (IFGC)
10. Underwriters Laboratories (UL)
11. Life Safety Code (NFPA 101)
12. State Sanitary Code
13. Louisiana State Uniform Construction Code Council (LSUCCC)

- C. All materials, equipment and accessories installed under this Contract shall conform to all rules, codes, etc. as recommended by National Associations governing the manufacturer, rating and testing of such materials, equipment and accessories. All materials shall be new and of the best quality and first class in every respect. Whenever directed by the Architect, the Contractor shall submit a sample for approval before proceeding.
- D. Where laws or local regulations provide that certain accessories such as gauges, thermometers, relief valves and parts be installed on equipment, it shall be understood that such equipment be furnished complete with the necessary accessories, whether or not called for in these Specifications.
- E. All unfired pressure vessels shall be built in accordance with the A.S.M.E. Code and so stamped. Furnish shop certificates for each vessel.

1.18 REVIEW OF MATERIALS

- A. Whenever manufacturers or trade names are mentioned in these Plans or Specifications, the words "or approved equivalent" shall be assumed to follow whether or not so stated. Manufacturers or trade names are used to establish a standard of quality only, and should not be construed to infer a preference. Equivalent products which meet the Architect's approval will be accepted; however, these products must be submitted to the Architect a minimum of seven (7) days prior to the Bid Date.
- B. Submission shall include the manufacturer's name, model number, rating table and construction features.
- C. Upon receipt and checking of this submittal, the Architect will issue an addendum listing items which are approved as equivalent to those specified. THE CONTRACTOR SHALL BASE HIS BID SOLELY ON THOSE ITEMS SPECIFIED OR INCLUDED IN THE "PRIOR APPROVAL ADDENDUM", AS NO OTHER ITEM WILL BE ACCEPTABLE.
- D. Prior approval of a particular piece of equipment does not mean automatic final acceptance and will not relieve the Contractor of the responsibility of assuring himself that this equipment is in complete accord with the Plans and Specifications and that it will fit into the space provided. Shop drawings must be submitted on all items of equipment for approval as hereinafter specified.
- E. Before proceeding with work and/or within thirty (30) days after the award of the General Contract for this work, the Mechanical Contractor shall furnish to the Architect complete shop and working drawings of such apparatus, equipment, controls, insulation, etc. to be provided in

this project. These drawings shall give dimensions, weights, mounting data, performance curves and other pertinent information.

- F. The Architect's approval of shop drawings shall not relieve the Contractor from the responsibility of incorrectly figured dimensions or any other errors which may be contained in these drawings. Any omission from the shop drawings or specifications, even though approved by the Architect, shall not relieve the Contractor from furnishing and erecting same.
- G. Six (6) sets of shop drawings shall be submitted to the Architect for approval. These submittals shall be supplied as part of this Contractor's contract. Any drawings not approved shall be resubmitted until they are approved.
- H. This information shall be bound in plastic hardbound notebooks with the job name permanently embossed on the cover. Rigid board dividers with labeled tabs shall be provided for different pieces of materials and equipment. Submit shop drawings to the Architect for approval. Faxed copies submissions will not be accepted.

1.19 MINOR DEVIATIONS

- A. Plans and detail sketches are submitted to limit, explain and define conditions, specified requirements, pipe sizes and manner of erecting work. Structural or other conditions may require certain modifications from the manner of installation shown, and such deviations are permissible and shall be made as required. However, specified sizes and requirements necessary for satisfactory operation shall remain unchanged. It may be necessary to shift ducts or pipes, or to change the shape of ducts, and these changes shall be made as required. All such changes shall be referred to the Architect and Engineer for approval before proceeding. Extra charges shall not be allowed for these changes. The contractor shall obtain a full set of plans and specifications for the coordination of his work prior to bidding this project. Items which are unclear to the bidding contractor shall be brought to the Architect and Engineers attention prior to bidding the project. An interpretation shall be clarified by the Architect and/or the Engineer prior to bidding.
- B. The Contractor shall realize that the drawings could delve into every step, sequence or operation necessary for the completion of the project, without drawing on the Contractor's experience or ingenuity. However, only typical details are shown on the Plans. In cases where the Contractor is not certain about the method of installation of his work, he shall ask for details. Lack of details will not be an excuse for improper installation.
- C. In general, the drawings are diagrammatic and the Contractor shall install his work in a manner so that interferences between the various trades are avoided. In cases where interferences do occur, the Architect is to state which item was first installed.

1.20 AS-BUILT RECORD DRAWINGS

- A. The Contractor shall obtain at his cost, two sets of blue line prints of the original bid documents by the Architect. One set shall be kept on the site with all information as referenced below, and shall update same as the work progresses. The other set will be utilized to record all field changes to a permanent record copy for the Owner.

- B. If the Contractor elects to vary from the Contract Documents and secures prior approval from the Architect for any phase of the work, he shall record in a neat and readable manner, ALL such variances on the blackline print in red. The original blackline prints shall be returned to the Architect for documentation.
- C. All deviations from sizes, locations, and from all other features of the installations shown in the Contract Documents shall be recorded.
- D. In addition, it shall be possible using these drawings to correctly and easily locate, identify and establish sizes of all piping, directions and the like, as well as other features of the work which will be concealed underground and/or in the finished building.
- E. Locations of underground work shall be established by dimensions to columns, lines or walls, locating all turns, etc., and by properly referenced centerline or invert elevations and rates of fall.
- F. For work concealed in the building, sufficient information shall be given so it can be located with reasonable accuracy and ease. In some cases this may be by dimension. In others, it may be sufficient to illustrate the work on the drawings in relation to the spaces in the building near which it was actually installed. The Architect's/Engineer's decision in this matter will be final.
- G. The following requirements apply to all "As-Built" drawings:
 - 1. They shall be maintained at the Contractor's expense.
 - 2. All such drawings shall be done carefully and neatly, and in a form approved by the Architect/Engineer.
 - 3. Additional drawings shall be provided as necessary for clarifications.
 - 4. These drawings shall be kept up-to-date during the entire course of the work and shall be available upon request for examination by the Architect/Engineer; and when necessary, to establish clearances for other parts of the work.
 - 5. "As-built" drawings shall be returned to the Architect upon completion of the work and are subject to approval of the Architect/Engineer.

1.21 REQUIRED SHOP DRAWING SUBMITTALS

- A. Provide the following shop drawing submittals:
 - 1. Pipe insulation.
 - 2. All Valves.
 - 3. Plumbing fixtures and trim.
 - 4. Pipe and pipe fittings.
 - 5. PVC jacket color samples.
 - 6. Water Heaters.
 - 7. Mixing Valves.
 - 8. Pumps.
 - 9. Backflow preventors.

PART 2 - PRODUCTS

2.1 PLUMBING PRODUCTS

PLUMBING GENERAL PROVISIONS

- A. Refer to individual Division 22 sections for plumbing products, pipe, tube and fitting materials and joining methods.

PART 3 - EXECUTION

3.1 MANUFACTURER'S DIRECTION

- A. The contractor shall install and operate equipment and material in accordance with the manufacturer's installation and operating instructions. The manufacturer's instructions of installation and operation shall become part of the Contract Documents and shall supplement the Drawings and Specifications.
- B. Store equipment in a clean, dry place protected from other construction. While stored, maintain factory wrapping or tightly cover and protect equipment against dirt, water, construction debris, chemical, physical or weather damage, traffic and theft.

3.2 EQUIPMENT LABELS

- A. Provide equipment labels for water heaters and mixing valves. Labels shall have permanent laminated construction secured to equipment.

3.3 PIPE LABELS

- A. Provide pipe markers and directional arrows on all piping in mechanical equipment rooms, or which is exposed in building, and on both sides of all valves located above ceiling. Markers shall be as manufactured by W.H. Bradley Co., Marking Services Inc. or the equivalent. All letters shall be color-coded and sized as recommended by OSHA. Samples of the type of letters to be used shall be submitted with shop drawings. Piping shall be color-coded.
- B. Pipe markers with arrows shall indicate lines content and shall be located 20 feet on center and at each change of direction of line. Identification bands shall be color coded to match pipe markers and shall be provided 10 feet on center. Pipe identification markers shall be taped at each end and shall be taped around the entire circumference of pipe.
- C. The following Piping shall be identified:
 - 1. Domestic Cold Water
 - 2. Domestic Hot Water
 - 3. Domestic Hot Water Return
 - 4. Sanitary Sewer
 - 5. Sanitary Vent
 - 6. Storm Drainage
 - 7. Condensate Drain
 - 8. Condensate Return

3.4 VALVE TAGS

- A. Secure metal tags to all valves. Labeling on all valve tags shall include type of system the valve controls and the area of building, zone, or equipment number affected by valve operation. Tag shall be 2" minimum diameter brass, engraved with code number, service and size. A framed list of the valves, giving manufacturer's name, model number, type and location shall be mounted in the main equipment room.

3.5 ACCESS DOORS:

- A. Provide access doors in walls, floors and ceilings to permit access to equipment and piping requiring service or adjustment.
 - 1. Valves.
 - 2. Plumbing drainage cleanouts.
 - 3. Other Plumbing equipment indicated in schedules or specifications which are requiring maintenance, adjustment or operation.
- B. Provide hinged access doors and frames as follows:
 - 1. Drywall Construction:
 - a. Provide with concealed spring hinges and flush screwdriver operated cam locks in sufficient number of the size of the panel.
 - b. Provide prime paintable surface (not galvanized).
 - c. Product: Milcor "Style M" (Karp DSC-214M).
 - 2. Visible Masonry and Ceramic Tile:
 - a. Milcor "Style M" (Karp DSC-214M).
 - 3. Cement Plaster:
 - a. Milcor "Style K" (Karp DSC-214 PL).
 - 4. Acoustical Plaster:
 - a. Reinforced panel as required to prevent sagging. Provide continuous steel piano type hinge for the length of the panel, and sufficient number for the size of the panel. Provide factory prime paint surface (not galvanized).
 - b. Product: Milcor "Style AP" (Karp 214 PL).
 - 5. Acoustical Tile:
 - a. Milcor "Style AT" (Larsen L-CPA).
- C. Provide continuous concealed hinges and cam locks.
- D. Provide UL listed 1-1/2 hour label "B" access doors with automatic self-closing latching mechanism where required.
- E. Provide removable ceiling access tile section immediately adjacent to each mechanical or electrical device located in the ceiling plenum above removable tile ceiling.
- F. Coordinate approval of type, color and location of access doors & frames with Architect.

3.6 CLEANING AND SERVICE

- A. Upon Completion of this work, the contractor shall clean and adjust equipment, controls, valves, etc.;
- B. Clean piping, fixtures, cleanout covers, floor drain covers, etc. and leave the entire installation in good working order.

- C. Adjust flush valves and faucets to allow for proper operation.

END OF SECTION 23 00 00

SECTION 22 05 23 – GENERAL DUTY VALVES FOR PLUMBING

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 the furnishing and installation of general duty valves for plumbing:

1.3 DEFINITIONS

- A. CWP: Cold working pressure.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
 - 1. Certification that products comply with NSF 61 Annex G and NSF 372 (lead free).

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, and soldered ends.
 - 3. Set ball valves open to minimize exposure of functional surfaces.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

- B. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded end valves.
 - 2. ASME B16.1 for flanges on iron valves.
 - 3. ASME B16.5 for flanges on steel valves.
 - 4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 5. ASME B16.18 for solder-joint connections.
 - 6. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
 - 1. Gear Actuator: For quarter-turn valves NPS 4 and larger.
 - 2. Hand lever: For quarter-turn valves smaller than NPS 4.
- H. Valves in Insulated Piping:
 - 1. Include 2-inch stem extensions.
 - 2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
 - 3. Memory stops that are fully adjustable after insulation is applied.

2.2 MANUFACTURERS

- A. Valves shall be manufactured by one of the following:
 - 1. Kitz.
 - 2. Red & White.
 - 3. Nibco.
 - 4. Kennedy.
 - 5. Crane.
 - 6. Milwaukee.
 - 7. Keystone.
 - 8. Stockham.
 - 9. Grinnell.
 - 10. Mueller.
 - 11. Jamesbury.
 - 12. DeZurik.
 - 13. Hammond.
 - 14. Apollo.

2.3 BRONZE BALL VALVES

- A. Two-Piece, Bronze Ball Valves with Full Port and Brass Trim:
 - 1. Kitz 59/69, Apollo 77C, NIBCO Design S-580-70, Milwaukee BA-150-S, Red & White 5049F or equal, threaded ends of heating hot water and low pressure steam of Kitz

58/68, Apollo 77CLF, NIBCO Design T-580-70, Milwaukee BA-100-S, Red & White 5044F or equal. For insulated piping systems, provide ball valves with extended stem, insulated handle with protective thermal barrier sleeve to prevent condensate moisture drip and pipe insulation deterioration.

2. Description:
 - a. Standard: MSS SP-110.
 - b. CWP Rating: 600 psig.
 - c. SSP Rating: 150 psi.
 - d. Body Design: Two piece.
 - e. Body Material: Bronze.
 - f. Ends: Threaded and soldered.
 - g. Seats: PTFE.
 - h. Stem: Brass. Blow-out proof.
 - i. Ball: Chrome-plated brass.
 - j. Port: Full.
 - k. Vinyl covered steel handle.
 - l. Lead Free.
 - m. Conforms to ASTM B-62.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown. Unions are not required on flanged devices.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.

- E. Install valve tags.
- F. All valves, unions, etc. where pipe is chrome plated shall have similar finish. All exposed supplies to plumbing fixtures shall be chrome plated.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- B. Select valves with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Solder ends, except provide threaded ends for heating hot water.
 - 2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
 - 4. For Steel Piping, NPS 2 and Smaller: Threaded ends or grooved ends.
 - 5. For Steel Piping, NPS 2-1/2 to NPS 4: Grooved end or Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 6. For Steel Piping, NPS 5 and Larger: Grooved end or Flanged ends.

3.4 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

- A. Pipe NPS 3 and Smaller (above grade):
 - 1. Two-piece, bronze ball valves with full port and brass trim.
- B. Domestic water valves (below grade):
 - 1. M & H AWWA Series C-509, NIBCO T113 (3/4" to 2"), NIBCO T619 (2-1/2" and above) resilient gate valve with low torque operation, positive shut-off, O- Ring seals, full epoxy coating and square valve stem end.
 - 2. Provide two (2) adjustable "TEE" handle valve wrenches to be turned over to the owner after construction is complete.

END OF SECTION 22 05 23

SECTION 22 05 29 – HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

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. Metal pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Fiberglass pipe hangers.
 - 4. Metal framing systems.
 - 5. Fiberglass strut systems.
 - 6. Thermal-hanger shield inserts.
 - 7. Fastener systems.
 - 8. Pipe stands.
 - 9. Pipe positioning systems.
 - 10. Equipment supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:
 - 1. Trapeze pipe hangers.
 - 2. Metal framing systems.
 - 3. Fiberglass strut systems.
 - 4. Pipe stands.
 - 5. Equipment supports.
- C. Delegated-Design Submittal: For trapeze hangers 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. Detail fabrication and assembly of trapeze hangers.
 - 2. Design Calculations: Calculate requirements for designing trapeze hangers.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
- B. Stainless-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.

2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. 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:
 - a. B-line, an Eaton business.
 - b. Flex-Strut Inc.
2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with intumed lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Electroplated zinc.

2.4 THERMAL-HANGER SHIELD INSERTS

- 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. Buckaroos, Inc.
 2. Carpenter & Paterson, Inc.
 3. Clement Support Services.
 4. National Pipe Hanger Corporation.
- B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.

- C. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate with 100-psig minimum compressive strength.
- D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
- E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
- F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless- steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 PIPE STANDS

- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
- C. Low-Type, Single-Pipe Stand: One-piece **[plastic]** **[stainless-steel]** base unit with plastic roller, for roof installation without membrane penetration.
- D. High-Type, Single-Pipe Stand:
 - 1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
 - 2. Base: **[Plastic]** **[Stainless steel]**.
 - 3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
 - 4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.
- E. High-Type, Multiple-Pipe Stand:
 - 1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
 - 2. Bases: One or more; plastic.
 - 3. Vertical Members: Two or more protective-coated-steel channels.
 - 4. Horizontal Member: Protective-coated-steel channel.
 - 5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

- F. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.7 PIPE POSITIONING SYSTEMS

- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.8 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.9 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Section 077200 "Roof Accessories" for curbs.

G. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

H. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

I. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

J. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

K. Install lateral bracing with pipe hangers and supports to prevent swaying.

L. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

M. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

N. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

O. Insulated Piping:

1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and 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. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 099113 "Exterior Painting." Section 099123 "Interior Painting." Section 099600 "High-Performance Coatings."
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports metal trapeze pipe hangers and metal framing systems and attachments for general service applications.
- F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.
- G. Use copper-plated pipe hangers and copper attachments for copper piping and tubing.
- H. Use padded hangers for piping that is subject to scratching.

- I. Use thermal-hanger shield inserts for insulated piping and tubing.
- J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
 5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
 6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
 11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
 12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
 17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
 18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
 19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
 20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
 21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

- K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

- L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 - 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 - 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 - 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 - 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

- M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 - 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 - 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 - 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 - 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 - 6. C-Clamps (MSS Type 23): For structural shapes.
 - 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 - 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 - 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 - 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 - 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 - 12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.
 - b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
 - 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 - 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 - 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

- N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
 8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.
- P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.
- R. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.
- S. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 22 05 29

SECTION 22 07 19 – PLUMBING PIPING 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 insulating the following plumbing piping services:
 - 1. Domestic cold-water piping.
 - 2. Domestic hot-water piping.
 - 3. Roof drains and rainwater leaders.
 - 4. Sanitary drain piping receiving condensate.
 - 5. Supplies and drains for handicap-accessible lavatories and sinks.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated and for each application. Include thermal conductivity, water-vapor permeance, thickness, and jackets (both factory- and field-applied, if any).

1.4 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- B. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 - 1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

- B. Reject damaged, deteriorated, wet, or contaminated material and immediately remove from the site. Replace removed materials at no additional cost to Owner.

1.6 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields.
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.7 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Insulation:
 - 1. Pittsburgh-Corning.
 - 2. Owens- Corning.
 - 3. Certainteed.
 - 4. Armacell.
 - 5. Rubatex.
 - 6. Knauf.
 - 7. Johns Manville.
- B. Jacketing:
 - 1. Ceel-Co.
 - 2. O'Brien.
 - 3. Zeston.
 - 4. Childers.
 - 5. Pabco.
- C. Adhesives:
 - 1. Benjamin Foster.
 - 2. Childers.
 - 3. Vimasco.
 - 4. B.E.H.

2.2 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
 - 1. Density of 5.0 lbs/cubic foot.
 - 2. K factor of 0.27 at 75 degrees F mean.
 - 3. Maximum water vapor transmission of 0.17 per inch.
 - 4. Must be listed for 25/50 flame/smoke spread of thickness used.
- G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- H. Mineral-Fiber, Preformed Pipe Insulation: Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. All-service jacket ASJ-SSL type factory applied jacketing.
 - 2. 6 lbs/cu ft minimum density.
 - 3. k-factor of 0.31 maximum at 200 degrees F mean.
 - 4. 850 degree F service temperature.
 - 5. 0.02 perm maximum Jacket permeance.

2.3 PIPE AND FITTING COVERS

- A. Polyvinyl Chloride (PVC) Covers:
 - 1. Ultraviolet resistant.
 - 2. 0.020 inch minimum thickness.
 - 3. Preformed to match outer diameter of insulation.
 - 4. Preformed fitting covers, minimum 10 mil.
- B. Aluminum (A) Covers:
 - 1. ASTM B209, Alloy 3003 minimum.
 - 2. 0.016-inch thickness.
 - 3. Bright anodized or acrylic-coated smooth finish on exposed side.
 - 4. 2-piece tee and ribless elbow covers in minimum 0.016-inch, preformed.

5. Provide moisture barrier backing and butt-joint with mastic seal for joining of adjacent sections.

2.4 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
- D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
- E. PVC Jacket Adhesive: Compatible with PVC jacket.

2.5 MASTICS

- A. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.
 1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
 2. Service Temperature Range: 0 to 180 deg F.
 3. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
 4. Color: White.

2.6 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.
 1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
 3. Service Temperature Range: 0 to plus 180 deg F.
 4. Color: White.

2.7 SEALANTS

- A. Joint Sealants:
 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 2. Permanently flexible, elastomeric sealant.
 3. Service Temperature Range: Minus 100 to plus 300 deg F.
 4. Color: White or gray.
- B. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 2. Fire- and water-resistant, flexible, elastomeric sealant.
 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 4. Color: White.

2.8 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 - 1. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.

2.9 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 - 1. Width: 3 inches.
 - 2. Thickness: 11.5 mils.
 - 3. Adhesion: 90 ounces force/inch in width.
 - 4. Elongation: 2 percent.
 - 5. Tensile Strength: 40 lbf/inch in width.
 - 6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

2.10 SECUREMENTS

- A. Bands:
 - 1. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- C. Wire: 0.080-inch nickel-copper alloy.

2.11 PROTECTIVE SHIELDING GUARDS

- 1. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.
- 2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.

3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 4. Seal jacket to wall flashing with flashing sealant.

- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- F. Insulation Installation at Floor Penetrations:
 - 1. Pipe: Install insulation continuously through floor penetrations.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 - 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 - 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 - 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 - 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 - 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 - 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 - 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.

8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
1. Install pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
1. Install mitered sections of pipe insulation.
 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

- D. Insulation Installation on Valves and Pipe Specialties:
 - 1. Install preformed valve covers manufactured of same material as pipe insulation when available.
 - 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 - 3. Install insulation to flanges as specified for flange insulation application.
 - 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
 - 1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 - 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 - 3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
 - 4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
 - 1. Install preformed pipe insulation to outer diameter of pipe flange.
 - 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 - 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
 - 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.
- C. Insulation Installation on Pipe Fittings and Elbows:
 - 1. Install preformed sections of same material as straight segments of pipe insulation when available.
 - 2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.
- D. Insulation Installation on Valves and Pipe Specialties:
 - 1. Install preformed sections of same material as straight segments of pipe insulation when available.
 - 2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
 - 3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 - 4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD-APPLIED JACKET INSTALLATION

- A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.
 - 1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
 - 2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
 - 3. Completely encapsulate insulation with coating, leaving no exposed insulation.
- B. Where FSK jackets are indicated, install as follows:
 - 1. Draw jacket material smooth and tight.
 - 2. Install lap or joint strips with same material as jacket.
 - 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 - 4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
 - 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
 - 1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.9 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
 - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.10 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Cold Water:
 1. Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
- B. Domestic Hot and Recirculated Hot Water Mains:
 1. NPS 2 and Smaller: Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
 2. NPS 2-1/2 and Larger: Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1-1/2 inch thick.
- C. Domestic Hot Water Supply and Return runouts (up to NPS 2 and not exceeding 12 feet in length from fixture shutoff valve back toward main line):
 1. NPS 2 and Smaller: Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
- D. Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities (Handicapped Lavatory & Sinks P-Trap & Supply Lines):
 1. All Pipe Sizes: Insulation shall be the following:
 - a. Insulate p-trap, tailpiece and water supplies on handicapped lavatories with white, Truebro Model 102, Zurn 8947 handi lav-guard, or approved equivalent insulating system to meet A.D.A. Requirements. Provide accessories for offset tailpiece as required.
- E. Floor Drains, Traps, and aboveground Sanitary Drain Piping receiving HVAC condensate:
 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Flexible Elastomeric: 1/2 inch thick.
 - b. Mineral-Fiber, 3/4 lb density, ductwrap insulation with aluminum foil vapor barrier, Type I: 2 inch thick.
- F. Exposed Domestic Cold and Hot Water Piping.
 1. All exposed domestic cold and hot water piping shall also have field install PVC jacket.
- G. Sewer Waste and Vent Piping:
 1. Where Contractor elects to use schedule 40 PVC waste and vent piping (in lieu of cast iron piping) (exposed, in walls, in furrings, or above ceilings) (vertical and horizontal lines) shall be insulated with 2" thick 3/4 # density fiberglass ductwrap insulation with aluminum foil vapor barrier. Insulation shall be sealed at all seams and joints. Insulation shall be installed with a foil backed adhesive tape around the diameter of the pipe with insulation at 24" on center intervals.

3.12 INDOOR, PIPING WITHIN CMU BLOCK WALLS PIPING INSULATION SCHEDULE

- A. Domestic cold water, hot water and condensate drain lines shall be insulated with 1/2" thick flexible closed cell elastomeric thermal tube insulation as manufactured by Armaflex AP, Rubatex or prior approved equal. All joints are to be firmly butted together. All lap and butt joint strips are to be sealed in place with vapor barrier adhesive. Fittings are to be mitered segments

of insulation held in place with vapor barrier sealant. Engineered Polymer Foam Insulation (EPFI) will not be accepted.

3.13 INDOOR, UNDERGROUND PIPING INSULATION SCHEDULE

- A. Domestic cold and hot water lines run below slab within building shall be insulated with 1/2" thick flexible closed cell elastomeric thermal tube insulation as manufactured by Armaflex AP, Rubatex or prior approved equal.
- B. All joints are to be firmly butted together. All lap and butt joint strips are to be sealed in place with vapor barrier adhesive. Fittings are to be mitered segments of insulation held in place with vapor barrier sealant.
- C. Engineered Polymer Foam Insulation (EPFI) will not be accepted.
- D. Apply two (2) coats of mastic on insulation.

3.14 OUTDOOR, ABOVE GROUND PIPING INSULATION SCHEDULE

- A. All water lines on the outside of the building exposed to the weather shall be insulated with 1/2" thick flexible closed cell elastomeric thermal tube insulation as manufactured by Armaflex AP, Rubatex or prior approved equal.
- B. All joints are to be firmly butted together. All lap and butt joint strips are to be sealed in place with vapor barrier adhesive. Fittings are to be mitered segments of insulation held in place with vapor barrier sealant.
- C. Engineered Polymer Foam Insulation (EPFI) will not be accepted.
- D. Apply two (2) coats of mastic on insulation.
- E. Lines shall be covered with 0.016 smooth aluminum jacket and elbows. At contractor's option, in lieu of 0.016 aluminum jacket, the contractor may use Venture Clad 1577CW multi-layered laminate coated, acrylic pressure sensitive adhesive jacket system.

3.15 STORM DRAINAGE PIPING WITHIN BUILDING, ROOF DRAIN BODIES (ABOVE SLAB)

- A. Shall be wrapped on outside with 2" thick, 3/4# density fiberglass insulation with aluminum foil vapor barrier. Insulation shall be taped at all joints and installed per manufacturer's recommendations.

3.16 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

- A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION 22 07 19

SECTION 22 11 13 – FACILITY WATER DISTRIBUTION PIPING

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 water-distribution piping and related components outside the building for combined 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. LLDPE: Linear, low-density polyethylene plastic.
- C. PA: Polyamide (nylon) plastic.
- D. PE: Polyethylene plastic.
- E. PP: Polypropylene plastic.
- F. PVC: Polyvinyl chloride plastic.
- G. RTRF: Reinforced thermosetting resin (fiberglass) fittings.
- H. RTRP: Reinforced thermosetting resin (fiberglass) pipe.

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 Owner no fewer than two days in advance of proposed interruption of service.
 2. Do not proceed with interruption of water-distribution service without 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 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.

2. Copper, Pressure-Seal Fittings:

- 1) Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 2) Elkhart Products Corporation.
- 3) Mueller Industries, Inc.
- 4) Viega LLC.

b. NPS 2 and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.

c. NPS 2-1/2 to NPS 4: Bronze fitting with stainless-steel grip ring and EPDM O-ring seal in each end.

B. Hard Copper Tube: 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.
2. Copper, Pressure-Seal Fittings:

- 1) Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- 2) Elkhart Products Corporation.
- 3) Mueller Industries, Inc.
- 4) Viega LLC.

b. NPS 2 and Smaller: Wrought-copper fitting with EPDM O-ring seal in each end.

c. NPS 2-1/2 to NPS 4: Bronze fitting with stainless-steel grip ring and EPDM O-ring seal in each end.

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 PVC PIPE AND FITTINGS

A. PVC, Schedule 40 Pipe: ASTM D 1785.

1. PVC, Schedule 40 Socket Fittings: ASTM D 2466.

B. PVC, Schedule 80 Pipe: ASTM D 1785.

1. PVC, Schedule 80 Socket Fittings: ASTM D 2467.
2. PVC, Schedule 80 Threaded Fittings: ASTM D 2464.

C. PVC, AWWA Pipe: AWWA C900, Class 200, with bell end with gasket, and with spigot end.

1. Comply with UL 1285 for fire-service mains if indicated.

2. PVC Fabricated Fittings: AWWA C900, Class 200, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
3. PVC Molded Fittings: AWWA C907, Class 150, with bell-and-spigot or double-bell ends. Include elastomeric gasket in each bell.
4. Push-on-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - a. Gaskets: AWWA C111, rubber.
5. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.
 - a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

2.3 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. Bonding Adhesive for Fiberglass Piping: As recommended by fiberglass piping manufacturer.
- D. Plastic Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

2.4 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. Tubular-Sleeve Pipe Couplings:
 1. 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:
 - a. Cascade Waterworks Mfg. Co.
 - b. Dresser, Inc.
 - c. Hays Fluid Controls.
 - d. JCM Industries, Inc.
 - e. Viking Johnson.
 2. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners and with ends of same sizes as piping to be joined.
 - a. Standard: AWWA C219.

- b. Center-Sleeve Material: Manufacturer's standard.
- c. Gasket Material: Natural or synthetic rubber.
- d. Pressure Rating: 200 psig minimum.
- e. Metal Component Finish: Corrosion-resistant coating or material.

C. 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: **[Manufacturer's standard] [Carbon steel] [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.

D. 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.

E. Dielectric Fittings:

- 1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- 2. Dielectric Unions:
 - a. Description:
 - 1) Standard: ASSE 1079.
 - 2) Pressure Rating: 250 psig.
 - 3) End Connections: Solder-joint copper alloy and threaded ferrous.
- 3. Dielectric Flanges:
 - a. Description:
 - 1) Standard: ASSE 1079.
 - 2) Factory-fabricated, bolted, companion-flange assembly.
 - 3) Pressure Rating: 300 psig.

- 4) End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

4. Dielectric-Flange Insulating Kits:

a. Description:

- 1) Nonconducting materials for field assembly of companion flanges.
- 2) Pressure Rating: 150 psig.
- 3) Gasket: Neoprene or phenolic.
- 4) Bolt Sleeves: Phenolic or polyethylene.
- 5) Washers: Phenolic with steel backing washers.

5. Dielectric Nipples:

a. Description:

- 1) Standard: IAPMO PS 66
- 2) Electroplated steel nipple. complying with ASTM F 1545.
- 3) Pressure Rating: 300 psig at 225 deg F.
- 4) End Connections: Male threaded or grooved.
- 5) Lining: Inert and noncorrosive, propylene.

2.5 CORROSION-PROTECTION PIPING ENCASEMENT

A. Encasement for Underground Metal Piping:

1. Standards: ASTM A 674 or AWWA C105.
2. Form: Tube.
3. Material: LLDPE film of 0.008-inch minimum thickness.
4. Material: LLDPE film of 0.008-inch minimum thickness, or high-density, crosslaminated PE film of 0.004-inch minimum thickness.
5. Material: High-density, crosslaminated PE film of 0.004-inch minimum thickness.
6. Color: Black.

2.6 GATE VALVES

A. AWWA, Cast-Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Cast Iron Pipe Company.
 - b. Crane; Crane Energy Flow Solutions.
 - c. M & H Valve Company; a division of McWane, Inc.
 - d. Mueller Co.
 - e. NIBCO INC.
 - f. Zurn Industries, LLC.

2. 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.

3. 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.

4. Nonrising-Stem, High-Pressure, Resilient-Seated Gate Valves:

- a. Description: Ductile-iron body and bonnet; with bronze or ductile-iron gate, resilient seats, bronze stem, and stem nut.

- 1) Standard: AWWA C509.
- 2) Minimum Pressure Rating: 250 psig.
- 3) End Connections: Push on or mechanical joint.
- 4) Interior Coating: Complying with AWWA C550.

5. OS&Y, Rising-Stem, Metal-Seated Gate Valves:

- a. Description: Cast- or ductile-iron body and bonnet, with cast-iron double disc, bronze disc and seat rings, and bronze stem.

- 1) Standard: AWWA C500.
- 2) Minimum Pressure Rating: 200 psig.
- 3) End Connections: Flanged.

6. 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. [American Cast Iron Pipe Company.](#)
- b. [Crane; Crane Energy Flow Solutions.](#)
- c. [M & H Valve Company; a division of McWane, Inc.](#)
- d. [Mueller Co.](#)
- e. [NIBCO INC.](#)
- f. [U.S. Pipe and Foundry Company.](#)
- g. [Zurn Industries, LLC.](#)

2. 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.

3. OS&Y, Rising-Stem Gate Valves:

- a. Description: Iron body and bonnet and bronze seating material.
 - 1) Standards: UL 262 and FMG approved.
 - 2) Minimum Pressure Rating: 175 psig.
 - 3) End Connections: Flanged.

C. Bronze Gate Valves:

1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:

- a. [Crane; Crane Energy Flow Solutions.](#)
- b. [Milwaukee Valve Company.](#)
- c. [NIBCO INC.](#)
- d. [Stockham; Crane Energy Flow Solutions.](#)
- e. [Zurn Industries, LLC.](#)

2. OS&Y, Rising-Stem Gate Valves:

- a. Description: Bronze body and bonnet and bronze stem.
 - 1) Standards: UL 262 and FMG approved.
 - 2) Minimum Pressure Rating: 175 psig.
 - 3) End Connections: Threaded.

3. 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.

2.7 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Cast Iron Pipe Company.
 - b. Flowserve Corporation.
 - c. Kennedy Valve Company; a division of McWane, Inc.
 - d. M & H Valve Company; a division of McWane, Inc.
 - e. Mueller Co.
 - f. U.S. Pipe and Foundry Company.
2. 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, metal-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," 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.

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.

2.8 CHECK VALVES

A. AWWA Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Cast Iron Pipe Company.
 - b. Crane; Crane Energy Flow Solutions.
 - c. M & H Valve Company; a division of McWane, Inc.
 - d. Mueller Co.
 - e. NIBCO INC.
 - f. WATTS.

2. 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. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Cast Iron Pipe Company.
 - b. Crane; Crane Energy Flow Solutions.
 - c. Mueller Co.
 - d. NIBCO INC.
 - e. United Brass Works, Inc.
2. 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: 250 psig.

2.9 DETECTOR CHECK VALVES

A. Detector Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Ames Fire & Waterworks; A WATTS Brand.
 - b. Mueller Co.
 - c. Victaulic Company.
 - d. WATTS.
 - e. Zurn Industries, LLC.
2. Description: Galvanized cast-iron body, bolted cover with air-bleed device for access to internal parts, and flanged ends. Include one-piece bronze disc with bronze bushings, pivot, and replaceable seat. Include threaded bypass taps in inlet and outlet for bypass meter connection. Set valve to allow minimal water flow through bypass meter when major water flow is required.
 - a. Standards: UL 312 and FMG approved.
 - b. Pressure Rating: 175 psig.
 - c. Water Meter: AWWA C700, disc type, at least one-fourth size of detector check valve. Include meter, bypass piping, gate valves, check valve, and connections to detector check valve.

3. Description: Iron body, corrosion-resistant clapper ring and seat ring material, flanged ends, with connections for bypass and installation of water meter.
 - a. Standards: UL 312 and FMG approved.
 - b. Pressure Rating: 175 psig.

2.10 BUTTERFLY VALVES

A. AWWA Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. DeZURIK/Copes-Vulcan.
 - b. Flomatic Corporation.
 - c. Milliken Valve Company.
 - d. Milwaukee Valve Company.
 - e. Mosser Valve.
 - f. Mueller Co.
 - g. Pratt, Henry Company.
 - h. Val-Matic Valve & Manufacturing Corp.
2. Description: Rubber seated.
 - a. Standard: AWWA C504.
 - b. Body: Cast or ductile iron.
 - c. Body Type: Wafer or flanged.
 - d. Pressure Rating: 150 psig.

B. UL Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Kennedy Valve Company; a division of McWane, Inc.
 - b. McWane, Inc.
 - c. Milwaukee Valve Company.
 - d. Mueller Co.
 - e. NIBCO INC.
 - f. Pratt, Henry Company.
2. Description: Metal on resilient material seating.
 - a. Standards: UL 1091 and FMG approved.
 - b. Body: Cast or ductile iron.
 - c. Body Type: Wafer or flanged.
 - d. Pressure Rating: 175 psig.

2.11 PLUG VALVES

A. Plug Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. DeZURIK/Copes-Vulcan.
 - b. Homestead Valve.
 - c. M & H Valve Company; a division of McWane, Inc.
 - d. McWane, Inc.
 - e. Milliken Valve Company.
 - f. Pratt, Henry Company.
 - g. Val-Matic Valve & Manufacturing Corp.
2. Description: Resilient-seated eccentric.
 - a. Standard: MSS SP-108.
 - b. Body: Cast iron.
 - c. Pressure Rating: 175-psig minimum CWP.
 - d. Seat Material: Suitable for potable-water service.

2.12 CORPORATION VALVES AND CURB VALVES

A. Manufacturers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. A.Y. McDonald Mfg. Co.
 - b. Amcast Industrial Corporation.
 - c. Ford Meter Box Company, Inc. (The).
 - d. Jones, James Company.
 - e. Master Meter, Inc.
 - f. Mueller Co.
 - g. Red Hed Manufacturing Company; a division of Everett J. Prescott, Inc.

B. Service-Saddle Assemblies: Comply with AWWA C800. Include saddle and valve compatible with tapping machine.

1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.
2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.
3. Manifold: Copper fitting with two to four inlets as required, with ends matching corporation valves and outlet matching service piping material.

C. Curb Valves: Comply with AWWA C800. Include bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

- D. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches in diameter.
 - 1. Shutoff Rods: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

2.13 WATER METERS

- A. Water meters will be furnished by utility company.

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 the following:
 - 1. PVC, Schedule 40 pipe; PVC, Schedule 40 socket fittings; and solvent-cemented joints.
- F. Aboveground Water-Service Piping NPS 3/4 to NPS 3 shall be **any of** the following:
 - 1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed 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, high-pressure, 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, rising stem.
 - b. Gate Valves, NPS 3 and Larger: AWWA, cast iron, OS&Y rising stem, resilient seated.
 - c. Check Valves: AWWA C508, 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. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.
- C. 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.
- D. 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.
- E. Install PVC, AWWA pipe according to ASTM F 645 and AWWA M23.
- F. 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.
 2. Under Railroad Tracks: With at least 48 inches cover over top.
 3. In Loose Gravelly Soil and Rock: With at least 12 inches additional cover.
- G. Install piping by tunneling or jacking, or combination of both, under streets and other obstructions that cannot be disturbed.
- H. 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.
- I. Sleeves are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- J. Mechanical sleeve seals are specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- K. 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.
- L. 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. Copper-Tubing, Pressure-Sealed Joints: Use proprietary crimping tool and procedure recommended by copper, pressure-seal-fitting manufacturer.
 2. 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.
 3. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

- a. Dielectric Fittings for [NPS 2] <Insert pipe size> and Smaller: Use dielectric [nipples] [unions].
- b. Dielectric Fittings for [NPS 2-1/2 to NPS 4] <Insert pipe size range>: Use dielectric [flanges] [flange kits] [nipples].
- c. Dielectric Fittings for [NPS 5] <Insert pipe size> 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. Heat-fused joints.
 - 6. 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. Bonded-Joint Fiberglass, Water-Service Piping: According to AWWA M45.
 - 4. 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.
- F. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.
- G. Relief Valves: Comply with AWWA C512. Install aboveground with shutoff valve on inlet.

3.9 DETECTOR-CHECK VALVE INSTALLATION

- A. Install in vault or aboveground.
- B. Install for proper direction of flow. Install bypass with water meter, gate valves on each side of meter, and check valve downstream from meter.
- C. Support detector check valves, meters, shutoff valves, and piping on brick or concrete piers.

3.10 VACUUM BREAKER ASSEMBLY INSTALLATION

- A. Install pressure vacuum breaker assemblies 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 pressure vacuum breaker assemblies in vault or other space subject to flooding.

3.11 CONNECTIONS

- A. See Section 330500 "Common Work Results for Utilities" for piping connections to valves and equipment.
- B. Connect water-distribution piping to existing water main. Use tapping sleeve and tapping valve.
- C. Connect water-distribution piping to interior domestic water piping.
- D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.12 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.

3.13 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.

3.14 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 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 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 221113

SECTION 22 11 16 – DOMESTIC WATER PIPING

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. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
 - 2. Encasement for piping.

1.3 ACTION SUBMITTALS

- A. Product Data: For piping, transition fittings and dielectric fittings.

1.4 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
- C. Copper Unions:
 - 1. MSS SP-123.
 - 2. Cast-copper-alloy, hexagonal-stock body.
 - 3. Ball-and-socket, metal-to-metal seating surfaces.
 - 4. Lead free Solder-joint.

2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials:
 - 1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
 - 2. Full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys.
- D. Flux: ASTM B 813, water flushable.
- E. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 TRANSITION FITTINGS

- A. General Requirements:
 - 1. Same size as pipes to be joined.
 - 2. Pressure rating at least equal to pipes to be joined.
 - 3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2.5 AT CONTRACTOR'S OPTION, PEX TUBE AND FITTINGS

- A. PEX Distribution System: ASTM F 877, SDR 9 tubing.
- B. Fittings for PEX-a Tube:
 - 1. Metal insert Crimp ASTM F 1807: metal-insert type with copper or stainless-steel crimp rings and matching PEX-a tube dimensions.
 - 2. Cold Expansion ASTM F 1960: Lead-free brass or engineered polymer (EP) fittings manufactured by the pipe manufacturer, utilizing cold-expansion PEX-a reinforcing rings made of same material as the pipe. Fittings shall be third party certified to NSF-14, and ASTM-F1960 and shall comply to ASTM-F876 & ASTM-F877.
 - a. Flanges: ASME B16.5, Class 150, with ASTM F1960 cold-expansion end.
 - b. Groove Adapter: One CSA B242-05 groove end and one ASTM F1960 cold-expansion end.
 - c. Press: PEX-a to Press One-piece lead free (LF) brass fitting with one ASME B16.51 copper press end and one ASTM F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
- C. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F 877; with plastic or corrosion-resistant-metal valve for each outlet.

2.6 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 - 1. Standard: ASSE 1079.
 - 2. Pressure Rating: 150 psig.
 - 3. End Connections: Solder-joint copper alloy and threaded ferrous.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Comply with requirements in Section 220000 "Plumbing General Provisions" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance.
- D. Install shutoff valve immediately upstream of each dielectric fitting.
- E. Install domestic water piping level and plumb.
- F. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- G. 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.
- H. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- I. Install piping to permit valve servicing.
- J. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- K. Install piping free of sags and bends.
- L. Install fittings for changes in direction and branch connections.
- M. Install sleeves for piping penetrations of walls, ceilings, and floors.
- N. Install sleeve seals for piping penetrations of concrete walls and slabs.
- O. Install escutcheons for piping penetrations of walls, ceilings, and floors.
- P. Domestic cold water lines penetrating concrete slabs shall be wrapped with "Protect-O-Sleeve" vinyl flexible tube as manufactured by Robert H. Harris Co., Jones Stephen or equivalent.

- Q. PEX-a piping shall be installed per ASTM E84 requirements for plenum applications. Install all PEX-a pipe support and provide all required hangers and supporting strapping as required by manufacturer to provide a code compliant installation.
- R. Install PEX-a piping in straight runs free of kinks, provide bend supports at all pipe drops. All PEX-a piping penetrations through wall plates shall be protected or shielded as required to prevent damage to piping.
- S. Install PEX-a piping from the manifold to each fixture as a home run, not taps, tees or branches shall be permitted between the manifold and the fixture.
- T. Install PEX-a Pipe Support, fixed anchor points and hangers in compliance with the Uponor Commercial Piping Pocket Guide (2017).
- U. PEX-a shall not be installed in areas within five feet of UV light unless protected.
- V. Install piping in compliance with manufacturer's Commercial Piping Pocket Guide (2017).
- W. Install PEX-a piping at each fixture with out of the wall support bracket to secure piping and prevent excess movement when water stops or shut valves are operated.
- X. Install all PEX Manifolds centered in access panels to permit servicing.

3.3 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.
- D. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- E. Joints for PEX Piping: Join according to ASTM F 1807 or ASTM F1960

3.4 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
 - 1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
 - 2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

- C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition unions.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Provide pipe hangers and support products. Install as per the following:
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support vertical piping and tubing at base and at each floor.
- C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
- D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
 - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
 - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
 - 4. NPS 2-1/2: 108 inches with 1/2-inch rod.
 - 5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
 - 6. NPS 6: 10 feet with 5/8-inch rod.
 - 7. NPS 8: 10 feet with 3/4-inch rod.
- E. Install supports for vertical copper tubing every 10 feet.
- F. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.
- G. Install vinyl-coated hangers for PEX-a piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. Crosslinked Polyethylene PEX-a Pipe: Install hangers for PEX tubing in strict accordance with manufactures instructions.

- a. Horizontal PEX-a Piping Hangers: Install CTS hangers suitable for PEX-a piping in compliance with the Uponor Commercial Piping Pocket Guide (2017) and local codes, with the following maximum spacing:
 - b. For IPC Jurisdictions: 3 inch and below: Maximum span, 32 inches.
 - c. For UPC Jurisdictions: 1 inch and below: Maximum span, 32 inches.
 - d. For UPC Jurisdictions: 1-1/4 inch and above: Maximum span, 48 inches.
 - e. Note: The above maximum hanger spacing requirements may be extended with the use of a continuous support channel such as Uponor PEX-a Pipe Support.
 - 2. Horizontal PEX-a Piping with PEX-a Pipe Channel: Install hangers for PEX-a piping with horizontal support channel in accordance with local jurisdiction and manufacturer's recommendations, with the following maximum spacing:
 - a. 3/4 inch and below: Maximum span, 6 feet.
 - b. 1 inch and above: Maximum span, 8 feet.
- H. Install hangers for vertical PEX piping every 48 inches.
 - 1. Vertical PEX-a Piping: Support PEX-a piping with maximum spacing of 5 feet.
- I. PEX-a Riser Supports: Install CTS riser clamps at the base of each floor and at the top of every other floor for domestic hot-water systems. Install mid-story guides between each floor. Install CTS riser clamps at the base of each floor and at the top of every fourth floor for domestic cold-water systems. Install mid-story guides.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 - 1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
 - 3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.7 IDENTIFICATION

- A. Identify system components.

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

- a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
- b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
- c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
- d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

- a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
- c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
- d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
- e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
- f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.9 ADJUSTING

- A. Perform the following adjustments before operation:
1. Close drain valves, hydrants, and hose bibs.
 2. Open shutoff valves to fully open position.
 3. Open throttling valves to proper setting.
 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
 - b. Adjust calibrated balancing valves to flows indicated.
 5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
 6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
 7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
 8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.10 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of available chlorine. Isolate with valves and allow to stand for 24 hours (minimum time shall be 6 hours). A chlorine residual of at least 5 ppm should remain before the lines are put in use.
 3. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - a. Repeat procedures if biological examination shows contamination.
 - b. Submit water samples in sterile bottles to authorities having jurisdiction.

- B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.11 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Underground piping up to 5'-0" from building, domestic cold water, building-service piping, NPS 4 and smaller, shall be the following:
 - 1. PVC, Schedule 40; socket fittings; and solvent-cemented joints.
- E. Aboveground domestic water piping, NPS 4 and smaller, shall be the following:
 - 1. Hard copper tube, ASTM B 88, Type L; copper, solder-joint fittings; and soldered joints.
- F. Under-building-slab, domestic water piping, 3" and smaller, shall be the following:
 - 1. PEX-a tube, 3" and smaller; fittings for PEX-a tube with cold expansion ASTM F1960 connection.
- G. Aboveground domestic water piping, 2" and smaller, shall be the following:
 - 1. PEX-a tube, 2" and smaller; fittings for PEX-a tube with cold expansion ASTM F1960 connection.
- H. Aboveground domestic water piping, 2-1/2" to 4", shall be the following:
 - 1. PEX-a tube, 3" and smaller; fittings for PEX-a tube with cold expansion ASTM F1960 connection.

3.12 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 - 1. Shutoff Duty: Use ball valves for piping NPS 3 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 4 and larger.

2. Throttling Duty: Use ball or globe valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
3. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 22 11 16

SECTION 22 11 19 – DOMESTIC WATER PIPING SPECIALTIES

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. Vacuum breakers.
 - 2. Water-hammer arresters.
 - 3. Escutcheons
 - 4. Trap-seal primer valves.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

- A. Potable-water piping and components shall comply with NSF 61 Annex G.

2.2 PERFORMANCE REQUIREMENTS

- A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

- A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:
 - 1. Standard: ASSE 1001.
 - 2. Size: NPS 1/4 to NPS 3, as required to match connected piping.
 - 3. Body: Bronze.
 - 4. Inlet and Outlet Connections: Threaded.
 - 5. Finish: Rough bronze.
- B. Hose-Connection Vacuum Breakers:
 - 1. Standard: ASSE 1011.
 - 2. Body: Bronze, non-removable, with manual drain.
 - 3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
 - 4. Finish: Chrome or nickel plated.

2.4 WATER-HAMMER ARRESTERS

- A. Water-Hammer Arresters:
 - 1. 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:
 - a. AMTROL, Inc.
 - b. Precision Plumbing Products.
 - c. Sioux Chief Manufacturing Company, Inc.
 - 2. Standard: ASSE 1010 or PDI-WH 201.
 - 3. Type: Copper tube with piston.
 - 4. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.
 - 5. Plumbing fixtures with quick closing valves (i.e.: Dishwashers, Ice Maker, Tub/Shower Valve, Washing Machines, etc.) install "Shock Trol", "Precision Plumbing Products", Sioux Chief "Hydra-Rester", or equal water Hammer arrester properly sized for each unit.

2.5 ESCUTCHEONS

- A. Provide escutcheons for all exposed lines passing through floors, walls, and ceilings. They shall be chrome plated brass and shall be of such flange size as to cover necessary penetrating openings.

2.6 TRAP-SEAL PRIMER DEVICE

- A. Supply-Type, Trap-Seal Primer Device:
 - 1. Standard: ASSE 1018.
 - 2. Pressure Rating: 125 psig minimum.
 - 3. Body: Bronze.
 - 4. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.

5. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
 6. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.
- B. Drainage-Type, Trap-Seal Primer Device:
1. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 minimum, trap makeup connection.
 2. Size: NPS 1-1/4 minimum.
 3. Material: Chrome-plated, cast brass.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install water-hammer arresters in water piping according to PDI-WH 201.
- B. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
- C. Install drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

END OF SECTION 22 11 19

SECTION 22 12 19 – NATURAL GAS DISTRIBUTION AND PIPING

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. Natural gas pipes, tubes, and fittings in the buildings.
- B. Product Data: For piping, transition fittings and dielectric fittings.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of natural gas distribution piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Provide pipe hangers and support products. Install as per the following:
 - 1. Vertical Piping: MSS Type 8 or 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support vertical piping and tubing at base and at each floor.
- C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

3.3 IDENTIFICATION

- A. Identify system components.
- B. All piping below grade shall be installed with a 14 Gauge tracer wire on complete system below grade. Tracer wire shall stub up at each pipe penetration from below grade and be secured to the pipe.

3.4 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
1. Piping Inspections:
 - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
 - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
 - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
 - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
 2. Piping Tests:
 - a. All low pressure gas piping shall be tested with a 10" mercury column for thirty (30) minutes.
 - b. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 - c. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
 - d. Prepare reports for tests and for corrective action required.
- B. Natural gas water piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Natural gas piping, NPS 4 and smaller, shall be the following:
 - 1. Gas piping on the building interior of the building shall be standard black steel, Schedule 40, National Tube Co., or equal. Fittings which are 2 inches and below shall be malleable screw fittings. Piping above 2 inches shall be electrically welded utilizing weld fittings.
 - 2. Gas piping on the exterior of the building and on the roof shall be the same as specified above, except to be coated with Scotch-Kote polyethylene coating (20 mil) and all joints weatherproofed with two coats of field applied Scotch-Kote wrapping tape.
 - 3. Gas piping below grade shall be orange polyethylene pipe ASTM D-3350, PE 23533E with polyethylene butt fusion weld fittings.

END OF SECTION 22 12 19

SECTION 22 13 16 – SANITARY WASTE AND VENT PIPING

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. PVC pipe and fittings.

- B. Related Requirements:

- 1. Section 221313 "Facility Sanitary Sewers" for sanitary sewerage piping and structures outside the building.
 - 2. Section 221329 "Sanitary Sewerage Pumps" for effluent and sewage pumps.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, and details.

1.4 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For waste and vent piping, 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. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.
- B. Field quality-control reports.

1.5 FIELD CONDITIONS

- A. Interruption of Existing Sanitary Waste 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 service according to requirements indicated:

1. Notify Architect no fewer than two days in advance of proposed interruption of sanitary waste service.
2. Do not proceed with interruption of sanitary waste service without Architect's written permission.

1.6 WARRANTY

- A. Listed manufacturers to provide labeling and warranty of their respective products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 1. Soil, Waste, and Vent Piping: 10-foot head of water.

2.2 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 PVC PIPE AND FITTINGS

- A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.
- B. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- C. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40 **will not be accepted**.
- D. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns.
- E. PVC Pressure Fittings: ASTM D 2466, Socket Type
- F. Primer: ASTM F 656.
 1. Primer shall have a VOC content of 550g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24)
 2. Adhesive primer shall comply with the testing and product requirements of the California Department of Health Services "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers"
- G. Solvent Cement: ASTM D 2564.

1. PVC solvent cement shall have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24)
2. Solvent cement shall comply with the testing and product requirements of the California Department of Health Services "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers"

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.
 1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
 2. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- 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 above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.
 1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
 2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.

- a. Straight tees, elbows, and crosses may be used on vent lines.
- 3. Do not change direction of flow more than 90 degrees.
- 4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.
 - a. Reducing size of waste piping in direction of flow is prohibited.
- K. Lay buried building waste piping beginning at low point of each system.
 - 1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
 - 2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
 - 3. Maintain swab in piping and pull past each joint as completed.
- L. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Waste: 2 percent downward in direction of flow for piping **NPS 3 (DN 80)** and smaller; 1 percent downward in direction of flow for piping **NPS 4 (DN 100)** and larger.
 - 2. Horizontal Sanitary Waste Piping: 2 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- M. Install aboveground PVC piping according to ASTM D 2665.
- N. Install underground PVC piping according to ASTM D 2321.
- O. Install engineered soil and waste and vent piping systems as follows:
 - 1. Combination Waste and Vent: Comply with standards of authorities having jurisdiction.
 - 2. Reduced-Size Venting: Comply with standards of authorities having jurisdiction.
- P. Plumbing Specialties:
 - 1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.
 - a. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."
 - 2. Install drains in sanitary waste gravity-flow piping.
 - a. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."
- Q. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- R. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- S. Install sleeve seals for piping penetrations of concrete walls and slabs.
 1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."
- T. Install escutcheons for piping penetrations of walls, ceilings, and floors.
 1. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

3.3 JOINT CONSTRUCTION

- A. Plastic, Nonpressure-Piping, Solvent-Cement 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. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 appendixes.

3.4 INSTALLATION OF HANGERS AND SUPPORTS

- A. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Install hangers for PVC piping, with maximum horizontal spacing and minimum rod diameters, to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.
- C. Support horizontal piping and tubing within 12 inches (300 mm) of each fitting, valve, and coupling.
- D. Support vertical runs of PVC piping to comply with manufacturer's written instructions, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.5 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect waste and vent piping to the following:
 1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.

2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Comply with requirements for backwater valves cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
6. Equipment: Connect waste piping as indicated.

- a. Provide shutoff valve if indicated and union for each connection.
- b. Use flanges instead of unions for connections **NPS 2-1/2 (DN 65)** and larger.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping **NPS 2 (DN 50)** and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping **NPS 2-1/2 (DN 65)** and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.6 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping.
- B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.7 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary waste and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.

- a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.
 - a. Expose work that was covered or concealed before it was tested.
3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.
 - a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water (30 kPa).
 - b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
 - c. Inspect joints for leaks.
4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.
 - a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg (250 Pa).
 - b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
 - c. Air pressure must remain constant without introducing additional air throughout period of inspection.
 - d. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.8 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.
- E. Repair damage to adjacent materials caused by waste and vent piping installation.

3.11 PREVENTIVE MAINTENANCE

- A. All piping coming from parking deck drains shall be flushed with clean water for not

less than 10 minutes in each drain after winter season, and every 120 days. If chemicals are used to clean garage walls, this chemical shall be washed off the exterior of the pipe.

- B. All piping from dedicated soda station floor sinks shall be flushed by dumping a basin of 5 gallons of warm clean water every 3rd day into the floor sink.
- C. All piping connected to "low flow" fixtures shall be flushed with clean water by filling, and releasing a utility wash basin sink from the furthest point possible not less than once every 7 days.

3.12 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping **NPS 4 (DN 100)** and smaller shall be the following:
 - 1. Solid Wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
- C. Aboveground, vent piping **NPS 4 (DN 100)** and smaller shall be the following:
 - 1. Solid Wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
- D. Underground, soil, waste, and vent piping **NPS 4 (DN 100)** and smaller shall be the following:
 - 1. Solid Wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

END OF SECTION 22 13 16

SECTION 22 13 19 – SANITARY WASTE PIPING SPECIALTIES

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. Cleanouts.
 - 2. Floor drains.
 - 3. Roof flashing assemblies.
 - 4. Through-penetration firestop assemblies.
 - 5. Miscellaneous sanitary drainage piping specialties.
 - 6. Flashing materials.

1.3 DEFINITIONS

- A. PVC: Polyvinyl chloride plastic.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For drainage piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 HUB DRAIN (MARKED "HD"):

- A. Provide SureSeal Model SS2009V for 2" diameter condensate hub drains.

2.2 TRAP PRIMER VALVE:

- A. Precision Plumbing Products Model P-1/P-2 (Mifab M-500), with air gap supply Precision Plumbing Products AG-500 (Mifab MI-GAP). Provide Precision Plumbing Products Distribution Unit (DU) (Mifab MI-DU) with proper number of branch lines as indicated on plans.

2.3 CLEANOUTS:

- A. Cleanouts other than type listed below as manufactured by J.R. Smith, Josam, Zurn and Wade, will not be acceptable.
- B. Cleanouts shall be provided where shown on plans, at each change of direction of the building drain greater than 45 degrees and at or near the foot of each vertical waste or soil stack. Location of all cleanouts shall be the same size as the piping. Every cleanout shall be installed so that the cleanout opens in the direction of the flow of the drainage line or at right angle thereto.
- C. Floor cleanouts shall be an adjustable type with anchor flange for clamp device, clamping collar and nickel bronze cover. Contractor shall install 2# lead flashing a minimum of 18" all around cleanout and flash into flange and anchor with clamping collar.
- D. Top of cleanout shall be level with top of finished floor so there is a continuous surface.
- E. Floor cleanouts shall be Zurn 1400, Wade W-6000, or J.R. Smith 4031 (NB) with adjustable scoriated secured nickel bronze top.
- F. Outside cleanouts shall be as detailed on the Plans.

2.4 ROOF FLASHING ASSEMBLIES

- A. Roof Flashing Assemblies:
 - 1. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch- thick, lead flashing collar and skirt extending at least 8 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.
 - a. Open-Top Vent Cap: Without cap.

2.5 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

- A. Through-Penetration Firestop Assemblies:
 - 1. Standard: UL 1479 assembly of sleeve and stack fitting with firestopping plug.
 - 2. Size: Same as connected soil, waste, or vent stack.
 - 3. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
 - 4. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
 - 5. Special Coating: Corrosion resistant on interior of fittings.

2.6 FLASHING MATERIALS

- A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:
 - 1. General Use: 4.0-lb/sq. ft., 0.0625-inch thickness.
 - 2. Vent Pipe Flashing: 3.0-lb/sq. ft., 0.0469-inch thickness.
 - 3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.
- B. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness, unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.
- C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.
- D. Fasteners: Metal compatible with material and substrate being fastened.
- E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
- F. Solder: ASTM B 32, lead-free alloy.
- G. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
 - 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 - 2. Locate at each change in direction of piping greater than 45 degrees.
- B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- D. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.
- E. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
- F. Install deep-seal traps on floor drains and other waste outlets, if indicated.
- G. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
 - 1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
 - 2. Size: Same as floor drain inlet.

3.2 FLASHING INSTALLATION

- A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
 - 1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft., 0.0625-inch thickness or thinner.
 - 2. Copper Sheets: Solder joints of copper sheets.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
 - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
 - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
 - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.
- C. Set flashing on floors and roofs in solid coating of bituminous cement.
- D. Secure flashing into sleeve and specialty clamping ring or device.
- E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 076200 "Sheet Metal Flashing and Trim."
- F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.
- G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.3 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 13 19

SECTION 22 14 13 – FACILITY STORM DRAINAGE PIPING

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. Pipe, tube, and fittings.
 - 2. Specialty pipe fittings.

1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Storm Drainage Piping: 10-foot head of water.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF/ANSI 14, "Plastics Piping System Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic drain piping.

1.6 PROJECT CONDITIONS

- A. Interruption of Existing Storm-Drainage 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 service according to requirements indicated:
 - 1. Notify Architect no fewer than two days in advance of proposed interruption of storm-drainage service.

2. Do not proceed with interruption of storm-drainage service without Architect's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 74, Service classes.
- B. Gaskets: ASTM C 564, rubber.

2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. CISPI, Hubless-Piping Couplings:
 1. Standards: ASTM C 1277 and CISPI 310.
 2. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

2.4 PVC PIPE AND FITTINGS

- A. Solid-Wall Schedule 40 PVC Pipe: ASTM D 2665, drain, waste, and vent.
- B. Cellular-Core PVC Pipe is **not acceptable**.
- C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- D. Adhesive Primer: ASTM F 656.
- E. Solvent Cement: ASTM D 2564.

2.5 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
 1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.

2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified-piping-system fitting.
3. Shielded, Nonpressure Transition Couplings:
 - a. Standard: ASTM C 1460.
 - b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

PART 3 - EXECUTION

3.1 EARTH MOVING

- A. Comply with requirements for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

- A. 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 from layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- 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 above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Make changes in direction for storm drainage piping using appropriate branches, bends, and long-sweep bends. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- K. Lay buried building storm drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of

lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

- L. Install storm drainage piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Storm Drain: 1 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
 - 2. Horizontal Storm-Drainage Piping: 2 percent downward in direction of flow.
- M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - 1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.
- N. Install aboveground PVC piping according to ASTM D 2665.
- O. Install underground PVC piping according to ASTM D 2321.
- P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- Q. Install sleeves for piping penetrations of walls, ceilings, and floors.
- R. Install sleeve seals for piping penetrations of concrete walls and slabs.
- S. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.3 JOINT CONSTRUCTION

- A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.
- B. Hubless, Cast-Iron Soil Piping Coupled Joints: Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.
- C. Plastic, Nonpressure-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. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.4 SPECIALTY PIPE FITTING INSTALLATION

- A. Transition Couplings:
 - 1. Install transition couplings at joints of piping with small differences in OD's.
 - 2. In Drainage Piping: Shielded, nonpressure transition couplings.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices.
- B. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."
 - 1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 - 2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
 - 3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 - 4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
 - 5. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 6. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 - 7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 - 8. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
 - 2. NPS 3: 60 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
 - 4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
 - 5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
 - 6. Spacing for 10-foot pipe lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.
- G. Install supports for vertical cast-iron soil piping every 15 feet.
- H. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
 - 2. NPS 3: 48 inches with 1/2-inch rod.
 - 3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
 - 4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
 - 5. NPS 10 and NPS 12: 48 inches with 7/8-inch rod.
- I. Install supports for vertical PVC piping every 48 inches.

- J. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect storm drainage piping to roof drains and storm drainage specialties.
 - 1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

3.7 IDENTIFICATION

- A. Identify exposed storm drainage piping.

3.8 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 48 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
 - 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 - 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 - 2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 - 3. Test Procedure: Test storm drainage piping on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of

water. From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.

4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.9 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.10 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground storm drainage piping shall be any of the following:
 1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
 2. Hubless, cast-iron soil pipe and fittings; CISPI, hubless-piping couplings; and coupled joints.
 3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- C. Aboveground, storm drainage piping shall be the following:
 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.
- D. Underground, storm drainage piping shall be the following:
 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 2. Dissimilar Pipe-Material Couplings: Shielded, nonpressure transition couplings.

END OF SECTION 22 14 13

SECTION 22 14 23 – STORM DRAINAGE PIPING SPECIALTIES

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 drains.
 - 2. Miscellaneous storm drainage piping specialties.
 - 3. Cleanouts.
 - 4. Through-penetration firestop assemblies.
 - 5. Flashing materials.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 METAL ROOF DRAINS

- A. Cast-Iron, Large-Sump, General-Purpose Roof Drains:
 - 1. 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:
 - a. MIFAB, Inc
 - b. Zurn Industries, LLC.
 - 2. Standard: ASME A112.6.4, for general-purpose roof drains.
 - 3. Body Material: Cast iron.

4. Dimension of Body: Nominal 15" diameter
5. Combination Flashing Ring and Gravel Stop: Required.
6. Outlet: Bottom.
7. Extension Collars: Required.
8. Underdeck Clamp: Required.
9. Sump Receiver Plate: Required.
10. Dome Material: Cast iron.
11. Vandal-Proof Dome: Not required.
12. Water Dam: 2 inches high.

2.2 CLEANOUTS

A. Test Tees:

1. 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:
 - a. MIFAB, Inc
 - b. Zurn Industries, LLC.
 - c. Josam Company
2. Standard: ASME A112.36.2M and ASTM A 74, ASTM A 888, or CISPI 301, for cleanout test tees.
3. Size: Same as connected drainage piping.
4. Body Material: Hub-and-spigot, cast-iron soil-pipe T-branch or hubless, cast-iron soil-pipe test tee as required to match connected piping.
5. Closure Plug: Countersunk or raised head, brass.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

2.3 THROUGH-PENETRATION FIRESTOP ASSEMBLIES

A. Through-Penetration Firestop Assemblies:

1. 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:
 - a. ProSet Systems Inc.
2. Standard: ASTM E 814, for through-penetration firestop assemblies.
3. Certification and Listing: Refer to Architectural specifications for through-penetration firestop assemblies.
4. Size: Same as connected pipe.
5. Sleeve: Molded PVC plastic, of length to match slab thickness and with integral nailing flange on one end for installation in cast-in-place concrete slabs.
6. Stack Fitting: ASTM A 48/A 48M, gray-iron, hubless-pattern, wye branch with neoprene O-ring at base and gray-iron plug in thermal-release harness. Include PVC protective cap for plug.
7. Special Coating: Corrosion resistant on interior of fittings.

2.4 FLASHING MATERIALS

- A. Copper Sheet: ASTM B 152/B 152M, 12 oz./sq. ft..
- B. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch minimum thickness unless otherwise indicated. Include G90 hot-dip galvanized, mill-phosphatized finish for painting if indicated.
- C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.
- D. Fasteners: Metal compatible with material and substrate being fastened.
- E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.
- F. Solder: ASTM B 32, lead-free alloy.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.
 - 1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
 - 2. Install expansion joints, if indicated, in roof drain outlets.
 - 3. Position roof drains for easy access and maintenance.
- B. Install conductor nozzles at exposed bottom of conductors where they spill onto grade.
- C. Install cleanouts in aboveground piping and building drain piping according to the following instructions unless otherwise indicated:
 - 1. Use cleanouts the same size as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
 - 2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
 - 3. Locate cleanouts at minimum intervals of 50 feet <Insert dimension> for piping NPS 4 and smaller and 100 feet for larger piping.
 - 4. Locate cleanouts at base of each vertical soil and waste stack.
- D. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
- E. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
- F. Install horizontal backwater valves in floor with cover flush with floor.

- G. Install drain-outlet backwater valves in outlet of drains.
- H. Install test tees in vertical conductors and near floor.
- I. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.
- J. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface unless otherwise indicated.
- K. Assemble channel drainage system components according to manufacturer's written instructions. Install on support devices so that top will be flush with adjacent surface.
- L. Install through-penetration firestop assemblies in plastic conductors at concrete floor penetrations.
- M. Install sleeve flashing device with each conductor passing through floors with waterproof membrane.

3.2 CONNECTIONS

- A. Comply with requirements for piping specified in Section 221413 "Facility Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 FLASHING INSTALLATION

- A. Fabricate flashing from single piece of metal unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
 - 1. Lead Sheets: Burn joints of 6.0-lb/sq. ft. lead sheets, 0.0938-inch thickness or thicker. Solder joints of 4.0-lb/sq. ft. lead sheets, 0.0625-inch thickness or thinner.
 - 2. Copper Sheets: Solder joints of copper sheets.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
 - 1. Pipe Flashing: Sleeve type, matching the pipe size, with a minimum length of 10 inches and with skirt or flange extending at least 8 inches around pipe.
 - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
 - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.
- C. Set flashing on floors and roofs in solid coating of bituminous cement.
- D. Secure flashing into sleeve and specialty clamping ring or device.
- E. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 14 23

SECTION 22 33 00 – ELECTRIC DOMESTIC WATER HEATERS

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. Commercial, electric, storage, domestic-water heaters.
 - 2. Domestic-water heater accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type and size of domestic-water heater indicated.
- B. Shop Drawings:
 - 1. Wiring Diagrams: For power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For electric, domestic-water heaters to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1.
- C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
- D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 Annex G, "Drinking Water System Components - Health Effects."

1.6 COORDINATION

- A. Coordinate sizes and locations of framed stands / bases with actual equipment provided.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of electric, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Structural failures including storage tank and supports.
 - b. Faulty operation of controls.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
2. Warranty Periods: From date of Substantial Completion.
 - a. Commercial, Electric, Storage, Domestic-Water Heaters:
 - 1) Storage Tank: Three years.
 - 2) Controls and Other Components: Three years.
 - b. Compression Tanks: Five years.

PART 2 - PRODUCTS

- A. REFER TO WATER HEATER SCHEDULE FOR ADDITIONAL INFORMATION.

2.1 DOMESTIC-WATER HEATER ACCESSORIES

- A. Drain Pans: Corrosion-resistant metal with raised edge. Comply with ANSI/CSA LC 3. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads or with ASME B1.20.7 garden-hose threads.
- B. Piping-Type Heat Traps: Field-fabricated piping arrangement according to ASHRAE/IESNA 90.1.
- C. Heat-Trap Fittings: ASHRAE 90.2.
- D. Pressure-Reducing Valves: ASSE 1003 for water. Set at 50-psig- maximum outlet pressure unless otherwise indicated.
- E. Combination Temperature-and-Pressure Relief Valves: ASME rated and stamped. Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

- F. Pressure Relief Valves: ASME rated and stamped. Include pressure setting less than domestic-water heater working-pressure rating.
- G. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.
- H. Shock Absorbers: ASSE 1010 or PDI-WH 201, Size A water hammer arrester.
- I. Domestic-Water Heater Stands: Manufacturer's factory-fabricated steel stand for floor mounting, capable of supporting domestic-water heater and water. Include dimension that will support bottom of domestic-water heater a minimum of 18 inches above the floor.

PART 3 - EXECUTION

3.1 CONNECTIONS

- A. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.2 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Prepare test and inspection reports.

3.3 WATER HEATER BOILER INSPECTION

- A. Contractor shall install water heaters to conform to Louisiana Boiler Inspection Law. Contractor shall contact the State Fire Marshal Boiler Inspection Division (800-256-5452) to get a final inspection on all water heaters 50 gallon capacity or larger and / or 100,000 BTU/HR heat input or greater.

END OF SECTION 22 33 00

SECTION 22 42 00 – PLUMBING FIXTURES

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. Floor drains.
 - 2. Water closets.
 - 3. Flush valves.
 - 4. Toilet seats.
 - 5. Urinals.
 - 6. Lavatories.
 - 7. Sinks.
 - 8. Hose bibs.
 - 9. Electric Water Cooler.
 - 10. Ice Machine Connection.
 - 11. Refrigerator water connection box.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each of the plumbing fixtures.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flush valves to include in operation and maintenance manuals.

PART 2 - PRODUCTS

- 2.1 REFER TO PLUMBING FIXTURE SCHEDULE IN DRAWINGS FOR ADDITIONAL INFORMATION.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.
- B. Examine walls and floors for suitable conditions where plumbing fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Refer to Architectural Drawings for mounting height and exact location of all plumbing fixtures. Handicapped fixtures shall be installed to meet the latest A.D.A. requirements.

3.3 QUALITY

- A. Plumbing Contractor shall furnish and install all plumbing fixtures shown on accompanying Drawings. Refer to both Plumbing and Architectural, and provide all fixtures shown on either. Fixtures shall be complete with all necessary brass and accessories required for a complete installation, including traps, escutcheons, angle supplies, basin cocks, etc. All fixtures shall be new and must be delivered to the building properly crated in perfect condition.
- B. All brass must be of the best quality. Lightweight goods will not be accepted.
- C. All brass pipe shall be seamless brass tubing and nipples shall be extra heavy.
- D. All fittings and trim shall be chromium plated heavy brass unless otherwise specified.
- E. "P" traps on lavatories and sinks shall be cast brass with cleanouts.
- F. All exposed piping shall be chromium plated.
- G. Provide cut-off valves at each fixture in both hot and cold water piping.
- H. For the purpose of establishing type and class of fixtures required, the following plate numbers have been taken from the Manufacturer's Catalog as indicated: Other fixture manufacturer's and model numbers, with prior approval, will be acceptable, however fixtures and accessories shall meet standards and features indicated below.

- I. Contractor shall install silicon caulk around the base of a plumbing fixture or around the perimeter of a plumbing fixture where it attaches to a wall. The color of the caulk shall match the color of the plumbing fixture or shall be a color selected by the architect. Verify final color prior to installation. Caulked joint shall be properly smoothed out and shall completely seal the joint between the plumbing fixture and the surface the fixture is attached to. Unacceptable applications shall be completely removed and re-applied in accordance with directions from the architect.
- J. Water-Closet Installation:
 1. Install level and plumb according to roughing-in drawings.
 2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
 3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.
- K. Support Installation:
 1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
 2. Use carrier supports with waste-fitting assembly and seal.
 3. Install floor-mounted, back-outlet water closets attached to building floor substrate, onto waste-fitting seals; and attach to support.
 4. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.
- L. Flushometer-Valve Installation:
 1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
 2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
 3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
 4. Install actuators in locations that are easy for people with disabilities to reach.
 5. Install fresh batteries in battery-powered, electronic-sensor mechanisms.
- M. Install toilet seats on water closets.
- N. Wall Flange and Escutcheon Installation:
 1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
 2. Install deep-pattern escutcheons if required to conceal protruding fittings.
 3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."
- O. Joint Sealing:
 1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
 2. Match sealant color to water-closet color.
 3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.4 CONNECTIONS

- A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.

- B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.5 ADJUSTING

- A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.
- B. Adjust water pressure at flushometer valves to produce proper flow.

3.6 CLEANING AND PROTECTION

- A. Clean plumbing fixtures and fittings with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed plumbing fixtures and fittings.
- C. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 42 00

DIVISION 23 – HEATING, VENTILATION AND AIR CONDITIONING

230000	MECHANICAL GENERAL PROVISIONS
230513	COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT
230523.12	BALL VALVES FOR HVAC PIPING
230523.13	BUTTERFLY VALVES FOR HVAC PIPING
230529	HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
230553	IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT
230593	TESTING, ADJUSTING, AND BALANCING FOR HVAC
230713	DUCT INSULATION
230719	HVAC PIPING INSULATION
232113	HYDRONIC PIPING
232113.13	UNDERGROUND HYDRONIC PIPING
232114	HVAC CONDENSATE PIPING
233113	METAL DUCTS
233300	AIR DUCT ACCESSORIES
233423	HVAC POWER VENTILATORS
233713	DIFFUSERS, REGISTERS, GRILLES AND LOUVERS
237413	PACKAGED, ROOFTOP A/C UNITS
239020	TEMPERATURE CONTROLS

SECTION 23 00 00 – MECHANICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. The General Conditions of the Architectural Specifications, along with the supplementary conditions, special conditions, information to bidders, and any other pertinent information and documents shall apply the same as if repeated herein.



1.2 SCOPE OF WORK

- A. Furnish all labor and material necessary to provide and install the complete mechanical portion of this Contract, including HVAC systems as called for herein and on accompanying drawings. Parts of the mechanical division may be bid separately or in combination, at the Contractor's option; however, it shall be the responsibility of the General Contractor to assure himself that all items covered in this Division have been included if he chooses to accept separate bids.
- B. This Contractor shall refer to the Architectural and Structural drawings and install equipment, piping, etc. to meet building and space requirements. No equipment shall be bid on or submitted for approval if it will not fit in the space provided.
- C. It is the intention of these Specifications that all mechanical systems shall be furnished complete with all necessary valves, controls, insulation, piping, devices, equipment, etc. necessary to provide a satisfactory installation in working order.
- D. Contractor shall visit the site and acquaint himself thoroughly with all existing facilities and conditions that would affect his portion of the work. Failure to do so shall not relieve the Contractor from the responsibility of installing his work to meet the conditions.
- E. This Contractor shall protect the entire system and all parts thereof from injury throughout the project and up to acceptance of the work. Failure to do so shall be sufficient cause for the Architect to reject any piece of equipment.

1.3 DEMOLITION

- A. The contractor shall visit the site prior to bid to determine the extent of work required to complete the project.
- B. Contractor shall coordinate demolition with owner. The Owner shall have "First Right of Refusal" regarding salvage of all equipment and materials to be removed. Locate equipment as directed by owner. All equipment and materials not salvaged by the owner shall be removed from the site and discarded at the contractor's expense.

- C. Contractor shall coordinate all work with general contractor and phase work as required by project.
- D. All equipment piping, etc. required to be removed to accommodate the modifications shall be removed.
- E. Contractor shall maintain services to existing facilities which shall remain during and after construction is complete.
- F. Contractor shall coordinate any shutdown of services with the owner. It is intended that the building will remain occupied during construction. Contractor shall schedule shut down of services with the owner in order to prevent disruption of building occupancy.
- G. Contractor shall be responsible for draining down of existing systems to complete demolition. All work shall be scheduled with the owner. Contractor shall also be responsible for refilling system and removing all air in order to return the systems to proper operating conditions.
- H. All shut down of services shall be done at night or during a time period approved by the owner. The systems shall be required to be back up and running each morning unless otherwise approved by the owner.

1.4 GROUNDS AND CHASES

- A. This Contractor shall see that all required chases, grounds, holes and accessories necessary for the installation of his work are properly built in as the work progresses; otherwise, he shall bear the cost of providing them.

1.5 CUTTING AND PATCHING

- A. Initial cutting and patching shall be the responsibility of the General Contractor, with the Mechanical Contractor being responsible for laying out and marking any and all holes required for the reception of his work. No structural beams or joists shall be cut or thimble without first receiving the approval of the Architect. After initial surfacing has been done, any further cutting, patching and painting shall be done at this Contractor's expense.

1.6 FILL AND CHARGES FOR EQUIPMENT

- A. Fill and charge with materials or chemicals all those devices or equipment as required to comply with the manufacturer's guarantee or as required for proper operation of the equipment.

1.7 MACHINERY GUARDS

- A. This Contractor shall provide v-belt guards for each v-belt drive or other hazardous drive. The guard shall enclose the drive entirely and shall have a hole for taking a tachometer reading.
- B. Provide protective guard for belts, pulleys, gears, couplings, projecting set screws, keys and other rotating parts which are located such that a person might come in close proximity. Construct protective guard around angle iron frame, securely bolted to apparatus; comply with

safety requirements. Install guard to completely enclose drives and pulleys and not interfere with lubrication of equipment. Provide 2-inch minimum diameter opening in fan belt guards housing for tachometer.

1.8 REPAIRING ROADWAYS AND WALKS

- A. Where this Contractor cuts or breaks roadways or walks, in order to lay piping, he shall repair or replace these sections to meet the Architect's approval.

1.9 EXCAVATION AND BACKFILL

- A. Contractor shall perform all excavating necessary to lay the specified services. Perform excavation of every description and of whatever substance encountered to depths indicated or specified. Pile materials suitable for backfilling a sufficient distance from banks of trenches to prevent slides or cave-ins. Comply with OSHA requirements for excavation, trenching and shoring. Waste excavation materials, rubbish, etc. shall be carted away from the premises, as indicated. Remove water from trenches by pumping or other approved method, discharge at a safe distance from the excavation.
- B. Provide trenches of necessary width for proper laying of pipe and comply with latest publication of OSHA 2226 Excavating and Trenching Operations. Coordinate trench excavation with pipe installation to avoid open trenches for prolonged periods. Accurately grade bottoms of trenches to provide uniform bearing and support for each section of pipe on undisturbed soil or the required thickness of bedding material at every point along its entire length.
- C. Provide minimum 12 inches between outer surfaces and embankment or shoring, which may be used, when excavating for manholes and similar structures. Remove unstable soil that is incapable of supporting the structure in the bottom of the excavation to the depth necessary to obtain design bearing.
- D. Material to be excavated is "unclassified". No adjustment in the contract price will be made on account of the presence or absence of rock, shale, masonry, or other materials.
- E. Protect existing utility lines that are indicated or the locations of which are made known prior to excavating and trenching and that are to be retained. Protect utility lines encountered during excavating and trenching operations, from damage during excavating, trenching and backfilling; if damaged, repair lines as directed by utilities, owner and A/E. Issue notices when utility lines that are to be removed are encountered within the area of operations in ample time for the necessary measures to be taken to prevent interruption of the service.
- F. Provide trenches for utilities of a depth that will provide the following minimum depths of cover from existing grade or from indicated finished grades, or depths of cover in accordance with the manufacturer's recommendations, whichever is lower:
 - 1. 3-Foot Minimum Cover: Chilled Water lines, Heating Hot Water Lines.
- G. Underground piping shall have a 6" bed of sand below the piping and backfilled with sand to 6" above the top of piping. Select fill may be used above the sand layer.

- H. Backfill trenches after piping, fittings and joints have been tested and approved. Backfill trenches with sand to provide 6 inches of sand below piping and 12 inches of sand cover above piping.
- I. Backfill remainder of trenches with satisfactory material consisting of earth, loam, sandy clay, sand and gravel or soft shale, free from large clods of earth and stones not over 1-1/2 inches in size. Deposit backfill material in 9 inch maximum layers, loose depth as indicated or as specified. Take care not to damage utility lines.
- J. Deposit the remainder of backfill materials in the trench in 1 foot maximum layers and compact by mechanical means. Refer to architectural for minimum density for compaction (Minimum 85 percent of maximum soil density as determined by ASTM D 698). Re-open trenches and excavation pits improperly backfilled or where settlement occurs to the depth required to obtain the specified compaction, the refill and compact with the surface restored to the required grade and compaction.
- K. Backfill utility line trench with backfill material, in 6 inch layers, where trenches cross streets, driveways, building slabs, or other pavement. Moisten each layer and compact to 95 percent of the maximum soil density as determined by ASTM D 698. Accomplish backfilling in such a manner as to permit the rolling and compaction of the filled trench with the adjoining material to provide the required bearing value so that paving of the area can proceed immediately after backfilling is complete.

1.10 WELDING

- A. Weld piping and above grade steel tanks in accordance with qualified procedures using performance qualified welders and welding operators. Qualified procedures and welders in accordance with ASME Section IX. Welding procedures qualified by others and welders and welding operators qualified by another employer may be accepted as permitted by ANSI B31.1. Notify the A/E 24 hours in advance of tests, and perform the tests at the work site if practicable. Furnish A/E with a copy of qualified procedures and a list of names and identification symbols of qualified welders and welding operators. Apply welders or welding operators assigned symbols near each weld they make as permanent record.

1.11 NOISE AND VIBRATION

- A. Provide the plumbing system and its associated components, items, piping, and equipment free of objectionable vibration or noise. Statically and dynamically balance rotating equipment and mount or fasten so that no vibration is transmitted to or through the building structure by equipment, piping, ducts or other parts of work, rectify such conditions at no additional compensation.

1.12 CLEANING AND ADJUSTING

- A. Upon completion of his work, the Contractor shall clean and adjust all equipment, controls, valves, etc.; clean all piping, ductwork, etc.; and leave the entire installation in good working order.

1.13 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Provide the Owner with three (3) copies of printed instructions indicating various pieces of equipment by name and model number, complete with parts lists, maintenance and repair instructions and test and balance report.
- B. COPIES OF SHOP DRAWINGS WILL NOT BE ACCEPTABLE AS OPERATION AND MAINTENANCE INSTRUCTIONS BUT MUST BE INCLUDED IN SUBMITTAL PACKAGE.
- C. This information shall be bound in plastic hardbound notebooks with the job name permanently embossed on the cover. Rigid board dividers with labeled tabs shall be provided for different pieces of equipment. Submit manuals to the Architect for approval.
- D. In addition to the operation and maintenance brochure, the Contractor shall provide a separate brochure which shall include registered warranty certificates on all equipment, especially any pieces of equipment which carry warranties exceeding one (1) year.
- E. The operation and maintenance brochure shall be furnished with a detailed list of all equipment furnished to the project, including the serial number and all pertinent nameplate data such as voltage, amperage draw, recommended fuse size, rpm, etc. The Contractor shall include this data on each piece of equipment furnished under this contract.

1.14 GUARANTEE

- A. The Contractor shall guarantee all materials, equipment and workmanship for a period of one (1) year from the date of final acceptance of the project. This guarantee shall include furnishing of all labor and material necessary to make any repairs, adjustments or replacement of any equipment, parts, etc. necessary to restore the project to first class condition. This guarantee shall exclude only the changing or cleaning of filters. Warranties exceeding one (1) year are hereinafter specified with individual pieces of equipment.

1.15 LOCAL CONDITIONS

- A. The location and elevation of all utility services is based on available surveys and utility maps and are reasonably accurate; however, these shall serve as a general guide only, and the Contractor shall visit the site and verify the location and elevation of all services to his satisfaction in order to determine the amount of work required for the execution of the Contract.
- B. The Contractor shall contact the various utility companies, determine the extent of their requirements and he shall include in his bid all lawful fees and payments required by these companies for complete connection and services to the building, including meters, connection charges, street patching, extensions from meters to main, etc.
- C. In case major changes are required, this fact, together with the reasons therefor, shall be submitted to the Architect, in writing, not less than seven (7) days before the date of bidding. Failure to comply with this requirement will make the Contractor liable for any changes, additions and expenses necessary for the successful completion of the project.

1.16 PERMITS, INSPECTIONS AND TESTS

- A. All permits, fees, etc. for the installation, inspections, plan review, service connections locations, and/or construction of the work which are required by any authority and/or agencies having jurisdiction, shall be obtained and paid for by the Contractor. This shall be verified during the bidding process.
- B. The Contractor shall make all tests required by the Architect, Engineer or other governing authorities at no additional cost to the Owner.
- C. The Contractor shall notify the Architect and local governing authorities before any tests are made, and the tests are not to be drawn off a line covered or insulated until examined and approved by the authorities. In event defects are found, these shall be corrected and the work shall be retested.
- D. Prior to requesting final inspection by the Architect, the Contractor shall have a complete coordination and adjustment meeting of all of his sub-contractors directly responsible for the operation of any portion of the system. At the time of this meeting, each and every sequence of operation shall be checked to assure proper operation. Notify the Architect in writing ten (10) days prior to this meeting, instructing him of the time, date and whom you are requesting to be present.
- E. This project shall not be accepted until the above provisions are met to the satisfaction of the Architect.

1.17 CODES AND STANDARDS

- A. The entire mechanical work shall comply with the rules and regulations of the City, Parish, County and State in which this project is being constructed, including the State Fire Marshal and the State Board of Health. All modifications required by these authorities shall be made without additional charge to the Owners. The Mechanical Contractor shall report these changes to the Architect and secure his approval before work is started.
- B. In addition to the codes heretofore mentioned, all mechanical work and equipment shall conform to the applicable portions of the following specifications, codes and/or regulations:
 - 1. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - 2. National Electrical Code (NEC)
 - 3. National Fire Protection Association (NFPA)
 - 4. American Society of Mechanical Engineers (ASME)
 - 5. American Gas Association (AGA)
 - 6. International Building Code (IBC)
 - 7. International Mechanical Code (IMC)
 - 8. International Plumbing Code (IPC)
 - 9. International Fuel Gas Code (IFGC)
 - 10. Underwriters Laboratories (UL)
 - 11. Life Safety Code (NFPA 101)
 - 12. State Sanitary Code
 - 13. Louisiana State Uniform Construction Code Council (LSUCCC)

- C. All materials, equipment and accessories installed under this Contract shall conform to all rules, codes, etc. as recommended by National Associations governing the manufacturer, rating and testing of such materials, equipment and accessories. All materials shall be new and of the best quality and first class in every respect. Whenever directed by the Architect, the Contractor shall submit a sample for approval before proceeding.
- D. Where laws or local regulations provide that certain accessories such as gauges, thermometers, relief valves and parts be installed on equipment, it shall be understood that such equipment be furnished complete with the necessary accessories, whether or not called for in these Specifications.
- E. All unfired pressure vessels shall be built in accordance with the A.S.M.E. Code and so stamped. Furnish shop certificates for each vessel.

1.18 REVIEW OF MATERIALS

- A. Whenever manufacturers or trade names are mentioned in these Plans or Specifications, the words "or approved equivalent" shall be assumed to follow whether or not so stated. Manufacturers or trade names are used to establish a standard of quality only, and should not be construed to infer a preference. Equivalent products which meet the Architect's approval will be accepted; however, these products must be submitted to the Architect a minimum of seven (7) days prior to the Bid Date.
- B. Submission shall include the manufacturer's name, model number, rating table and construction features.
- C. Upon receipt and checking of this submittal, the Architect will issue an addendum listing items which are approved as equivalent to those specified. THE CONTRACTOR SHALL BASE HIS BID SOLELY ON THOSE ITEMS SPECIFIED OR INCLUDED IN THE "PRIOR APPROVAL ADDENDUM", AS NO OTHER ITEM WILL BE ACCEPTABLE.
- D. Prior approval of a particular piece of equipment does not mean automatic final acceptance and will not relieve the Contractor of the responsibility of assuring himself that this equipment is in complete accord with the Plans and Specifications and that it will fit into the space provided. Shop drawings must be submitted on all items of equipment for approval as hereinafter specified.
- E. Before proceeding with work and/or within thirty (30) days after the award of the General Contract for this work, the Mechanical Contractor shall furnish to the Architect complete shop and working drawings of such apparatus, equipment, controls, insulation, etc. to be provided in this project. These drawings shall give dimensions, weights, mounting data, performance curves and other pertinent information.
- F. The Architect's approval of shop drawings shall not relieve the Contractor from the responsibility of incorrectly figured dimensions or any other errors which may be contained in these drawings. Any omission from the shop drawings or specifications, even though approved by the Architect, shall not relieve the Contractor from furnishing and erecting same.
- G. If contractor submits hard copies, Six (6) sets of shop drawings shall be submitted to the Architect for approval. These submittals shall be supplied as part of this Contractor's contract.

- H. This information shall be bound in plastic hardbound notebooks with the job name on the cover. Rigid board dividers with labeled tabs shall be provided for different pieces of materials and equipment. Submit shop drawings to the Architect for approval. Faxed copies shall not be acceptable. We prefer electronic submissions sent via E-Mail.
- I. Required shop drawing submittals shall include but are not limited to the following:
 - 1. Packaged Air Conditioning Equipment.
 - 2. Grilles, registers, diffusers and louvers.
 - 3. Ductwork and duct sealer.
 - 4. Duct insulation and accessories.
 - 5. Controls/Building Automation System.
 - 6. Exhaust fans.
 - 7. Relief and intake hoods.
 - 8. Fire dampers
 - 9. Manual Dampers, Motorized Dampers and Control Dampers.
 - 10. Actuators.
 - 11. Test and Balancing Agency (including forms).

1.19 COORDINATION DRAWINGS

- A. Submit three (3) black line prints of all mechanical room layouts showing locations of all equipment, piping, etc. to insure all will fit in space provided. Submit drawings at 1/4" scale. Layouts shall include equipment submitted on project to scale on plans.
- B. Submit coordination drawings with the respective equipment shop drawings.

1.20 MINOR DEVIATIONS

- A. Plans and detail sketches are submitted to limit, explain and define conditions, specified requirements, pipe sizes and manner of erecting work. Structural or other conditions may require certain modifications from the manner of installation shown, and such deviations are permissible and shall be made as required. However, specified sizes and requirements necessary for satisfactory operation shall remain unchanged. It may be necessary to shift ducts or pipes, or to change the shape of ducts, and these changes shall be made as required. All such changes shall be referred to the Architect and Engineer for approval before proceeding. Extra charges shall not be allowed for these changes. The contractor shall obtain a full set of plans and specifications for the coordination of his work prior to bidding this project. Items which are unclear to the bidding contractor shall be brought to the Architect and Engineers attention prior to bidding the project. An interpretation shall be clarified by the Architect and/or the Engineer prior to bidding.
- B. The Contractor shall realize that the drawings could delve into every step, sequence or operation necessary for the completion of the project, without drawing on the Contractor's experience or ingenuity. However, only typical details are shown on the Plans. In cases where the Contractor is not certain about the method of installation of his work, he shall ask for details. Lack of details will not be an excuse for improper installation.

- C. In general, the drawings are diagrammatic and the Contractor shall install his work in a manner so that interferences between the various trades are avoided. In cases where interferences do occur, the Architect is to state which item was first installed.

1.21 AS-BUILT RECORD DRAWINGS

- A. The Contractor shall obtain at his cost, two sets of blackline prints of the original bid documents by the Architect. One set shall be kept on the site with all information as referenced below, and shall update same as the work progresses. The other set will be utilized to record all field changes to a permanent record copy for the Owner.
- B. If the Contractor elects to vary from the Contract Documents and secures prior approval from the Architect for any phase of the work, he shall record in a neat and readable manner, ALL such variances on the blackline print in red. The original blackline prints shall be returned to the Architect for documentation.
- C. All deviations from sizes, locations, and from all other features of the installations shown in the Contract Documents shall be recorded.
- D. In addition, it shall be possible using these drawings to correctly and easily locate, identify and establish sizes of all piping, directions and the like, as well as other features of the work which will be concealed underground and/or in the finished building.
- E. Locations of underground work shall be established by dimensions to columns, lines or walls, locating all turns, etc., and by properly referenced centerline or invert elevations and rates of fall.
- F. For work concealed in the building, sufficient information shall be given so it can be located with reasonable accuracy and ease. In some cases this may be by dimension. In others, it may be sufficient to illustrate the work on the drawings in relation to the spaces in the building near which it was actually installed. The Architect's/Engineer's decision in this matter will be final.
- G. The following requirements apply to all "As-Built" drawings:
 - 1. They shall be maintained at the Contractor's expense.
 - 2. All such drawings shall be done carefully and neatly, and in a form approved by the Architect/Engineer.
 - 3. Additional drawings shall be provided as necessary for clarifications.
 - 4. These drawings shall be kept up-to-date during the entire course of the work and shall be available upon request for examination by the Architect/Engineer; and when necessary, to establish clearances for other parts of the work.
 - 5. "As-built" drawings shall be returned to the Architect upon completion of the work and are subject to approval of the Architect/Engineer.

PART 2 - PRODUCTS

2.1 HVAC SYSTEM PRODUCTS

- A. Refer to individual Division 23 sections for mechanical products, controls, fans, pipe, tube and fitting materials and joining methods.

PART 3 - EXECUTION

3.1 MANUFACTURER'S DIRECTION

- A. The contractor shall install and operate all equipment and material in accordance with the manufacturer's installation and operating instructions. The manufacturer's instructions of installation and operation shall become part of the Contract Documents and shall supplement the Drawings and Specifications.

3.2 EQUIPMENT LABELS

- A. Provide equipment labels for HVAC Equipment. Labels shall have permanent laminated construction secured to equipment.

3.3 PIPE LABELS

- A. Provide pipe markers and directional arrows on all piping in mechanical equipment rooms, or which is exposed in building, and on both sides of all valves located above ceiling. Markers shall be as manufactured by W.H. Bradley Co., Marking Services Inc. or the equivalent. All letters shall be color-coded and sized as recommended by OSHA. Samples of the type of letters to be used shall be submitted with shop drawings. Piping shall be color-coded.
- B. Pipe markers with arrows shall indicate lines content and shall be located 20 feet on center and at each change of direction of line. Identification bands shall be color coded to match pipe markers and shall be provided 10 feet on center. Pipe identification markers shall be taped at each end and shall be taped around the entire circumference of pipe.
- C. The following Piping shall be identified:
 - 1. Heating Hot Water Supply
 - 2. Heating Hot Water Return
 - 3. Chilled Water Supply
 - 4. Chilled Water Return

3.4 VALVE TAGS

- A. Secure metal tags to all valves. Labeling on all valve tags shall include type of system the valve controls and the area of building, zone, or equipment number affected by valve operation. Tag shall be 2" minimum diameter brass, engraved with code number, service and size. A framed list of the valves, giving manufacturer's name, model number, type and location shall be mounted in the main equipment room.

3.5 ACCESS DOORS:

- A. Provide access doors in walls, floors and ceilings to permit access to equipment and piping requiring service or adjustment.
 - 1. Valves.
 - 2. Manual balancing dampers and automatic control dampers.

3. Air terminal units and VRF indoor units.
4. Duct mounted filters and coils.
5. Drainage cleanouts.
6. Kitchen Hood exhaust ductwork in accordance with NFPA requirements.
7. Equipment shutoff protection devices such as disconnects, motor rated switches, etc.
8. Other mechanical equipment indicated in schedules or specifications which are requiring maintenance, adjustment or operation.

B. Provide hinged access doors and frames as follows:

1. Drywall Construction:
 - a. Provide with concealed spring hinges and flush screwdriver operated cam locks in sufficient number of the size of the panel.
 - b. Provide prime paintable surface (not galvanized).
 - c. Product: Milcor "Style M" (Karp DSC-214M).
2. Visible Masonry and Ceramic Tile:
 - a. Milcor "Style M" (Karp DSC-214M).
3. Cement Plaster:
 - a. Milcor "Style K" (KarpDSC-214 PL).
4. Acoustical Plaster:
 - a. Reinforced panel as required to prevent sagging. Provide continuous steel piano type hinge for the length of the panel, and sufficient number for the size of the panel. Provide factory prime paint surface (not galvanized).
 - b. Product: Milcor "Style AP" (Karp 214 PL).
5. Acoustical Tile:
 - a. Milcor "Style AT" (Larsen L-CPA).

C. Provide continuous concealed hinges and cam locks.

D. Provide UL listed 1-1/2 hour label "B" access doors with automatic self-closing latching mechanism where required.

E. Provide removable ceiling access tile section immediately adjacent to each mechanical or electrical device located in the ceiling plenum above removable tile ceiling.

F. Coordinate approval of type, color and location of access doors & frames with Architect.

3.6 CLEANING AND SERVICE

- A. Upon Completion of this work, the contractor shall clean and adjust equipment, controls, valves, etc.;
- B. Inspect, clean and service air filters and strainers immediately prior to final acceptance of project.
- C. Provide complete and working charge of proper refrigerant, free of contaminants, into each refrigerant system. After each system has been in operation long enough to ensure completely balanced condition, check the charge and modify it for proper operation as required.
- D. Place mechanical systems in complete working order. Clean equipment and piping materials thoroughly returning to "as new" condition prior to request for substantial completion.

- E. Remove excess materials and debris from mechanical rooms and drain pans. Broom clean areas. Thoroughly clean ductwork inside and outside before air devices (diffusers, grilles, etc.) are installed.

3.7 TEMPORARY HEATING AND AIR CONDITIONING DURING CONSTRUCTION PHASE

- A. Permanent building air conditioning equipment or systems are not designed to control building temperature and humidity levels during construction of the building. The building's HVAC system is not designed nor is it well suited for the proper drying of building/construction materials, and should not be used for such purposes.
- B. At all times, during construction phases, provide temporary ventilation both for comfort and protection of workers, for proper drying of wet work, and for proper curing of installed materials. Follow material manufacturer's published instructions with regard to installation of building materials.
- C. Provide temporary heat both for the comfort and protection of workers and as necessary to ensure suitable working conditions for construction operations of construction trades, and also as necessary for storage of products and materials. Refer to material manufacturer's literature for environmental operational temperature and humidity requirements.
- D. Provide temporary heat by use of self-contained, vented portable heating units, employing tanked gas or other approved heat source.
- E. Use only heating apparatus and fuels labeled or listed by a "National Recognized Testing Laboratory" recognized by OSHA. Keep equipment and surroundings in clean, safe conditions.
- F. Use flame resistant tarpaulins other material for temporary enclosures of space.
- G. Provide temporary humidity control by the use of small incremental de-humidifiers, packaged desiccant type de-humidifiers, and/or packaged DX type air conditioners.
- H. Do not permit space temperatures to reach or fall to a level which will cause damage to work. Coordinate the temperature and humidity requirements with the manufacturer of the finishes being provided.
- I. Replace interior or exterior surfaces damaged by the use of temporary heaters with new materials or refinish at no additional expense to the owner.
- J. As soon as practical after permanent heating, ventilation, and air conditioning systems are in place and operable, the contractor at his option, may provide heat from the permanent building heating system, until such time that the building is complete. It is recommended that the building's permanent heating and air conditioning systems not be utilized to maintain temperature and humidity conditions within the building during the construction phase. Small space heaters and portable de-humidifiers are suggested as sources of temperature and humidity control. It is the intent that the permanent HVAC systems should not be used to condition or control humidity during construction.
- K. The use of permanent HVAC systems will require that the systems be complete and fully controllable by the Building Automation System (BAS) including the ability to remotely alarm proper maintenance personnel in the event of any and all system failure(s) or inability to

maintain setpoint temperatures and humidity levels. Should the contractor elect to utilize the building's permanent HVAC system, the contractor shall bring the HVAC systems and ductwork back to an original unused condition or state by thoroughly cleaning and/or repairing both equipment and ductwork including repair and refinishing scrapes, tears, scratches and dents, cleaning ductwork, cleaning AHU coils, etc.

- L. All dust, dirt, fungal growth, and debris in duct work shall be cleaned.
- M. All disposable or wearable parts such as belts, filters, etc., shall be replaced without option or cause.
- N. Contractor's Use of Permanent HVAC Systems:
 - 1. Heating System:
 - a. Should the contractor (at his option and at his own risk), utilize the building's permanent heating systems provided under this contract to provide space heating prior to project completion date subject to the restraints stated herein.
 - b. The fuel for such space heating and for required tests of heating equipment shall be provided by contractor.
 - c. The start up of equipment for use by the contractor shall not commence any warranty period.
 - d. The heating system shall be operated only by qualified personnel, and shall be operated with all auxiliaries, safeties, and in accordance with manufacturer's instructions and good operating practice.
 - e. If at any time the Owner's Representative determines that the equipment is being improperly operated or maintained, contractor will be directed to disconnect its use.
 - f. Heating systems shall be operated and controlled to prevent temperature in any room or space in any building from exceeding 90 deg. F.
 - g. Temperature controls shall be functional to the extent that the operating temperatures of equipment, ductwork piping, etc., shall not either fall or be elevated above or below normal operating limits. The contractor shall demonstrate to the owner or his representative the ability of the system to be controlled, including limit alarms installed and the ability to monitor the systems off-site.
 - h. Systems shall not be operated unattended such as on holidays, weekends, nights, etc, nor shall personnel unfamiliar with the operation of the HVAC Systems be employed to "monitor or attend to" the systems such as security personnel, or janitorial staff. The heating system, when in operation, shall be continuously monitored by the mechanical contractor's approved personnel.
 - i. Systems when activated, may be placed into operation without diffusers and registers in place, but filters capable of filtering gypsum dust or other associated construction dust and debris shall be provided both in air handling equipment and at return air grille locations. Filter all return air entering duct work, to prevent return air ductwork from accumulating dust or otherwise becoming dirty.
 - j. Prior to final acceptance of the work, the contractor shall place heating systems and related equipment in a condition equal to new in that contractor shall clean all ductwork, coils, equipment, etc.
 - k. All disposable or wearable parts such as belts, filters, etc., shall be replaced without option or cause.
 - 2. Preliminary Heating Test, Adjusting and Balancing Report:
 - a. Provide a TAB report at the time the heating system(s) start-up which shall indicate the following conditions:
 - 1) Air pressure drop across the unit filters
 - 2) Air pressure drop across the unit's cooling coil(s)

- 3) Air pressure drop across the unit's heating coil(s)
 - 4) Total static pressure produced by the unit
 - 5) Discharge air static pressure
 - 6) Fan RPM
 - 7) Suction air pressure
 - 8) Provide a unit pressure graph
 - 9) Discharge air temperature (each air moving device)
 - 10) Return air temperature (each air moving device)
 - 11) Entering water temperatures (hot & chilled)
 - 12) Leaving water temperatures (hot & chilled)
 - 13) Water flow quantity (gpm) through the coil(s)(hot & chilled)
3. Air Conditioning System:
- a. Should the contractor (at his option and at his own risk), utilize the building's permanent air conditioning systems provided under this contract to provide space cooling and de-humidification prior to the project completion date. As such, any damages, loss of performance, wear, and other detrimental effects caused by the operational performance characteristics of the A/C system such as condensation, sweating of grilles, registers, diffusers, ducts, equipment, walls, floors, ceilings, and other conditions which may cause damage to building components or which cause mold, mildew, etc., shall be the total responsibility of the contractor.
 - b. The fuel, electricity or other energy required for space cooling and for any subsequent operation or testing shall be provided by the Contractor.
 - c. The cooling system(s) shall be operated only by fulling qualified personnel and shall be operated with all safety auxiliaries, and in accordance with manufacturer's instructions and good operating practice.
 - d. Start-up of equipment for use by the Contractor shall not commence any warranty period.
 - e. If at any time the Owner's Representative determines that the equipment is being improperly operated or maintained, the contractor will be directed to discontinue and disconnect its use and the contractor will be required to provide portable units to maintain space temperatures.
 - f. Temporary cooling and/or de-humidification systems shall be operated and controlled to prevent temperature and humidity in any room or space in any portion of the building from falling below 75 deg. F or above 65% relative humidity.
 - g. Temperature controls shall be functional to the extent that the operating temperatures of equipment, ductwork, piping, etc., shall not fall below the normal stated "design" operating limits. The contractor shall demonstrate to the owner or his representative the ability of the system to be controlled, including limit alarms installed and the ability to monitor the systems off-site.
 - h. Insulation systems for all piping, ductwork, etc., shall be completely installed prior to use of the permanent systems.
 - i. Systems shall not be operated unattended such as on holidays, weekends, nights, etc., nor shall personnel unfamiliar with the operation of the HVAC Systems be employed to "monitor or attend to" the systems such as security personnel, or janitorial staff. The air conditioning system when in operation, shall be continuously monitored by the mechanical contractor's approved personnel.
 - j. Systems when activated, may be placed into operation without diffusers and registers in place, but filters capable of filtering gypsum dust or other associated construction dust and debris shall be provided both in air handling equipment and at return air grille locations. Filter all return air entering duct work, to prevent return air duct work from accumulating dust or otherwise becoming dirty.

- k. Contractor shall, prior to final acceptance of the work, place cooling systems and related equipment in a condition equal to new in that contractor shall clean all ductwork, coils, equipment, etc.
- l. All disposable or wearable parts such as belts, filters, etc., shall be replaced without option or cause.
- 4. Preliminary Air Conditioning Test, Adjusting and Balancing Report:
 - a. Provide a TAB report at the time the heating system(s) start-up which shall indicate the following conditions:
 - 1) Air pressure drop across the unit filters
 - 2) Air pressure drop across the unit's cooling coil(s)
 - 3) Air pressure drop across the unit's heating coil(s)
 - 4) Total static pressure produced by the unit
 - 5) Discharge air static pressure
 - 6) Fan RPM
 - 7) Suction air pressure
 - 8) Provide a unit pressure graph
 - 9) Discharge air temperature (each air moving device)
 - 10) Return air temperature (each air moving device)
 - 11) Entering water temperatures (hot & chilled)
 - 12) Leaving water temperatures (hot & chilled)
 - 13) Water flow quantity (gpm) through the coil(s)(hot & chilled)

END OF SECTION 23 00 00

SECTION 23 05 13 – COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

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 general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.3 COORDINATION

- A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:
 - 1. Motor controllers.
 - 2. Torque, speed, and horsepower requirements of the load.
 - 3. Ratings and characteristics of supply circuit and required control sequence.
 - 4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 GENERAL MOTOR REQUIREMENTS

- A. Comply with NEMA MG 1 unless otherwise indicated.

2.2 MOTOR CHARACTERISTICS

- A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.
- B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

2.3 POLYPHASE MOTORS

- A. Description: NEMA MG 1, Design B, medium induction motor.
- B. Efficiency: Energy efficient, as defined in NEMA MG 1.
- C. Service Factor: 1.15.
- D. Multispeed Motors: Variable torque.
 - 1. For motors with 2:1 speed ratio, consequent pole, single winding.
 - 2. For motors with other than 2:1 speed ratio, separate winding for each speed.
- E. Rotor: Random-wound, squirrel cage.
- F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.
- G. Temperature Rise: Match insulation rating.
- H. Insulation: Class F.
- I. Code Letter Designation:
 - 1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
 - 2. Motors Smaller than 15 HP: Manufacturer's standard starting characteristic.
- J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

2.4 POLYPHASE MOTORS WITH ADDITIONAL REQUIREMENTS

- A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
- B. Motors Used with Variable Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
 - 1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
 - 2. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
 - 3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
 - 4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

2.5 SINGLE-PHASE MOTORS

- A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
 - 1. Permanent-split capacitor.
 - 2. Split phase.
 - 3. Capacitor start, inductor run.

- 4. Capacitor start, capacitor run.
- B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
- C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
- D. Motors 1/20 HP and Smaller: Shaded-pole type.
- E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. All materials and equipment shall be installed in accordance with Manufacturer's recommended installation methods for obtaining conformance with the Contract Documents.
- B. Alignment of all motors, factory coupled or mounted, and all motors field coupled and mounted, shall be rechecked after all connections have been made and after 48 hours of operation in designed service.
- C. Verify the voltage characteristics of each motor prior to ordering.
- D. Verify the correct wire connections and rotation of equipment by "bumping" motor after wiring.
- E. Confirm voltage imbalance on 3-phase motors is less than 2%.

3.2 APPLICATION: Except as specifically indicated, motors shall be selected as follows:

- A. Phase:
 - 1. Less than 1.0 HP: Single-Phase.
 - 2. 1 HP and Larger: Three-phase.
- B. Single Phase Starting:
 - 1. 1/8 HP and Less: Split phase or permanent split capacitor.
 - 2. Greater than 1/8 HP: Capacitor start.
- C. Enclosure:
 - 1. Totally enclosed fan-cooled (TEFC) for all motors located outside above roof, in wet areas, in mechanical rooms, or elsewhere as indicated.
 - 2. Open drip-proof (ODP) for motors located elsewhere, in a clean, dry environment.

END OF SECTION 23 05 13

SECTION 23 05 23 – BALL VALVES FOR HVAC PIPING

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. Brass ball valves.
- 2. Bronze ball valves.
- 3. Steel ball valves.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. SWP: Steam working pressure.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, and weld ends.
 - 3. Set ball valves open to minimize exposure of functional surfaces.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B1.20.1 for threads for threaded-end valves.
 - 2. ASME B16.1 for flanges on iron valves.
 - 3. ASME B16.5 for flanges on steel valves.
 - 4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 5. ASME B16.18 for solder-joint connections.
 - 6. ASME B31.1 for power piping valves.
 - 7. ASME B31.9 for building services piping valves.
- C. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- D. Refer to HVAC valve schedule articles for applications of valves.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valve Actuator Types:
 - 1. Gear Actuator: For quarter-turn valves **NPS 4 (DN 100)** and larger.
 - 2. Handlever: For quarter-turn valves smaller than **NPS 4 (DN 100)**.
- H. Valves in Insulated Piping:
 - 1. Include **2-inch (50-mm)** stem extensions.
 - 2. Extended operating handle of nonthermal-conductive material, and protective sleeves that allow operation of valves without breaking the vapor seals or disturbing insulation.
 - 3. Memory stops that are fully adjustable after insulation is applied.
- I. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRASS BALL VALVES

- A. Two-Piece Brass Ball Valves with Full Port and Brass Trim:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Valve, Inc.
 - b. Apollo Flow Controls; Conbraco Industries, Inc.

- c. [Crane; a Crane brand.](#)
- d. [KITZ Corporation.](#)
- e. [NIBCO INC.](#)
- f. [WATTS.](#)

2. Description:

- a. Standard: MSS SP-110.
- b. SWP Rating: 150 psig (1035 kPa).
- c. CWP Rating: 600 psig (4140 kPa).
- d. Body Design: Two piece.
- e. Body Material: Forged brass.
- f. Ends: Threaded.
- g. Seats: PTFE.
- h. Stem: Brass.
- i. Ball: Chrome-plated brass.
- j. Port: Full.

2.3 BRONZE BALL VALVES

A. Two-Piece Bronze Ball Valves with Full Port and Brass Trim:

1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:

- a. [American Valve, Inc.](#)
- b. [Apollo Flow Controls; Conbraco Industries, Inc.](#)
- c. [Crane; a Crane brand.](#)
- d. [NIBCO INC.](#)
- e. [WATTS.](#)

2. Description:

- a. Standard: MSS SP-110.
- b. SWP Rating: 150 psig (1035 kPa).
- c. CWP Rating: 600 psig (4140 kPa).
- d. Body Design: Two piece.
- e. Body Material: Bronze.
- f. Ends: Threaded.
- g. Seats: PTFE.
- h. Stem: Bronze.
- i. Ball: Chrome-plated brass.
- j. Port: Full.

2.4 STEEL BALL VALVES

A. Class 150 Steel Ball Valves with Full Port and Stainless-Steel Trim:

1. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:

- a. [Apollo Flow Controls; Conbraco Industries, Inc.](#)
 - b. [NIBCO INC.](#)
2. Description:
- a. Standard: MSS SP-72.
 - b. CWP Rating: 285 psig (1964 kPa).
 - c. Body Design: Split body.
 - d. Body Material: Carbon steel, ASTM A 216, Type WCB.
 - e. Ends: Flanged.
 - f. Seats: PTFE.
 - g. Stem: Stainless steel.
 - h. Ball: Stainless steel, vented.
 - i. Port: Full.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install valve tags. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for valve tags and schedules.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

- A. If valves with specified SWP classes or CWP ratings are unavailable, the same types of valves with higher SWP classes or CWP ratings may be substituted.
- B. Select valves with the following end connections:
 - 1. For Copper Tubing, **NPS 2 (DN 50)** and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
 - 2. For Copper Tubing, **NPS 2-1/2 to NPS 4 (DN 65 to DN 100)**: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 3. For Copper Tubing, **NPS 5 (DN 125)** and Larger: Flanged ends.
 - 4. For Steel Piping, **NPS 2 (DN 50)** and Smaller: Threaded ends.
 - 5. For Steel Piping, **NPS 2-1/2 to NPS 4 (DN 65 to DN 100)**: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
 - 6. For Steel Piping, **NPS 5 (DN 125)** and Larger: Flanged ends.

3.4 CHILLED-WATER VALVE SCHEDULE

- A. Pipe **NPS 2 (DN 50)** and Smaller: One piece, regular port, brass or bronze with stainless-steel trim.
 - 1. Valves may be provided with solder-joint ends instead of threaded ends.
- B. Pipe **NPS 2-1/2 (DN 65)** and Larger: Iron ball valves.
 - 1. Iron Valves, **NPS 2-1/2 to NPS 4 (DN 65 to DN 100)**: May be provided with threaded ends instead of flanged ends.
 - 2. Steel Ball Valves: Class 150.
- C. Pipe **NPS 2-1/2 (DN 65)** and Larger:
 - 1. Iron ball valves.
 - a. Iron Valves, **NPS 2-1/2 to NPS 4 (DN 65 to DN 100)**: May be provided with threaded ends instead of flanged ends.
 - 2. Class 150 steel ball valves.

3.5 HEATING-WATER VALVE SCHEDULE

- A. Pipe **NPS 2 (DN 50)** and Smaller: One piece, regular port, brass or bronze with stainless-steel trim.
 - 1. Valves may be provided with solder-joint ends instead of threaded ends.
- B. Pipe **NPS 2-1/2 (DN 65)** and Larger:
 - 1. Iron ball valves.
 - a. Iron Valves, **NPS 2-1/2 to NPS 4 (DN 65 to DN 100)**: May be provided with threaded ends instead of flanged ends.

2. Class 150 steel ball valves.

END OF SECTION 23 05 23

SECTION 23 05 23.13 – BUTTERFLY VALVES FOR HVAC PIPING

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. High-performance butterfly valves.

1.3 DEFINITIONS

- A. CWP: Cold working pressure.
- B. EPDM: Ethylene propylene copolymer rubber.
- C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
- D. SWP: Steam working pressure.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of valve.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set butterfly valves closed or slightly open.
- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
 - 1. ASME B16.1 for flanges on iron valves.
 - 2. ASME B16.5 for pipe flanges and flanged fittings, NPS 1/2 through NPS 24.
 - 3. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
 - 4. ASME B31.1 for power piping valves.
 - 5. ASME B31.9 for building services piping valves.
- C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.
- D. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- E. Valve Sizes: Same as upstream piping unless otherwise indicated.
- F. Valve Actuator Types:
 - 1. Gear Actuator: For valves **NPS 8 (DN 200)** and larger.
 - 2. Handlever: For valves **NPS 6 (DN 150)** and smaller.
 - 3. Chainwheel: Device for attachment to gear, stem, or other actuator of size and with chain for mounting height, according to "Valve Installation" Article.
- G. Valves in Insulated Piping: With **2-inch (50-mm)** stem extensions with extended necks.

2.2 HIGH-PERFORMANCE BUTTERFLY VALVES

- A. Class 150, Single-Flange, High-Performance Butterfly Valves:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Apollo Flow Controls; Conbraco Industries, Inc.
 - b. Milwaukee Valve Company.
 - c. NIBCO INC.
 - 2. Description:
 - a. Standard: MSS SP-68.
 - b. CWP Rating: **285 psig (1965 kPa)** at **100 deg F (38 deg C)**.

- c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
- d. Body Material: Carbon steel, cast iron, ductile iron, or stainless steel.
- e. Seat: Reinforced PTFE or metal.
- f. Stem: Stainless steel; offset from seat plane.
- g. Disc: Carbon steel.
- h. Service: Bidirectional.

B. Class 300, Single-Flange, High-Performance Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Apollo Flow Controls; Conbraco Industries, Inc.
 - b. Milwaukee Valve Company.
 - c. NIBCO INC.
2. Description:
 - a. Standard: MSS SP-68.
 - b. CWP Rating: **720 psig** (4965 kPa) at **100 deg F** (38 deg C).
 - c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
 - d. Body Material: Carbon steel, cast iron, or ductile iron.
 - e. Seat: Reinforced PTFE or metal.
 - f. Stem: Stainless steel; offset from seat plane.
 - g. Disc: Carbon steel.
 - h. Service: Bidirectional.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine mating flange faces for damage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- D. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install chainwheels on operators for butterfly valves **NPS 4 (DN 100)** and larger and more than **96 inches (2400 mm)** above floor. Extend chains to **60 inches (1520 mm)** above finished floor.
- F. Install valve tags. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for valve tags and schedules.

3.3 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 CHILLED-WATER VALVE SCHEDULE

- A. Pipe **NPS 2-1/2 (DN 65)** and Larger:
 - 1. High-Performance Butterfly Valves: Class 300, single flange.

3.5 HEATING-WATER VALVE SCHEDULE

- A. Pipe **NPS 2-1/2 (DN 65)** and Larger:
 - 1. High-Performance Butterfly Valves: Class 300, single flange.

END OF SECTION 23 05 23.13

SECTION 23 05 29 – HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

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. Metal pipe hangers and supports.
 - 2. Trapeze pipe hangers.
 - 3. Metal framing systems.
 - 4. Thermal-hanger shield inserts.
 - 5. Fastener systems.
 - 6. Pipe stands.
 - 7. Equipment supports.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of the Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
 - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
 - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

- A. Carbon-Steel Pipe Hangers and Supports:
 - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
 - 2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
 - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
 - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
 - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

2.2 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

- A. MFMA Manufacturer Metal Framing Systems:
 - 1.
 - 2. Manufacturers:
 - a. Cooper B-Line, Inc.; a division of Cooper Industries.
 - b. Flex-Strut Inc.
 - c. Thomas & Betts Corporation, A Member of the ABB Group.
 - d. Unistrut; an Atkore International company.
 - e. Wesanco, Inc.
 - 3. Standard: MFMA-4.
 - 4. Channels: Continuous slotted steel channel with intumed lips.
 - 5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
 - 6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
 - 7. Metallic Coating: Electroplated zinc.

2.4 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened Portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.5 EQUIPMENT SUPPORTS

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.6 MISCELLANEOUS MATERIALS

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
 - 1. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.
 - 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
 - 2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
- E. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
 2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Install lateral bracing with pipe hangers and supports to prevent swaying.
- J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- M. Insulated Piping:
1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
 2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
 4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
 - d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
 - e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.
 5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.

6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and 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. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use carbon-steel pipe hangers and supports metal trapeze pipe hangers and metal framing systems and attachments for general service applications.
- E. Use thermal-hanger shield inserts for insulated piping and tubing.
- F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
 - 2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
 - 3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
 - 4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
 - 5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
 - 6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
 - 7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
 - 10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
 - 11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
 - 12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
 - 13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
 - 14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
 - 15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
 - 16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
 - 17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.

18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
 19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
 20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
 21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.
- H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
 3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
 4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
 5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.
- I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
 3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
 4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
 6. C-Clamps (MSS Type 23): For structural shapes.
 7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
 9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
 11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lb.

- b. Medium (MSS Type 32): 1500 lb.
 - c. Heavy (MSS Type 33): 3000 lb.
- 13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
- 14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- 15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

- J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 - 2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
 - 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

- K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
 - 1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 - 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 - 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
 - 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 - 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
 - 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
 - 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
 - 8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

- L. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

- M. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

END OF SECTION 23 05 29

SECTION 23 05 53 – IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

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. Equipment Labels.
 - 2. Chilled Water Piping Labels (Exterior)

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

- A. Plastic Labels for Equipment:
 - 1. Manufacturer shall be one of the following:
 - a. Brady Corporation.
 - b. Brimar Industries, Inc.
 - c. Carlton Industries, LP.
 - d. Champion America.
 - e. Craftmark Pipe Markers.
 - f. Emedco.
 - g. Kolbi Pipe Marker Co.
 - h. LEM Products Inc.
 - i. Marking Services, Inc.
 - j. Seton Identification Products.
 - 2. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.

3. Letter Color: White.
 4. Background Color: Black.
 5. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
 6. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
 7. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
 8. Fasteners: Stainless-steel rivets.
 9. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- B. Label Content: Include equipment's Drawing designation or unique equipment number, drawing numbers where equipment is indicated (plans, details, and schedules).
- C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

- A. Labels for Chilled Water Piping (Exterior):
1. Manufacturer shall be one of the following:
 - a. Brady Corporation.
 - b. Brimar Industries, Inc.
 - c. Carlton Industries, LP.
 - d. Champion America.
 - e. Craftmark Pipe Markers.
 - f. Emedco.
 - g. Kolbi Pipe Marker Co.
 - h. LEM Products Inc.
 - i. Marking Services, Inc.
 - j. Seton Identification Products.
- B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction according to ASME A13.1.
- C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.
- D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.
1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
 2. Lettering Size: At least 1/2 inch for viewing distances up to 72 inches and proportionately larger lettering for greater viewing distances.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulated.

3.2 GENERAL INSTALLATION REQUIREMENTS

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with locations of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

3.3 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

END OF SECTION 23 05 53

SECTION 23 05 93 – TESTING, ADJUSTING, AND BALANCING FOR HVAC

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 SCOPE OF WORK

- A. The Contractor shall obtain the services of an independent Test and Balance (TAB) Company which specializes in the testing and balancing of heating, ventilating and air conditioning (HVAC) systems to test, adjust and balance all HVAC systems in the building(s).
- B. The work included in this section consists of furnishing labor, instruments, and tools required in testing, adjusting and balancing the HVAC systems as described in these specifications or shown on accompanying drawings. Services shall include checking equipment performance, taking the specified measurements, and recording and reporting the results. The testing, adjusting and balancing agency shall act as a reporting agency; that is, list and report each piece of equipment as to identification number, manufacturer, model number, serial number, proper location, specified performance, and report actual performance of all equipment as found during testing. The report is intended to be used during the life of the building as a ready reference indicating original conditions, equipment components, etc.
- C. Representatives of the Test and Balance Company shall visit the job site during installation of the HVAC equipment, piping and ductwork as required.
- D. Upon completion of the HVAC system installation, the Test and Balance Company shall perform all required testing and balancing with the full cooperation of the Contractor and his Sub-contractors. The Contractor shall make changes and/or adjustments to the HVAC system components that are required by the Test and Balance Company to accomplish proper balancing. The TAB agency shall not supply or install any materials or balancing devices such as pulleys, drives, belts, etc. All of this work is by the Contractor and shall be performed at no additional cost to the Owner.
- E. The test and balance report complete with a summary page listing all deficiencies shall be submitted to the Architect for review. If the Architect agrees with the report, he shall sign it and return it to the Contractor. The test and balance report must be complete and must be accepted by the Architect prior to acceptance of the project. Any outstanding test and balance items shall be placed on the punch list and a monetary value shall be assigned to them.
- F. After all deficiencies have been corrected the Architect shall sign the testing and balancing report, and the Test and Balance Company shall supply four (4) copies of the final and complete report to the Contractor for inclusion in the Operation and Maintenance Manuals.

- G. The Test and Balance Company shall obtain a copy of all HVAC related shop drawings from the contractor. The contractor shall provide a set of approved shop drawings to the TAB contractor within 30 days from receiving approved shop drawings.
- H. The items requiring testing, adjusting, and balancing include (but are not restricted to) the following:
 - 1. Air Systems:
 - a. Supply Fan AHU
 - b. Relief Fans
 - c. Exhaust Fans
 - d. Zone Branch and main ducts
 - e. Diffusers, Registers, Grilles and Dampers
 - f. Coils (Air Temperatures)
 - g. Valves
 - h. Vibration Isolators
 - 2. Hydronic Systems: Contractor to complete full hydraulic test and balance of existing chilled water system **prior to construction of new piping**. Contractor to include pressure profile of existing pumps with report to be submitted to the engineer prior to construction for verification of impeller and pump sizes. Contractor shall also provide a hydronic **after installation of new chilled water piping** to restore hydraulic systems to previous performance.
 - a. Pumps
 - b. System Mains and Branches
 - c. Heat Exchangers
 - d. Coils

1.3 DEFINITIONS

- A. AABC: Associated Air Balance Council.
- B. BAS: Building automation systems.
- C. NEBB: National Environmental Balancing Bureau.
- D. TAB: Testing, adjusting, and balancing.
- E. TABB: Testing, Adjusting, and Balancing Bureau.
- F. TAB Specialist: An independent entity meeting qualifications to perform TAB work.
- G. TDH: Total dynamic head.

1.4 INFORMATIONAL SUBMITTALS

- A. Certified TAB reports.

- B. Sample report forms.

1.5 QUALITY ASSURANCE

- A. TAB Specialists Qualifications: Certified by AABC NEBB or TABB.
- B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."
- D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.
- B. Examine installed systems for balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.
- C. Examine the approved submittals for HVAC systems and equipment.
- D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about HVAC system and equipment controls.
- E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.
- F. Examine equipment performance data including fan and pump curves.
 - 1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
 - 2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

- G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.
- H. Examine test reports specified in individual system and equipment Sections.
- I. Examine HVAC equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.
- J. Examine operating safety interlocks and controls on HVAC equipment.
- K. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

- A. Prepare a TAB plan that includes the following:
 - 1. Equipment and systems to be tested.
 - 2. Strategies and step-by-step procedures for balancing the systems.
 - 3. Instrumentation to be used.
 - 4. Sample forms with specific identification for all equipment.
- B. Perform system-readiness checks of HVAC systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:
 - 1. Airside:
 - a. Verify that leakage and pressure tests on air distribution systems have been satisfactorily completed.
 - b. Duct systems are complete with terminals installed.
 - c. Volume, smoke, and fire dampers are open and functional.
 - d. Clean filters are installed.
 - e. Fans are operating, free of vibration, and rotating in correct direction.
 - f. Variable-frequency controllers' startup is complete and safeties are verified.
 - g. Automatic temperature-control systems are operational.
 - h. Ceilings are installed.
 - i. Windows and doors are installed.
 - j. Suitable access to balancing devices and equipment is provided.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

- A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.
- B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.
 - 1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
 - 2. After testing and balancing, install test ports and duct access doors.
 - 3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish.

- C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.
- D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Cross-check the summation of required outlet volumes with required fan volumes.
- B. Prepare schematic diagrams of systems' "as-built" duct layouts.
- C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- F. Verify that motor starters are equipped with properly sized thermal protection.
- G. Check dampers for proper position to achieve desired airflow path.
- H. Check for airflow blockages.
- I. Check condensate drains for proper connections and functioning.
- J. Check for proper sealing of air-handling-unit components.
- K. Verify that air duct system is sealed as specified.

3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

- A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.
 - 1. Measure total airflow.
 - a. Set outside-air, return-air, and relief-air dampers for proper position that simulates minimum outdoor-air conditions.
 - b. Where duct conditions allow, measure airflow by Pitot-tube traverse. If necessary, perform multiple Pitot-tube traverses to obtain total airflow.
 - c. Where duct conditions are not suitable for Pitot-tube traverse measurements, a coil traverse may be acceptable.
 - d. If a reliable Pitot-tube traverse or coil traverse is not possible, measure airflow at terminals and calculate the total airflow.
 - 2. Measure fan static pressures as follows:
 - a. Measure static pressure directly at the fan outlet or through the flexible connection.
 - b. Measure static pressure directly at the fan inlet or through the flexible connection.

- c. Measure static pressure across each component that makes up the air-handling system.
 - d. Report artificial loading of filters at the time static pressures are measured.
- 3. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
- 4. Obtain approval from Construction Manager for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
- 5. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload occurs. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.
- B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows.
 - 1. Measure airflow of submain and branch ducts.
 - 2. Adjust submain and branch duct volume dampers for specified airflow.
 - 3. Re-measure each submain and branch duct after all have been adjusted.
- C. Adjust air inlets and outlets for each space to indicated airflows.
 - 1. Set airflow patterns of adjustable outlets for proper distribution without drafts.
 - 2. Measure inlets and outlets airflow.
 - 3. Adjust each inlet and outlet for specified airflow.
 - 4. Re-measure each inlet and outlet after they have been adjusted.
- D. Verify final system conditions.
 - 1. Re-measure and confirm that minimum outdoor, return, and relief airflows are within design. Readjust to design if necessary.
 - 2. Re-measure and confirm that total airflow is within design.
 - 3. Re-measure all final fan operating data, rpms, volts, amps, and static profile.
 - 4. Mark all final settings.
 - 5. Test system in economizer mode. Verify proper operation and adjust if necessary.
 - 6. Measure and record all operating data.
 - 7. Record final fan-performance data.

3.6 PROCEDURES FOR MOTORS

- A. Motors 1/2 HP and Larger: Test at final balanced conditions and record the following data:
 - 1. Manufacturer's name, model number, and serial number.
 - 2. Motor horsepower rating.
 - 3. Motor rpm.
 - 4. Phase and hertz.
 - 5. Nameplate and measured voltage, each phase.
 - 6. Nameplate and measured amperage, each phase.
 - 7. Starter size and thermal-protection-element rating.
 - 8. Service factor and frame size.

3.7 PROCEDURES FOR CONDENSING UNITS

- A. Verify proper rotation of fans.
- B. Measure entering- and leaving-air temperatures.
- C. Record fan and motor operating data.

3.8 TOLERANCES

- A. Set HVAC system's airflow rates and water flow rates within the following tolerances:
 - 1. Supply, Return, and Equipment with Fans: Plus or minus 10 percent.
 - 2. Exhaust Fans: Plus 10 percent.
 - 3. Outside Airflow: Plus 10 percent.
 - 4. Air Outlets and Inlets: Plus or minus 10 percent.
 - 5. Heating-Water Flow Rate: Plus 10 percent or minus 5 percent. If design value is less than 10 gpm (0.63 L/s), within 10 percent.
 - 6. Chilled-Water Flow Rate: 10 percent or minus 5 percent. If design value is less than 10 gpm (0.63 L/s), within 10 percent.
- B. Maintaining pressure relationships as designed shall have priority over the tolerances specified above.

3.9 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

- A. Prepare test reports for pumps, coils, and other equipment. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required coil and equipment flow rates with pump design flow rate.
- B. Prepare schematic diagrams of systems' Record drawings piping layouts.
- C. In addition to requirements in "Preparation" Article, prepare hydronic systems for testing and balancing as follows:
 - 1. Check expansion tank for proper setting.
 - 2. Check highest vent for adequate pressure.
 - 3. Check flow-control valves for proper position.
 - 4. Locate start-stop and disconnect switches, electrical interlocks, and motor controllers.
 - 5. Verify that motor controllers are equipped with properly sized thermal protection.
 - 6. Check that air has been purged from the system.
- D. Measure and record upstream and downstream pressure of each piece of equipment.
- E. Measure and record upstream and downstream pressure of pressure-reducing valves.
- F. Check settings and operation of automatic temperature-control valves, self-contained control valves, and pressure-reducing valves. Record final settings.
 - 1. Check settings and operation of each safety valve. Record settings.

3.10 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

- A. Adjust pumps to deliver total design flow.
 1. Measure total water flow.
 - a. Position valves for full flow through coils.
 - b. Measure flow by main flow meter, if installed.
 - c. If main flow meter is not installed, determine flow by pump TDH or known equipment pressure drop.
 2. Measure pump TDH as follows:
 - a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - c. Convert pressure to head and correct for differences in gauge heights.
 - d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
 - e. With valves open, read pump TDH. Adjust pump discharge valve until design water flow is achieved. If excessive throttling is required to achieve desired flow, recommend pump impellers be trimmed to reduce excess throttling.
 3. Monitor motor performance during procedures, and do not operate motor in an overloaded condition.
- B. Adjust flow-measuring devices installed in mains and branches to design water flows.
 1. Measure flow in main and branch pipes.
 2. Adjust main and branch balance valves for design flow.
 3. Re-measure each main and branch after all have been adjusted.
- C. Adjust flow-measuring devices installed at terminals for each space to design water flows.
 1. Measure flow at terminals.
 2. Adjust each terminal to design flow.
 3. Re-measure each terminal after it is adjusted.
 4. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
 5. Perform temperature tests after flows have been balanced.
- D. For systems with pressure-independent valves at terminals:
 1. Measure differential pressure and verify that it is within manufacturer's specified range.
 2. Perform temperature tests after flows have been verified.
- E. For systems without pressure-independent valves or flow-measuring devices at terminals:
 1. Measure and balance coils by either coil pressure drop or temperature method.

2. If balanced by coil pressure drop, perform temperature tests after flows have been verified.

F. Verify final system conditions as follows:

1. Re-measure and confirm that total water flow is within design.
2. Re-measure final pumps' operating data, TDH, volts, amps, and static profile.
3. Mark final settings.

G. Verify that memory stops have been set.

3.11 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals, and proceed as specified above for hydronic systems.

B. Adjust the variable-flow hydronic system as follows:

1. Verify that the pressure-differential sensor(s) is located as indicated.
2. Determine whether there is diversity in the system.

C. For systems with no flow diversity:

1. Adjust pumps to deliver total design flow.

a. Measure total water flow.

- 1) Position valves for full flow through coils.
- 2) Measure flow by main flow meter, if installed.
- 3) If main flow meter is not installed, determine flow by pump TDH or known equipment pressure drop.

b. Measure pump TDH as follows:

- 1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
- 2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
- 3) Convert pressure to head and correct for differences in gauge heights.
- 4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
- 5) With valves open, read pump TDH. Adjust pump discharge valve or speed until design water flow is achieved. If excessive throttling is required to achieve desired flow, recommend pump impellers be trimmed to reduce excess throttling.

c. Monitor motor performance during procedures, and do not operate motor in an overloaded condition.

2. Adjust flow-measuring devices installed in mains and branches to design water flows.
 - a. Measure flow in main and branch pipes.
 - b. Adjust main and branch balance valves for design flow.
 - c. Re-measure each main and branch after all have been adjusted.
 3. Adjust flow-measuring devices installed at terminals for each space to design water flows.
 - a. Measure flow at terminals.
 - b. Adjust each terminal to design flow.
 - c. Re-measure each terminal after it is adjusted.
 - d. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
 - e. Perform temperature tests after flows have been balanced.
 4. For systems with pressure-independent valves at terminals:
 - a. Measure differential pressure and verify that it is within manufacturer's specified range.
 - b. Perform temperature tests after flows have been verified.
 5. For systems without pressure-independent valves or flow-measuring devices at terminals:
 - a. Measure and balance coils by either coil pressure drop or temperature method.
 - b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
 6. Prior to verifying final system conditions, determine the system pressure-differential set point(s).
 7. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion, open discharge valve 100 percent, and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
 8. Mark final settings and verify that all memory stops have been set.
 9. Verify final system conditions as follows:
 - a. Re-measure and confirm that total flow is within design.
 - b. Re-measure final pumps' operating data, TDH, volts, amps, speed, and static profile.
 - c. Mark final settings.
- D. For systems with flow diversity:
1. Determine diversity factor.
 2. Simulate system diversity by closing required number of control valves, as approved by Architect.
 3. Adjust pumps to deliver total design flow.
 - a. Measure total water flow.
 - 1) Position valves for full flow through coils.

- 2) Measure flow by main flow meter, if installed.
- 3) If main flow meter is not installed, determine flow by pump TDH or known equipment pressure drop.
- b. Measure pump TDH as follows:
 - 1) Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
 - 2) Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
 - 3) Convert pressure to head and correct for differences in gauge heights.
 - 4) Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.
 - 5) With valves open, read pump TDH. Adjust pump discharge valve or speed until design water flow is achieved. If excessive throttling is required to achieve desired flow, recommend pump impellers be trimmed to reduce excess throttling.
- c. Monitor motor performance during procedures, and do not operate motor in an overloaded condition.
4. Adjust flow-measuring devices installed in mains and branches to design water flows.
 - a. Measure flow in main and branch pipes.
 - b. Adjust main and branch balance valves for design flow.
 - c. Re-measure each main and branch after all have been adjusted.
5. Adjust flow-measuring devices installed at terminals for each space to design water flows.
 - a. Measure flow at terminals.
 - b. Adjust each terminal to design flow.
 - c. Re-measure each terminal after it is adjusted.
 - d. Position control valves to bypass the coil, and adjust the bypass valve to maintain design flow.
 - e. Perform temperature tests after flows have been balanced.
6. For systems with pressure-independent valves at terminals:
 - a. Measure differential pressure and verify that it is within manufacturer's specified range.
 - b. Perform temperature tests after flows have been verified.
7. For systems without pressure-independent valves or flow-measuring devices at terminals:
 - a. Measure and balance coils by either coil pressure drop or temperature method.
 - b. If balanced by coil pressure drop, perform temperature tests after flows have been verified.
8. Open control valves that were shut. Close a sufficient number of control valves that were previously open to maintain diversity, and balance terminals that were just opened.

9. Prior to verifying final system conditions, determine system pressure-differential set point(s).
10. If the pump discharge valve was used to set total system flow with variable-frequency controller at 60 Hz, at completion, open discharge valve 100 percent, and allow variable-frequency controller to control system differential-pressure set point. Record pump data under both conditions.
11. Mark final settings and verify that memory stops have been set.
12. Verify final system conditions as follows:
 - a. Re-measure and confirm that total water flow is within design.
 - b. Re-measure final pumps' operating data, TDH, volts, amps, speed, and static profile.
 - c. Mark final settings.

3.12 FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 2. Include a list of instruments used for procedures, along with proof of calibration.
 3. Certify validity and accuracy of field data.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 1. Fan curves.
 2. Manufacturers' test data.
 3. Field test reports prepared by system and equipment installers.
 4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.
- C. General Report Data: In addition to form titles and entries, include the following data:
 1. Title page.
 2. Name and address of the TAB specialist.
 3. Project name.
 4. Project location.
 5. Architect's name and address.
 6. Engineer's name and address.
 7. Contractor's name and address.
 8. Report date.
 9. Signature of TAB supervisor who certifies the report.
 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Notes to explain why certain final data in the body of reports vary from indicated values.
 14. Test conditions for fans performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.

- c. Cooling coil, wet- and dry-bulb conditions.
 - d. Fan drive settings including settings and percentage of maximum pitch diameter.
 - e. Settings for supply-air, static-pressure controller.
 - f. Other system operating conditions that affect performance.
- D. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:
- 1. Unit Data:
 - a. Unit identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and unit size.
 - e. Manufacturer's serial number.
 - f. Unit arrangement and class.
 - g. Discharge arrangement.
 - h. Sheave make, size in inches, and bore.
 - i. Center-to-center dimensions of sheave and amount of adjustments in inches.
 - j. Number, make, and size of belts.
 - k. Number, type, and size of filters.
 - 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave and amount of adjustments in inches.
 - 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Filter static-pressure differential in inches wg.
 - f. Preheat-coil static-pressure differential in inches wg.
 - g. Cooling-coil static-pressure differential in inches wg.
 - h. Heating-coil static-pressure differential in inches wg.
 - i. Outdoor airflow in cfm.
 - j. Return airflow in cfm.
 - k. Outdoor-air damper position.
 - l. Return-air damper position.
- E. Apparatus-Coil Test Reports:
- 1. Coil Data:
 - a. System identification.
 - b. Location.
 - c. Coil type.
 - d. Number of rows.
 - e. Fin spacing in fins per inch (mm) o.c.
 - f. Make and model number.
 - g. Face area in sq. ft. (sq. m).
 - h. Tube size in NPS (DN).
 - i. Tube and fin materials.
 - j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):
 - a. Airflow rate in cfm (L/s).
 - b. Average face velocity in fpm (m/s).
 - c. Air pressure drop in inches wg (Pa).
 - d. Outdoor-air, wet- and dry-bulb temperatures in deg F (deg C).
 - e. Return-air, wet- and dry-bulb temperatures in deg F (deg C).
 - f. Entering-air, wet- and dry-bulb temperatures in deg F (deg C).
 - g. Leaving-air, wet- and dry-bulb temperatures in deg F (deg C).
 - h. Water flow rate in gpm (L/s).
 - i. Water pressure differential in feet of head or psig (kPa).
 - j. Entering-water temperature in deg F (deg C).
 - k. Leaving-water temperature in deg F (deg C).

- F. Fan Test Reports: For supply, return, and exhaust fans, include the following:
 1. Fan Data:
 - a. System identification.
 - b. Location.
 - c. Make and type.
 - d. Model number and size.
 - e. Manufacturer's serial number.
 - f. Arrangement and class.
 - g. Sheave make, size in inches, and bore.
 - h. Center-to-center dimensions of sheave and amount of adjustments in inches.
 2. Motor Data:
 - a. Motor make, and frame type and size.
 - b. Horsepower and rpm.
 - c. Volts, phase, and hertz.
 - d. Full-load amperage and service factor.
 - e. Sheave make, size in inches, and bore.
 - f. Center-to-center dimensions of sheave, and amount of adjustments in inches.
 - g. Number, make, and size of belts.
 3. Test Data (Indicated and Actual Values):
 - a. Total airflow rate in cfm.
 - b. Total system static pressure in inches wg.
 - c. Fan rpm.
 - d. Discharge static pressure in inches wg.
 - e. Suction static pressure in inches wg.

- G. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:
 1. Report Data:
 - a. System and air-handling-unit number.
 - b. Location and zone.
 - c. Traverse air temperature in deg F.
 - d. Duct static pressure in inches wg.
 - e. Duct size in inches.
 - f. Duct area in sq. ft.
 - g. Indicated airflow rate in cfm.
 - h. Indicated velocity in fpm.
 - i. Actual airflow rate in cfm.
 - j. Actual average velocity in fpm.
 - k. Barometric pressure in psig.

- H. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves, and include the following:

1. Unit Data:

- a. Unit identification.
- b. Location.
- c. Service.
- d. Make and size.
- e. Model number and serial number.
- f. Water flow rate in gpm (L/s).
- g. Water pressure differential in feet of head or psig (kPa).
- h. Required net positive suction head in feet of head or psig (kPa).
- i. Pump speed.
- j. Impeller diameter in inches (mm).
- k. Motor make and frame size.
- l. Motor horsepower and rpm.
- m. Voltage at each connection.
- n. Amperage for each phase.
- o. Full-load amperage and service factor.
- p. Seal type.

2. Test Data (Indicated and Actual Values):

- a. Static head in feet of head or psig (kPa).
- b. Pump shutoff pressure in feet of head or psig (kPa).
- c. Actual impeller size in inches (mm).
- d. Full-open flow rate in gpm (L/s).
- e. Full-open pressure in feet of head or psig (kPa).
- f. Final discharge pressure in feet of head or psig (kPa).
- g. Final suction pressure in feet of head or psig (kPa).
- h. Final total pressure in feet of head or psig (kPa).
- i. Final water flow rate in gpm (L/s).
- j. Voltage at each connection.
- k. Amperage for each phase.

I. Instrument Calibration Reports:

1. Report Data:

- a. Instrument type and make.
- b. Serial number.
- c. Application.
- d. Dates of use.
- e. Dates of calibration.

3.13 VERIFICATION OF TAB REPORT

- A. The TAB specialist's test and balance engineer shall conduct the inspection in the presence of Architect.
- B. Architect may randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

- C. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
- D. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
- E. If TAB work fails, proceed as follows:
 - 1. TAB specialists shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
 - 2. If the second final inspection also fails, Owner may contract the services of another TAB specialist to complete TAB work according to the Contract Documents and deduct the cost of the services from the original TAB specialist's final payment.
 - 3. If the second verification also fails, the design professional may contact AABC Headquarters regarding the AABC National Performance Guaranty.
- F. Prepare test and inspection reports.

3.14 ADDITIONAL TESTS

- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
- B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 23 05 93

SECTION 23 07 13 – DUCT 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 insulating the following duct services:
 - 1. Indoor, concealed supply air.
 - 2. Indoor, concealed return air.
 - 3. Indoor, concealed exhaust air.
 - 4. Indoor, concealed outdoor air.
 - 5. Indoor, return air plenum boxes.
 - 6. Indoor, tops of ceiling diffusers and grilles.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance, thickness, and jackets (both factory- and field-applied if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
 - 3. Detail application of field-applied jackets.
 - 4. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields as specified.
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Fire Rated Insulation:
 - 1. Manufacturer shall be one of the following:
 - a. 3M FireMaster Fast Wrap 615+.
 - b. Thermal Ceramics FireMaster.
- G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II for sheet materials.
 - 1. Manufacturer shall be one of the following:
 - a. Aeroflex, USA, Inc.
 - b. Armacell LLC.
- H. Fiber-Glass Blanket Insulation: Fiber-Glass bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Manufacturer shall be one of the following:
 - a. Certainteed Corporation.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Knauf Insulation.
 - d. Manson Insulation Inc.
 - e. Owens Corning.

2.2 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.
- B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.
 - 1. Manufacture shall be one of the following:
 - a. Aeroflex USA, Inc.
 - b. Armacell LLC.
 - c. Foster Brand.
- C. Fiber-Glass Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. Manufacturer shall be one of the following:
 - a. Childers Brand.
 - b. Eagle Bridges – Marathon Industries.
 - c. Foster Brand.
 - d. Mon-Eco Industries, Inc.

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.

1. Manufacturer:
 - a. Foster Brand.
 - b. Knauf Insulation.
 - c. Vimasco Corporation.
 - d. Childers.
2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

2.4 SEALANTS

- A. FSK and Metal Jacket Flashing Sealants:
1. Materials shall be compatible with insulation materials, jackets, and substrates.
 2. Fire- and water-resistant, flexible, elastomeric sealant.
 3. Service Temperature Range: Minus 40 to plus 250 deg F.
 4. Color: Aluminum.
 5. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 6. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.5 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.6 TAPES

- A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Width: 3 inches.
 2. Thickness: 6.5 mils.
 3. Adhesion: 90 ounces force/inch in width.
 4. Elongation: 2 percent.
 5. Tensile Strength: 40 lbf/inch in width.
 6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.7 SECUREMENTS

- A. Bands:
 - 1. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.
- B. Insulation Pins and Hangers:
 - 1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch- diameter shank, length to suit depth of insulation indicated.
 - 2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.135-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
 - 3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
 - a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
 - b. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch-diameter shank, length to suit depth of insulation indicated.
 - c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
 - d. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
 - e. Spindle: Nylon, 0.106-inch- diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
 - f. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
- C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

2.8 WALL LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
 - 1. Manufacturers shall be as follows:
 - a. Certaineed
 - b. Owens Corning
 - c. Johns Manville
 - d. Knauf
 - 2. Maximum Thermal Conductivity:
 - a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 - 3. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating.

Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.

4. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
 - a. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 1. Verify that systems to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
 - 1. Seal penetrations with flashing sealant.
 - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 - 4. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.
- E. Insulation Installation at Floor Penetrations:
 - 1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
 - 2. Seal penetrations through fire-rated assemblies.

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 INSTALLATION OF FIBER-GLASS INSULATION

- A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.7 WALL LINER

- A. Apply on all mechanical room walls from floor to ceiling / deck.

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners or cut and fit to ensure butted-edge overlapping.
5. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

3.9 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.
- C. Install firestopping at penetrations through fire-rated assemblies.

3.10 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified.
 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.12 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 - 1. Indoor, concealed supply air.
 - 2. Indoor, concealed return air.
 - 3. Indoor, concealed exhaust air.
 - 4. Indoor, concealed outdoor air.
 - 5. Indoor, return air plenum boxes.
 - 6. Indoor, tops of ceiling diffusers and grilles.
 - 7. Mechanical Room Walls
- B. Items Not Insulated:
 - 1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
 - 2. Factory-insulated flexible ducts.
 - 3. Factory-insulated plenums and casings.
 - 4. Flexible connectors.
 - 5. Vibration-control devices.
 - 6. Factory-insulated access panels and doors.

3.13 DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, round and flat-oval, supply-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 - 2. Minimum installed R-value shall be R-6.0.
- B. Concealed, round and flat-oval, return-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 - 2. Minimum installed R-value shall be R-6.0.
- C. Concealed, round and flat-oval, outdoor-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 - 2. Minimum installed R-value shall be R-6.0.

- D. Concealed, round and flat-oval, exhaust-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 - 2. Minimum installed R-value shall be R-6.0.
- E. Concealed, rectangular, supply-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 - 2. Minimum installed R-value shall be R-6.0.
- F. Concealed, rectangular, return-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 - 2. Minimum installed R-value shall be R-6.0.
- G. Concealed, rectangular, outdoor-air duct insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 - 2. Minimum installed R-value shall be R-6.0.
- H. Concealed, rectangular, exhaust-air duct shall be the following:
 - 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 - 2. Minimum installed R-value shall be R-6.0.
- I. Concealed, supply-air plenum insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 - 2. Minimum installed R-value shall be R-6.0.
- J. Return air plenum boxes installation shall be the following:
 - 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 - 2. Minimum installed R-value shall be R-6.0.
- K. Tops of supply air diffusers and grilles insulation shall be the following:
 - 1. Mineral-Fiber Blanket: 2.125 inches thick and 0.75-lb/cu. ft. nominal density.
 - 2. Minimum installed R-value shall be R-6.0.

END OF SECTION 23 07 13

SECTION 23 07 19 – HVAC PIPING 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 insulating the following HVAC piping systems:
 - 1. Condensate drain piping, indoors and outdoors.
 - 2. Chilled-water and brine piping, indoors and outdoors.
 - 3. Heating hot-water piping, indoors.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.8 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. 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:
 - a. Owens Corning.
 - b. Knauf Insulation
 - c. Or Prior Approved Equal.
 - 2. Block Insulation: ASTM C 552, Type I.
 - 3. Special-Shaped Insulation: ASTM C 552, Type III.
 - 4. Board Insulation: ASTM C 552, Type IV.
 - 5. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
 - 6. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
 - 7. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Aeroflex USA.
 - b. Armacell LLC.
 - c. K-Flex USA.
 - d. Or Prior Approved Equal
- H. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type II with factory-applied vinyl jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation; Saint-Gobain North America.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Knauf Insulation.
 - d. Manson Insulation Inc.
 - e. Owens Corning.
 - f. Or Prior Approved Equal
- I. Mineral-Fiber, Preformed Pipe Insulation:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Johns Manville; a Berkshire Hathaway company.
 - b. Knauf Insulation.
 - c. Manson Insulation Inc.
 - d. Owens Corning.
 - e. Or Prior Approved Equal.
2. Type I, **850 deg F (454 deg C)** Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
- J. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is **2.5 lb/cu. ft. (40 kg/cu. m)** or more. Thermal conductivity (k-value) at **100 deg F (55 deg C)** is **0.29 Btu x in./h x sq. ft. x deg F (0.042 W/m x K)** or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. CertainTeed Corporation; Saint-Gobain North America.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. Knauf Insulation.
 - d. Manson Insulation Inc.
 - e. Owens Corning.
 - f. Or Prior Approved Equal.
- 2.2 INSULATING CEMENTS
- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
1. 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:
 - a. Ramco Insulation, Inc
 - b. Rutland.
 - c. Or Prior Approved Equal
- B. Expanded or Exfoliated Vermiculite Insulating Cement: Comply with ASTM C 196.
1. 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:
 - a. Ramco Insulation, Inc.
 - b. Rutland
 - c. Or Prior Approved Equal
- C. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. 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:

- a. Ramco Insulation, Inc.
- b. Rutland
- c. Or Prior Approved Equal

2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

- B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Aeroflex USA.
- b. Armacell LLC.
- c. K-Flex USA.
- d. Or Prior Approved Equal

2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Childers Brand; H. B. Fuller Construction Products.
- b. Foster Brand; H. B. Fuller Construction Products.
- c. Mon-Eco Industries, Inc.
- d. Or Prior Approved Equal

2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

- D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Childers Brand; H. B. Fuller Construction Products.
 - b. Foster Brand; H. B. Fuller Construction Products.
 - c. Mon-Eco Industries, Inc.
 - d. Or Prior Approved Equal
 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 - E. PVC Jacket Adhesive: Compatible with PVC jacket.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville; a Berkshire Hathaway company.
 - b. The Dow Chemical Company.
 - c. Voltek; a division of Sekisui America Corp.
 - d. Or Prior Approved Equal
 2. For indoor applications, adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- 2.4 MASTICS
- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - b. Foster Brand; H. B. Fuller Construction Products.
 - c. Knauf Insulation.
 - d. Mon-Eco Industries, Inc.
 - e. Vimasco Corporation.
 - f. Or Prior Approved Equal
 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - b. Foster Brand; H. B. Fuller Construction Products.
 - c. Or Prior Approved Equal
2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.033 metric perm) at 30-mil (0.8-mm) dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F (Minus 46 to plus 104 deg C).
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

2.5 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass, Phenolic, and Polyisocyanurate Products: Subject to compliance with requirements, provide one of the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - b. Foster Brand; H. B. Fuller Construction Products.
 - c. Mon-Eco Industries, Inc.
 - d. Owens Corning.
 - e. Or Prior Approved Equal
3. Joint Sealants for Polystyrene Products: Subject to compliance with requirements, provide one of the following:
4. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - b. Foster Brand; H. B. Fuller Construction Products.
 - c. Eagle Bridges - Marathon Industries.
 - d. Or Prior Approved Equal
5. Materials shall be compatible with insulation materials, jackets, and substrates.
6. Permanently flexible, elastomeric sealant.
7. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
8. Color: White or gray.

B. FSK and Metal Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Childers Brand; H. B. Fuller Construction Products.
- b. Foster Brand; H. B. Fuller Construction Products.
- c. Mon-Eco Industries, Inc.
- d. Or Prior Approved Equal
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: **Minus 40 to plus 250 deg F** (Minus 40 to plus 121 deg C).
5. Color: Aluminum.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Childers Brand; H. B. Fuller Construction Products.
 - b. Foster Brand; H. B. Fuller Construction Products.
 - c. Or Prior Approved Equal
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: **Minus 40 to plus 250 deg F** (Minus 40 to plus 121 deg C).
5. Color: White.
6. For indoor applications, sealants shall have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Sealants shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.6 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
 4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
 5. PVDC Jacket for Indoor Applications: **4-mil-** (0.10-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at **0.02 perm** (0.013 metric perm) when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

- 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) ITW Insulation Systems; Illinois Tool Works, Inc.
 - 2) Johns Manville; a Berkshire Hathaway company.
 - 3) Or Prior Approved Equal
6. PVDC Jacket for Outdoor Applications: 6-mil- (0.15-mm-) thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perm (0.007 metric perm) when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.
 - 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) ITW Insulation Systems; Illinois Tool Works, Inc.
 - 2) Johns Manville; a Berkshire Hathaway company.
7. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.
 - 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) ITW Insulation Systems; Illinois Tool Works, Inc.
 - 2) Johns Manville; a Berkshire Hathaway company.
 - 3) Or Prior Approved Equal
8. Vinyl Jacket: White vinyl with a permeance of 1.3 perms (0.86 metric perms) when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.7 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
- C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Airex Manufacturing.
 - b. Johns Manville; a Berkshire Hathaway company.
 - c. P.I.C. Plastics, Inc.
 - d. Proto Corporation.
 - e. Speedline Corporation.

- f. Or Prior Approved Equal
- 2. Adhesive: As recommended by jacket material manufacturer.
- 3. Color: White
- 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

D. Metal Jacket:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville; a Berkshire Hathaway company.
 - b. RPR Products, Inc.
 - c. Or Prior Approved Equal
- 2. Aluminum Jacket: Comply with **ASTM B 209 (ASTM B 209M)**, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
 - a. Sheet and roll stock ready for shop or field sizing
 - b. Finish and thickness are indicated in field-applied jacket schedules.
 - c. Moisture Barrier for Indoor Applications: **1-mil-** (0.025-mm-) thick, heat-bonded polyethylene and kraft paper
 - d. Moisture Barrier for Outdoor Applications: **3-mil-** (0.075-mm-) thick, heat-bonded polyethylene and kraft paper
 - e. Factory-Fabricated Fitting Covers:
 - 1) Same material, finish, and thickness as jacket.
 - 2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - 3) Tee covers.
 - 4) Flange and union covers.
 - 5) End caps.
 - 6) Beveled collars.
 - 7) Valve covers.
 - 8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.8 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Industrial Adhesives and Tapes Division.
 - b. Avery Dennison Corporation, Specialty Tapes Division.
 - c. Ideal Tape Co., Inc., an American Biltrite Company.
 - d. Knauf Insulation.

- e. Or Prior Approved Equal
 2. Width: **3 inches** (75 mm).
 3. Thickness: **11.5 mils** (0.29 mm).
 4. Adhesion: **90 ounces force/inch** (1.0 N/mm) in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: **40 lbf/inch** (7.2 N/mm) in width.
 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Industrial Adhesives and Tapes Division.
 - b. Avery Dennison Corporation, Specialty Tapes Division.
 - c. Ideal Tape Co., Inc., an American Biltrite Company.
 - d. Knauf Insulation.
 - e. Or Prior Approved Equal
 2. Width: **3 inches** (75 mm).
 3. Thickness: **6.5 mils** (0.16 mm).
 4. Adhesion: **90 ounces force/inch** (1.0 N/mm) in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: **40 lbf/inch** (7.2 N/mm) in width.
 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.
- C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Industrial Adhesives and Tapes Division.
 - b. Ideal Tape Co., Inc., an American Biltrite Company.
 - c. Or Prior Approved Equal
 2. Width: **2 inches** (50 mm).
 3. Thickness: **6 mils** (0.15 mm).
 4. Adhesion: **64 ounces force/inch** (0.7 N/mm) in width.
 5. Elongation: 500 percent.
 6. Tensile Strength: **18 lbf/inch** (3.3 N/mm) in width.
- D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. 3M Industrial Adhesives and Tapes Division.
 - b. Avery Dennison Corporation, Specialty Tapes Division.
 - c. Ideal Tape Co., Inc., an American Biltrite Company.
 - d. Knauf Insulation.
 - e. Or Prior Approved Equal
 2. Width: **2 inches** (50 mm).

3. Thickness: 3.7 mils (0.093 mm).
4. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

E. PVDC Tape for Indoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

1. 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:
 - a. Johns Manville; a Berkshire Hathaway company.
 - b. ITW Insulation Systems; Illinois Tool Works, Inc.
 - c. Or Prior Approved Equal
2. Width: 3 inches (75 mm).
3. Film Thickness: 4 mils (0.10 mm).
4. Adhesive Thickness: 1.5 mils (0.04 mm).
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 lbf/inch (10.1 N/mm) in width.

2.9 SECUREMENTS

A. Bands:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville; a Berkshire Hathaway company.
 - b. RPR Products, Inc.
 - c. Or Prior Approved Equal
2. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 3/4 inch (19 mm) wide with closed seal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
1. Verify that systems to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils (0.127 mm) thick and an epoxy finish 5 mils (0.127 mm) thick if operating in a temperature range between 140 and 300 deg F (60 and 149 deg C). Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F (0 and 149 deg C) with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
1. Draw jacket tight and smooth.
 2. Cover circumferential joints with **3-inch- (75-mm-)** wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced **4 inches (100 mm)** o.c.
 3. Overlap jacket longitudinal seams at least **1-1/2 inches (38 mm)**. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at [**2 inches (50 mm)**] [**4 inches (100 mm)**] o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least **4 inches (100 mm)** beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
 2. Testing agency labels and stamps.
 3. Nameplates and data plates.
 4. Manholes.
 5. Handholes.
 6. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least **2 inches (50 mm)** below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least **2 inches (50 mm)**.
 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.
- F. Insulation Installation at Floor Penetrations:
1. Pipe: Install insulation continuously through floor penetrations.
 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular

- surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached

insulation, to flanges with tie wire. Extend insulation at least **2 inches (50 mm)** over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at **6 inches (150 mm)** o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least **1 inch (25 mm)**, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
 - 1. Install pipe insulation to outer diameter of pipe flange.
 - 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 - 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
 - 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
 - 1. Install mitered sections of pipe insulation.
 - 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- D. Insulation Installation on Valves and Pipe Specialties:
 - 1. Install preformed valve covers manufactured of same material as pipe insulation when available.
 - 2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
 - 3. Install insulation to flanges as specified for flange insulation application.
 - 4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 INSTALLATION OF MINERAL-FIBER INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
 - 1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 - 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 - 3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches (150 mm) o.c.
 - 4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
 - 1. Install preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least **1 inch (25 mm)**, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.9 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with **2-inch (50-mm)** overlap at seams and joints.
2. Embed glass cloth between two **0.062-inch- (1.6-mm-)** thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with **1-1/2-inch (38-mm)** laps at longitudinal seams and **3-inch- (75-mm-)** wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with **1-inch (25-mm)** overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

- D. Where metal jackets are indicated, install with **2-inch (50-mm)** overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands **12 inches (300 mm)** o.c. and at end joints.
- E. Where PVDC jackets are indicated, install as follows:
 - 1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
 - 2. Wrap factory-presize jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presize jacket with an approximate overlap at butt joint of **2 inches (50 mm)** over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
 - 3. Continuous jacket can be spiral-wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
 - 4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of **33-1/2 inches (850 mm)** or less. The **33-1/2-inch- (850-mm-)** circumference limit allows for **2-inch- (50-mm-)** overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
 - 5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

3.10 FINISHES

- A. Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
 - 1. Flat Acrylic Finish: **[Two] <Insert number>** finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.12 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.13 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 Deg F (16 Deg C):

1. All Pipe Sizes: Insulation shall be the following:
 - a. Flexible Elastomeric: 3/4 inch (19 mm) thick.

B. Chilled Water and Brine, above 40 Deg F (5 Deg C):

1. NPS 12 (DN 300) and Smaller: Insulation shall be the following:
 - a. Cellular Glass: 2 inches (50 mm) thick.

C. Heating-Hot-Water Supply and Return, 200 Deg F (93 Deg C) and Below:

1. NPS 12 (DN 300) and Smaller: Insulation shall be the following:
 - a. Mineral-Fiber, Preformed Pipe, Type I: 2 inches (50 mm) thick.

3.14 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Chilled Water and Brine:

1. All Pipe Sizes: Insulation shall be the following:

a. Cellular Glass: 2 inches (75 mm) thick.

B. Heating-Hot-Water Supply and Return:

1. NPS 12 (DN 300) and Smaller: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe, Type I: 2 inches (50 mm) thick.

3.15 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. None.

D. Chilled and Hot Water Piping, Exposed:

1. PVC: 20 mils (0.5 mm) thick.

3.16 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. Aluminum, Smooth: 0.020 inch (0.51 mm) thick.

D. Chilled and Hot Water Piping, Exposed:

1. Aluminum, Smooth with Z-Shaped Locking Seam: 0.032 inch (0.81 mm) thick.

END OF SECTION 230719

SECTION 23 21 13 – HYDRONIC PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes pipe and fitting materials and joining methods for the following:

1. Chilled-water piping.
2. Hot-water piping.
3. Air-vent piping.
4. Safety-valve-inlet and -outlet piping.

1.2 ACTION SUBMITTALS

- A. Delegated-Design Submittal:

1. Design calculations and detailed fabrication and assembly of pipe anchors and alignment guides, hangers and supports for multiple pipes, expansion joints and loops, and attachments of the same to the building structure.
2. Locations of pipe anchors and alignment guides and expansion joints and loops.
3. Locations of and details for penetrations, including sleeves and sleeve seals for exterior walls, floors, basement, and foundation walls.
4. Locations of and details for penetration and firestopping for fire- and smoke-rated wall and floor and ceiling assemblies.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:

1. Chilled-Water Piping: 150 psig at 200 deg F.

2. Hot-Water Heating Piping: 150 psig at 200 deg F.
3. Air-Vent Piping: 200 deg F.
4. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

2.2 STEEL PIPE AND FITTINGS

- A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; welded and seamless, Grade B, and wall thickness as indicated in "Piping Applications" Article.
- B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in "Piping Applications" Article.
- C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in "Piping Applications" Article.
- D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in "Piping Applications" Article.
- E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in "Piping Applications" Article.
- F. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:
 1. Material Group: 1.1.
 2. End Connections: Butt welding.
 3. Facings: Raised face.

2.3 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.
- B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.
- C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- D. Solvent Cements for Joining Plastic Piping:
 1. CPVC Piping: ASTM F 493.
 - a. CPVC solvent cement shall have a VOC content of 490 g/L or less.

- b. Adhesive primer shall have a VOC content of 550 g/L or less.
 - c. Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- 2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
 - a. PVC solvent cement shall have a VOC content of 510 g/L or less.
 - b. Adhesive primer shall have a VOC content of 550 g/L or less.
 - c. Solvent cement and adhesive primer shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- E. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.4 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
 - 1. 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:
 - a. WATTS; A Watts Water Technologies Company.
 - b. Wilkins.
 - c. Zurn Industries, LLC.
 - d. Or Prior Approved Equal
 - 2. Description:
 - a. Standard: ASSE 1079.
 - b. Pressure Rating: 150 psig.
 - c. End Connections: Solder-joint copper alloy and threaded ferrous.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Chilled-water piping, aboveground, NPS 2 and smaller shall be any of the following:

1. Schedule 40 steel pipe; Class 150, malleable-iron fittings; cast-iron flanges and flange fittings; and threaded joints.
- B. Chilled-water piping, aboveground, NPS 2-1/2 and larger, shall be any of the following:
 1. Schedule 40 steel pipe; grooved, mechanical joint coupling and fittings; and grooved, mechanical joints.
- C. Hot-water heating piping, aboveground, NPS 2 and smaller, shall be the following:
 1. Schedule 40, Grade B, Type 96 steel pipe; Class 150, malleable-iron fittings; cast-iron flanges and flange fittings; and threaded joints.
- D. Hot-water heating piping, aboveground, NPS 2-1/2 and larger, shall be the following:
 1. Schedule 40 steel pipe; welded, mechanical joint coupling and fittings; and grooved, mechanical joints.
- E. Blowdown-Drain Piping: Same materials and joining methods as for piping specified for the service in which blowdown drain is installed.
- F. Air-Vent Piping:
 1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.
 2. Outlet: Type K, annealed-temper copper tubing with soldered or flared joints.
- G. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to piping manufacturer's written instructions.

3.2 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- 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 above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.

- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- L. Install drains, consisting of a tee fitting, NPS 3/4 ball valve, and short NPS 3/4 threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.
- M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.
- N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- O. Install branch connections to mains using **[mechanically formed]**tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.
- P. Install valves according to Section 230523.11 "Globe Valves for HVAC Piping," Section 230523.12 "Ball Valves for HVAC Piping," Section 230523.13 "Butterfly Valves for HVAC Piping," Section 230523.14 "Check Valves for HVAC Piping," and Section 230523.15 "Gate Valves for HVAC Piping."
- Q. Install unions in piping, **[NPS 2]** and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.
- R. Install flanges in piping, **[NPS 2-1/2]** and larger, at final connections of equipment and elsewhere as indicated.
- S. Install shutoff valve immediately upstream of each dielectric fitting.
- T. Comply with requirements in Section 230516 "Expansion Fittings and Loops for HVAC Piping" for installation of expansion loops, expansion joints, anchors, and pipe alignment guides.
- U. Comply with requirements in Section 230553 "Identification for HVAC Piping and Equipment" for identifying piping.
- V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 230517 "Sleeves and Sleeve Seals for HVAC Piping."
- X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 230518 "Escutcheons for HVAC Piping."

3.3 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

3.4 HANGERS AND SUPPORTS

- A. Comply with requirements in Section 230529 "Hangers and Supports for HVAC Piping and Equipment" for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
 - 2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
 - 4. Spring hangers to support vertical runs.
 - 5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
 - 6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.
- C. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 3/4: Maximum span, 7 feet.
 - 2. NPS 1: Maximum span, 7 feet.
 - 3. NPS 1-1/2: Maximum span, 9 feet.
 - 4. NPS 2: Maximum span, 10 feet.
 - 5. NPS 2-1/2: Maximum span, 11 feet.
 - 6. NPS 3 and Larger: Maximum span, 12 feet.
- D. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:
 - 1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
 - 2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
 - 3. NPS 1-1/4: Maximum span, 7 feet; minimum rod size, 3/8 inch.
 - 4. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 - 5. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 - 6. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
 - 7. NPS 3 and Larger: Maximum span, 10 feet; minimum rod size, 3/8 inch.
- E. Plastic Piping Hanger Spacing: Space hangers according to pipe manufacturer's written instructions for service conditions. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points.

- F. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. 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 complying with ASTM B 32.
- D. 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/A5.8M.
- E. 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.
- F. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.6 TERMINAL EQUIPMENT CONNECTIONS

- A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.
- B. Install control valves in accessible locations close to connected equipment.
- C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.
- D. Install ports for pressure gages and thermometers at coil inlet and outlet connections. Comply with requirements in Section 230519 "Meters and Gages for HVAC Piping."

3.7 FIELD QUALITY CONTROL

- A. Prepare hydronic piping according to ASME B31.9 and as follows:
 - 1. Leave joints, including welds, uninsulated and exposed for examination during test.
 - 2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.

3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
 4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
 5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.
- B. Perform the following tests on hydronic piping:
1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
 2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
 3. Isolate expansion tanks and determine that hydronic system is full of water.
 4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times the "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
 5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
 6. Prepare written report of testing.
- C. Perform the following before operating the system:
1. Open manual valves fully.
 2. Inspect pumps for proper rotation.
 3. Set makeup pressure-reducing valves for required system pressure.
 4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
 5. Set temperature controls so all coils are calling for full flow.
 6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
 7. Verify lubrication of motors and bearings.

END OF SECTION 23 21 13

Section 23 21 13.13 – Underground Hydronic Piping

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. Cased piping system.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing hydronic piping systems with the following minimum working-pressure ratings:
 - 1. Hot-Water Piping: 150 psig (1035 kPa) at 200 deg F (93 deg C).
 - 2. Chilled-Water Piping: 150 psig (1035 kPa) at 200 deg F (93 deg C).

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Conduit piping.
 - 2. Cased piping.
 - 3. Loose-fill insulation.
- B. Shop Drawings: For underground hydronic piping. Signed and sealed by a professional engineer.
 - 1. Calculate requirements for expansion compensation for underground piping.
 - 2. Show expansion compensators, offsets, and loops with appropriate materials to allow piping movement in the required locations. Show anchors and guides that restrain piping movement with calculated loads, and show concrete thrust block dimensions.
 - 3. Show pipe sizes, locations, and elevations. Show piping in trench, conduit, and cased pipe with details showing clearances between piping, and show insulation thickness.

1.5 INFORMATIONAL SUBMITTALS

- A. Profile Drawings: Show system piping in elevation. Draw profiles at horizontal scale of not less than 1 inch equals 50 feet (1:500) and at vertical scale of not less than 1 inch equals 5 feet (1:50). Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing hydronic piping.

- B. Qualification Data: For qualified Installer.
- C. Welding certificates.
- D. Material Test Reports: For cased piping.
- E. Source quality-control reports.
- F. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Fiberglass Pipe and Fitting Installers: Installers of RTRF and RTRP shall be certified by manufacturer of pipes and fittings as having been trained and qualified to join fiberglass piping with manufacturer-recommended adhesive.
- B. Welding Qualifications: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.
 - 1. Comply with provisions in ASME B31.9, "Building Services Piping."
 - 2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
- C. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

PART 2 - PRODUCTS

2.1 CASED PIPING SYSTEM

- A. Description: Factory-fabricated piping with carrier pipe, insulation, and casing.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Insul-Tek Piping Systems, Inc.
 - b. Perma-Pipe, Inc.
 - c. Thermacor Process, L.P.
- B. Carrier Pipe: Schedule 40 Steel pipe and fittings.
- C. Carrier Pipe Insulation:
 - 1. Polyurethane Foam Pipe Insulation: Rigid, cellular, high-pressure injected between carrier pipe and jacket.
 - a. Comply with ASTM C 591; thermal conductivity (k-value) shall not exceed 0.14 Btu x in./h x sq. ft. x deg F (0.020 W/m x K) at 75 deg F (24 deg C) after 180 days of aging.

- D. Casing: HDPE.
- E. Casing accessories include the following:
 - 1. Joint Kit: Half-shell, pourable or split insulation, casing sleeve, and shrink-wrap sleeve.
 - 2. Expansion Blanket: Elastomeric foam, formed to fit over piping.
 - 3. End Seals: Shrink wrap the casing material to seal watertight around casing and carrier pipe.
- F. Manholes: Black steel with lifting eyes.
 - 1. Finish: Spray-applied urethane, minimum 30 mils (0.75 mm) thick.
 - 2. Access: 30-inch- (750-mm-) diameter waterproof cover with gasket, ladder, and two 6-inch (150-mm) vents, one high and one low, extending above grade with rain caps.
 - 3. Conduit Stub-Outs and Seals: Welded steel with drain and vent openings.
 - 4. Sump: 12 inches (300 mm) in diameter, 12 inches (300 mm) deep.
 - 5. Floatation Anchor: Oversized bottom keyed into concrete base.
- G. Source Quality Control: Factory test the carrier pipe to 150 percent of the operating pressure of system. Furnish test certificates.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. See Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATION

- A. Hot-Water Heating Piping:
 - 1. Cased piping with polyurethane carrier-pipe insulation.
 - a. Piping Insulation Thickness: 1 inch (25 mm).
- B. Chilled-Water Piping:
 - 1. Cased piping with polyurethane carrier-pipe insulation.
 - a. Piping Insulation Thickness: 1 inch (25 mm).

3.3 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such 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 Coordination Drawings.
- B. Remove standing water in the bottom of trench.

- C. Do not backfill piping trench until field quality-control testing has been completed and results approved.
- D. Install piping at uniform grade of 0.2 percent. Install drains, consisting of a tee fitting, **NPS 3/4 (DN 20)** ball valve, and short **NPS 3/4 (DN 20)** threaded nipple with cap, at low points and elsewhere as required for system drainage. Install manual air vents at high points.
- E. In conduits, install drain valves at low points and manual air vents at high points.
- F. Install components with pressure rating equal to or greater than system operating pressure.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. See Section 230517 "Sleeves and Sleeve Seals for HVAC Piping" for sleeves and mechanical sleeve seals through exterior building walls.
- J. Secure anchors with concrete thrust blocks. Concrete is specified in Section 033000 "Cast-in-Place Concrete."
- K. See Section 264200 "Cathodic Protection" for cathodic devices and connections to piping and conduit systems.

3.4 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. Conduit and Cased Piping Joints: Assemble sections and finish joints with pourable or split insulation and exterior jacket sleeve, and apply shrink-wrap seals.

3.5 IDENTIFICATION

- A. Install continuous plastic underground warning tapes during back filling of trenches for underground hydronic piping. Locate tapes **6 to 8 inches (150 to 200 mm)** below finished grade, directly over piping. See Section 312000 "Earth Moving" for warning-tape materials and devices and their installation.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Prepare hydronic piping for testing according to ASME B31.9 and as follows:
 - a. Leave joints, including welds, uninsulated and exposed for examination during test.
 - b. Fill system with water. Where there is risk of freezing, air or a safe, compatible liquid may be used.
 - c. Use vents installed at high points to release trapped air while filling system.
2. Test hydronic piping as follows:
 - a. Subject hydronic piping to hydrostatic test pressure that is not less than 1.5 times the design pressure.
 - b. After hydrostatic test pressure has been applied for 10 minutes, examine joints for leakage. Remake leaking joints using new materials and repeat hydrostatic test until no leaks exist.
3. Test conduit as follows:
 - a. Seal vents and drains and subject conduit to 15 psig (105 kPa) for four hours with no loss of pressure. Repair leaks and retest as required.

E. Prepare test and inspection reports.

END OF SECTION 23 21 13.13

SECTION 23 21 14 – HVAC CONDENSATE PIPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes pipe and fitting materials and joining methods for the following:
 - 1. Condensate-drain piping.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of the following:
 - 1. Copper Tube.
- B. Delegated-Design Submittal:
 - 1. Design calculations and detailed fabrication and assembly of pipe anchors and alignment guides, hangers and supports for multiple pipes, expansion joints and loops, and attachments of the same to the building structure.
 - 2. Locations of pipe anchors and alignment guides and expansion joints and loops.
 - 3. Locations of and details for penetrations, including sleeves and sleeve seals for exterior walls, floors, basement, and foundation walls.
 - 4. Locations of and details for penetration and firestopping for fire- and smoke-rated wall and floor and ceiling assemblies.

1.3 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature unless otherwise indicated:
 - 1. Condensate-Drain Piping: 140 deg F.

2.2 COPPER TUBE AND FITTINGS

- A. DWV Copper Tubing: ASTM B 306, Type DWV.

2.3 JOINING MATERIALS

- A. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- B. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.
- C. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.4 TRANSITION FITTINGS

- A. Plastic-to-Metal Transition Fittings:
 - 1. One-piece fitting with one threaded brass or copper insert and one solvent-cement-joint end of material and wall thickness to match plastic pipe material.
- B. Plastic-to-Metal Transition Unions:
 - 1. Brass or copper end, solvent-cement-joint end of material and wall thickness to match plastic pipe material, rubber gasket, and threaded union.

2.5 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Condensate-Drain Piping: Type DWV, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

3.2 PIPING INSTALLATIONS

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

- 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 above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Select system components with pressure rating equal to or greater than system operating pressure.
- K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.
- L. Reduce pipe sizes using eccentric reducer fitting installed with level side up.
- M. Install shutoff valve immediately upstream of each dielectric fitting.
- N. Comply with requirements specified for identifying piping.

3.3 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples.
- C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric nipples.

3.4 HANGERS AND SUPPORTS

- A. Comply with requirements specified for hanger, support, and anchor devices. Comply with the following requirements for maximum spacing of supports.
- B. Install the following pipe attachments:
 - 1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet long.
 - 2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet or longer.
 - 3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet or longer, supported on a trapeze.
 - 4. Spring hangers to support vertical runs.

5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
- C. Install hangers for copper piping with the following maximum spacing and minimum rod sizes:
 1. NPS 3/4: Maximum span, 5 feet; minimum rod size, 1/4 inch.
 2. NPS 1: Maximum span, 6 feet; minimum rod size, 1/4 inch.
 3. NPS 1-1/4: Maximum span, 7 feet; minimum rod size, 3/8 inch.
 4. NPS 1-1/2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 5. NPS 2: Maximum span, 8 feet; minimum rod size, 3/8 inch.
 6. NPS 2-1/2: Maximum span, 9 feet; minimum rod size, 3/8 inch.
 7. NPS 3 and Larger: Maximum span, 10 feet; minimum rod size, 3/8 inch.
- D. Support vertical runs at roof, at each floor, and at 10-foot intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- C. 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 complying with ASTM B 32.
- D. 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/A5.8M.
- E. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tool and procedure, and brazed joints.

END OF SECTION 23 21 14

SECTION 23 31 13 – METAL DUCTS

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. Single-wall rectangular ducts and fittings.
 - 2. Single-wall round ducts and fittings.
 - 3. Sheet metal materials.
 - 4. Sealants and gaskets.
 - 5. Hangers and supports.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of the following products:
 - 1. Adhesives.
 - 2. Sealants and gaskets.

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
 - 2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction

methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Duct Galvanized Coating Designation: G90.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Galvanized sheet metal for rectangular and round ductwork shall have a minimum gauge of 26.

2.4 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
 - 1. Manufacturers shall be as follows:
 - a. Certaineed
 - b. Owens Corning
 - c. Johns Manville
 - d. Knauf
 - 2. Maximum Thermal Conductivity:
 - a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 - 3. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
 - 4. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
 - a. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Insulation Pins and Washers:
 - 1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch-diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
 - 2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
- C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 7-11, "Flexible Duct Liner Installation."
 - 1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.

2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
 - a. Fan discharges.
 - b. Intervals of lined duct preceding unlined duct.
 - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
 - a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.
10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.5 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
 1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
 2. Tape Width: 4 inches.
 3. Sealant: Modified styrene acrylic.
 4. Water resistant.
 5. Mold and mildew resistant.
 6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 7. Service: Indoor and outdoor.
 8. Service Temperature: Minus 40 to plus 200 deg F.
 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
 10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

11. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

E. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

G. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.6 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 - 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
 - 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements as specified for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

3.2 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article."
- B. If ducts are not listed in the "Duct Schedule" Article then seal unlisted ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Ducts:
 - a. Pressure Class: Positive 2-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 6.
 - d. SMACNA Leakage Class for Round and Flat Oval: 3.

3.3 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 CONNECTIONS

- A. Make connections to equipment with flexible connectors.
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
 - 1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
 - 2. Test the following systems:
 - a. Ducts with a Pressure Class Higher Than **3-Inch wg**:
 - 1) Test representative duct sections totaling no less than **25 percent** of total installed duct area for each designated pressure class.
 - b. Exhaust Ducts with a Pressure Class of **2-Inch wg or Higher**:
 - 1) Test representative duct sections totaling no less than **50 percent** of total installed duct area for each designated pressure class.
 - c. Outdoor Air Ducts with a Pressure Class of **2-Inch wg or Higher**:
 - 1) Test representative duct sections totaling no less than **50 percent** of total installed duct area for each designated pressure class.
 - 3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
 - 4. Test for leaks before applying external insulation.
 - 5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
 - 6. Give seven days' advance notice for testing.
- C. Duct System Cleanliness Tests:
 - 1. Visually inspect duct system to ensure that no visible contaminants are present.

2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
 - a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

- D. Duct system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.7 DUCT CLEANING

- A. Clean new and existing duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
 1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer.
 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:
 1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
 2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.
- D. Clean the following components by removing surface contaminants and deposits:
 1. Air outlets and inlets (registers, grilles, and diffusers).
 2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
 3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
 4. Coils and related components.
 5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
 6. Supply-air ducts, dampers, actuators, and turning vanes.
 7. Dedicated exhaust and ventilation components and makeup air systems.
- E. Mechanical Cleaning Methodology:
 1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.

2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.8 START UP

- A. Air Balance: Comply with requirements as specified.

3.9 DUCT SCHEDULE

- A. Supply Ducts:
 1. Ducts Connected to Constant-Volume Units, VRF Outside Air Units and RTUs:
 - a. Pressure Class: Positive 2-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 6.
 - d. SMACNA Leakage Class for Round and Flat Oval: 3.
- B. Return Ducts:
 1. Ducts Connected to Constant-Volume Units, VRF Outside Air Units and RTUs:
 - a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 6.
 - d. SMACNA Leakage Class for Round and Flat Oval: 3.
- C. Exhaust Ducts:
 1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
 - a. Pressure Class: Negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: A if negative pressure, and A if positive pressure.
 - c. SMACNA Leakage Class for Rectangular: 12.
 - d. SMACNA Leakage Class for Round and Flat Oval: 6.
- D. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:
 1. Ducts Connected to Constant-Volume Units, VRF Outside Air Units:
 - a. Pressure Class: Positive or negative 2-inch wg.
 - b. Minimum SMACNA Seal Class: A.
 - c. SMACNA Leakage Class for Rectangular: 6.
 - d. SMACNA Leakage Class for Round and Flat Oval: 3.

- E. Duct Liner (Thickness):
1. Supply Diffuser Plenums: Fibrous glass, Type I, 1 inch thick.
 2. Return Grille Plenums: Fibrous glass, Type I, 1 inch thick.
 3. Transfer Ducts: Fibrous glass, Type I, 1 inch thick.

END OF SECTION 23 31 13

SECTION 23 33 00 – AIR DUCT 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. Manual volume dampers.
 - 2. Spin Collars.
 - 3. Fire dampers.
 - 4. Turning vanes.
 - 5. Duct-mounted access doors.
 - 6. Duct Access Panel Assemblies.
 - 7. Flexible connectors.
 - 8. Flexible ducts.
 - 9. Duct accessory hardware.
 - 10. Intake/Relief Hoods, roof mounted.

1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G90.
 - 2. Exposed-Surface Finish: Mill phosphatized.

- B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 MANUAL VOLUME DAMPERS

- A. Low-Leakage, Steel, Manual Volume Dampers:
 - 1. Manufacturers:
 - a. Greenheck.
 - b. Dace Mfg.
 - c. Nailor Industries Inc.
 - d. Pottorff.
 - e. Ruskin Company.
 - 2. Comply with AMCA 500-D testing for damper rating.
 - 3. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
 - 4. Suitable for horizontal or vertical applications.
 - 5. Frames:
 - a. Hat Channel shaped.
 - b. 0.031-inch- thick, galvanized sheet steel.
 - c. Mitered and welded corners.
 - d. Flanges for attaching to walls and flangeless frames for installing in ducts.
 - 6. Blades:
 - a. Multiple blade.
 - b. Opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized, roll-formed steel, 0.031 inch thick.
 - 7. Blade Axles: Galvanized steel.
 - 8. Bearings:
 - a. Molded synthetic.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 - 9. Blade Seals: Neoprene.
 - 10. Jamb Seals: Stainless Steel.
 - 11. Tie Bars and Brackets: Galvanized steel.
 - 12. Accessories:
 - a. Include locking device to hold single-blade dampers in a fixed position without vibration.
- B. Jackshaft:
 - 1. Size: 0.5-inch diameter.
 - 2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
 - 3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.
- C. Damper Hardware:
 - 1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
 - 2. Include center hole to suit damper operating-rod size.

3. Include elevated platform for insulated duct mounting.

2.4 SPIN COLLARS

- A. All round take-offs to round branch duct shall be made with factory fabricated spin-type collar fittings with balancing damper and constructed of minimum 26 ga galvanized steel. The damper shall have a raised 2" handle with a high quality locking quadrant. A 3/8" continuous rod with "U" bolts connects the damper to the rod. Nylon end bearing are required where the rod penetrates the spin collar barrel. These spin-collars shall be as manufactured by Flexmaster Model FLD-B03, Dace #26ga MSD-C03 or approved equal.

2.5 FIRE DAMPERS

- A. The contractor shall furnish and install UL555 rated 1-1/2 hour fire dampers at the locations indicated on the drawings in new ducts and sound attenuators. The contractor shall provide dampers with sleeves and angle frames necessary to comply with the manufacturer's UL installation requirements. Dampers for vertical or horizontal air flow shall be provided as required.
- B. Manufacturers:
 1. Greenheck.
 2. Flex-Tek Group.
 3. Nailor Industries Inc.
 4. Pottorff.
 5. Ruskin Company.
- C. Fire damper shall be 100% free area and installed in wall and floor openings utilizing steel sleeves, angles, other materials and practice required to provide an installation equivalent to that utilized by the manufacturer when dampers are tested by UL555. Installation shall be in accordance with the damper manufacturer's instructions.
- D. Fire damper for rectangular ductwork and transfer openings shall be Ruskin type DIBD-B, Greenheck Model DFD-150-B (Basis of Design).
- E. Fire dampers for round ductwork shall be Ruskin Model DIBD-CR, Greenheck DFD-150-CR (Basis of Design).
- F. All fire dampers shall be installed per N.F.P.A. and U.L. requirements. Install U.L. approved sealant around the perimeter of the angle iron support at the sleeve and the wall in accordance with U. L. recommendations.
- G. All fire dampers shall meet the latest Class 1 leakage requirements.

2.6 CEILING RADIATION DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Nailor Industries Inc.
 2. Pottorff.

3. Ruskin Company.

- B. General Requirements:
 - 1. Labeled according to UL 555C by an NRTL.
 - 2. Comply with construction details for tested floor- and roof-ceiling assemblies as indicated in UL's "Fire Resistance Directory."
- C. Frame: Galvanized sheet steel, round or rectangular, style to suit ceiling construction.
- D. Blades: Galvanized sheet steel with refractory insulation.
- E. Heat-Responsive Device: Replaceable, 165 deg F (74 deg C) rated, fusible links.
- F. Fire Rating: 1 hours.

2.7 SMOKE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Greenheck Fan Corporation.
 - 2. Pottorff.
 - 3. Ruskin Company.
- B. Manufacturers offer additional features for engineered smoke control system dampers.
- C. <http://www.specagent.com/Lookup?ulid=3450> General Requirements: Label according to UL 555S by an NRTL.
- D. Smoke Detector: Integral, factory wired for single-point connection.
- E. Frame: Hat-shaped, 0.094-inch- (2.4-mm-) thick, galvanized sheet steel, with welded corners.
- F. Blades: Roll-formed, horizontal, interlocking, 0.063-inch- (1.6-mm) thick, galvanized sheet steel.
- G. Leakage: Class I.
- H. Rated pressure and velocity to exceed design airflow conditions.
- I. Mounting Sleeve: Factory-installed, 0.05-inch- (1.3-mm-) thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone calking.
- J. Damper Motors: two-position action.
- K. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 - 2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."

3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 150 in. x lbf (17 N x m).
5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F (minus 40 deg C).
6. Nonspring-Return Motors: For dampers larger than 25 sq. ft. (2.3 sq. m), size motor for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 300 in. x lbf (34 N x m).
7. Electrical Connection: 115 V, single phase, 60 Hz.

L. Accessories:

1. Auxiliary switches for signaling fan control or position indication.
2. Test and reset switches, damper mounted.

2.8 COMBINATION FIRE AND SMOKE DAMPERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Greenheck Fan Corporation.
 2. Pottorff.
 3. Ruskin Company.
- B. Type: Dynamic; rated and labeled according to UL 555 and UL 555S by an NRTL.
- C. Closing rating in ducts up to 4-inch wg (1-kPa) static pressure class and minimum 2000-fpm (10-m/s) velocity.
- D. Fire Rating: 1-1/2 and 3 hours.
- E. Frame: Hat-shaped, 0.094-inch- (2.4-mm-) thick, galvanized sheet steel, with welded interlocking, gusseted corners.
- F. Heat-Responsive Device: Resettable, 165 deg F (74 deg C) rated, fire-closure device.
- G. Heat-Responsive Device: Electric resettable device and switch package, factory installed, rated.
- H. Smoke Detector: Integral, factory wired for single-point connection.
- I. Blades: Roll-formed, horizontal, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized sheet steel.
- J. Leakage: Class I.
- K. Rated pressure and velocity to exceed design airflow conditions.

- L. Mounting Sleeve: Factory-installed, ~~0.05-inch-~~ (1.3-mm-) thick, galvanized sheet steel; length to suit wall or floor application with factory-furnished silicone calking.
- M. Master control panel for use in dynamic smoke-management systems.
- N. Damper Motors: two-position action.
- O. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 - 2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Section 230923 "Direct Digital Control (DDC) System for HVAC."
 - 3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
 - 4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of ~~150 in. x lbf~~ (17 N x m) and breakaway torque rating of ~~150 in. x lbf~~ (17 N x m).
 - 5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at ~~minus 40 deg F~~ (minus 40 deg C).
 - 6. Nonspring-Return Motors: For dampers larger than ~~25 sq. ft.~~ (2.3 sq. m), size motor for running torque rating of ~~150 in. x lbf~~ (17 N x m) and breakaway torque rating of ~~300 in. x lbf~~ (34 N x m).
 - 7. Electrical Connection: 115 V, single phase, 60 Hz.
- P. Accessories:
 - 1. Auxiliary switches for signaling fan control or position indication.
 - 2. Test and reset switches, damper mounted.

2.9 TURNING VANES

- A. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
 - 1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- B. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
- D. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.10 DUCT-MOUNTED ACCESS DOORS

- A. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."
 - 1. Door:
 - a. Double wall, rectangular.
 - b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - c. Vision panel.
 - d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
 - e. Fabricate doors airtight and suitable for duct pressure class.
 - 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 - 3. Number of Hinges and Locks:
 - a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
 - b. Access Doors up to 18 Inches Square: Continuous and two sash locks.
 - c. Access Doors up to 24 by 48 Inches: Continuous and two compression latches with outside and inside handles.
 - d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

2.11 DUCT ACCESS PANEL ASSEMBLIES

- A. Labeled according to UL 1978 by an NRTL.
- B. Panel and Frame: Minimum thickness 0.0528-inch carbon steel.
- C. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.
- D. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.
- E. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.12 FLEXIBLE CONNECTORS

- A. Materials: Flame-retardant or noncombustible fabrics.
- B. Coatings and Adhesives: Comply with UL 181, Class 1.
- C. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.
- D. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
 - 1. Minimum Weight: 26 oz./sq. yd.
 - 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 - 3. Service Temperature: Minus 40 to plus 200 deg F.

- E. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
 - 1. Minimum Weight: 24 oz./sq. yd..
 - 2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
 - 3. Service Temperature: Minus 50 to plus 250 deg F.
- F. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
 - 1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
 - 2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 - 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 - 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 - 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 - 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
 - 7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.13 FLEXIBLE DUCTS

- A. Manufacturers:
 - 1. Thermaflex Model M-KE
 - 2. Flexmaster 1M
- B. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.
 - 1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
 - 2. Maximum Air Velocity: 4000 fpm.
 - 3. Temperature Range: Minus 10 to plus 160 deg F.
 - 4. Insulation R-value: Comply with ASHRAE/IESNA 90.1. (R6)
- C. Flexible Duct Connectors:
 - 1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches, to suit duct size.
 - 2. Non-Clamp Connectors: Liquid adhesive plus tape.

2.14 DUCT ACCESSORY HARDWARE

- A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.
- B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

2.15 INTAKE/RELIEF HOODS (ROOF MOUNTED)

- A. Furnish and install intake hoods where indicated on Plans. Intake hood shall be Shipman Model SRV-1, Greenheck Model FGI/FGR, Acme Skymaster or prior approved equivalent.
- B. Each hood shall be of all extruded aluminum construction. Base and throat shall have continuous welded mitered corners. Hood and extrude structural members shall utilize stainless steel fasteners. Each hood shall have a full 360 degree perimeter opening for air flow. Hoods shall be designed to withstand 100 mph winds. Hoods shall be furnished with hinges to swing open for access to dampers. Each hood shall be furnished with mesh insect screens and factory fabricated roof curb.
- C. Intake hoods shall have a 2-to-1 ratio of hood perimeter opening to throat area to provide an inlet velocity at the hood opening not to exceed 650 feet per minute.
- D. Hood shall be provided with a minimum of a 14" high roof curb.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.
- D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 - 1. Install steel volume dampers in steel ducts.
 - 2. Install aluminum volume dampers in aluminum ducts.
- E. Set dampers to fully open position before testing, adjusting, and balancing.
- F. Install test holes at fan inlets and outlets and elsewhere as indicated.
- G. Install fire dampers according to UL listing.
- H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 - 1. Upstream from duct filters.
 - 2. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.

3. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
4. At each change in direction and at maximum 50-foot spacing.
5. Control devices requiring inspection.
6. Elsewhere as indicated.

I. Install access doors with swing against duct static pressure.

J. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

K. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

L. Install flexible connectors to connect ducts to equipment.

M. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

N. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.

O. Connect flexible ducts to metal ducts with draw bands.

P. Install duct test holes where required for testing and balancing purposes.

Q. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 23 33 00

SECTION 23 34 23 – HVAC POWER VENTILATORS

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. Centrifugal ceiling fans.
 - 2. Inline exhaust fans.
 - 3. Wall propeller fans.

1.3 PERFORMANCE REQUIREMENTS

- A. Operating Limits: Classify according to AMCA 99.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:
 - 1. Certified fan performance curves with system operating conditions indicated.
 - 2. Certified fan sound-power ratings.
 - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 - 4. Material thickness and finishes, including color charts.
 - 5. Dampers, including housings, linkages, and operators.
 - 6. Roof curbs.
 - 7. Fan speed controllers.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

- C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

1.7 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

PART 2 - PRODUCTS

2.1 CEILING MOUNTED FANS

- A. Manufacturers:
 - 1. Cook.
 - 2. Greenheck.
 - 3. ACME
 - 4. Pen-Barry
 - 5. Twin City
- B. All exhaust fans shall be equipped with bird screen, automatic back-draft dampers, solid state speed controller (direct drive) and integral disconnect switch unless noted otherwise. Fan motors shall be of the 40 deg C ambient temperature rise type and shall be suitable for continuous duty operation.
- C. Direct drive fans shall be complete with solid state speed control switch mounted on unit for balancing. Interlock with remote on/off switch.
- D. Housing: Steel, lined with acoustical insulation.
- E. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.
- F. Grille: White ceiling mounted metal grille. The grille shall be removable to provide service access to fan, motor, etc.
- G. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

2.2 INLINE EXHAUST FANS

- A. Manufacturers:
 - 1. Cook.
 - 2. Greenheck.
 - 3. ACME
 - 4. Pen-Barry
 - 5. Twin City

- B. All exhaust fans shall be equipped with bird screen, automatic back-draft dampers, solid state speed controller (direct drive) and integral disconnect switch unless noted otherwise. Fan motors shall be of the 40 deg C ambient temperature rise type and shall be suitable for continuous duty operation.
- C. Direct drive fans shall be complete with solid state speed control switch mounted on unit for balancing. Interlock with remote on/off switch.
- D. Housing: Steel.
- E. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service.
- F. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

2.3 WALL PROPELLER FANS

- A. Manufacturers:
 - 1. Cook.
 - 2. Greenheck.
 - 3. ACME
 - 4. Pen-Barry
 - 5. Twin City
- B. Installation of the fan shall include miscellaneous or structural metal supports, field electrical wiring, cable, conduit, fuses, disconnect switches, etc.
- C. Housing: Galvanized-steel sheet with flanged edges and integral orifice ring with baked-enamel finish coat applied after assembly.
- D. Steel Fan Wheels: Formed-steel blades riveted to heavy-gage steel spider bolted to cast-iron hub.
- E. Fan Wheel: Replaceable, aluminum, airfoil blades fastened to steel hub; factory set pitch angle of blades.
- F. Fan Drive: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.
- G. Fan Drive:
 - 1. Resiliently mounted to housing.
 - 2. Statically and dynamically balanced.
 - 3. Selected for continuous operation at maximum rated fan speed and motor horsepower, with final alignment and belt adjustment made after installation.
 - 4. Extend grease fitting to accessible location outside of unit.
 - 5. Service Factor Based on Fan Motor Size: 1.4.
 - 6. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
 - 7. Shaft Bearings: Permanently lubricated, permanently sealed, self-aligning ball bearings.
 - a. Ball-Bearing Rating Life: ABMA 9, L₁₀ of 100,000 hours.

8. Pulleys: Cast iron with split, tapered bushing; dynamically balanced at factory.
9. Motor Pulleys: Adjustable pitch for use with motors through 5 hp; fixed pitch for use with larger motors. Select pulley so pitch adjustment is at the middle of adjustment range at fan design conditions.
10. Belts: Oil resistant, nonsparking, and nonstatic; matched sets for multiple belt drives.
11. Belt Guards: Fabricate of steel for motors mounted on outside of fan cabinet.

H. Accessories:

1. Gravity Shutters: Aluminum blades in aluminum frame; interlocked blades with nylon bearings.
2. Motor-Side Back Guard: Galvanized steel, complying with OSHA specifications, removable for maintenance.
3. Wall Sleeve: Galvanized steel to match fan and accessory size.
4. Weathershield Hood: Galvanized steel to match fan and accessory size.
5. Weathershield Front Guard: Galvanized steel with expanded metal screen.
6. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
7. Disconnect Switch: Nonfusible type, with thermal-overload protection mounted inside fan housing, factory wired through an internal aluminum conduit.

I. Capacities and Characteristics: See Mechanical Schedules.

J. Spark Arrestance Class: [A] [B] [C].

2.4 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
- B. Enclosure Type: Totally enclosed, fan cooled.

2.5 SOURCE QUALITY CONTROL

- A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
- B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install power ventilators level and plumb.
- B. Install units with clearances for service and maintenance.
- C. Label units according to requirements specified.

3.2 CONNECTIONS

- A. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors.
- B. Install ducts adjacent to power ventilators to allow service and maintenance.
- C. Ground equipment.

3.3 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Replace fan and motor pulleys as required to achieve design airflow.
- D. Lubricate bearings.

END OF SECTION 23 34 23

SECTION 23 37 13 - DIFFUSERS, REGISTERS, GRILLES, AND LOUVERS

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. Rectangular and square ceiling diffusers.
 - 2. Louvered face diffuser.
 - 3. Fixed face registers and grilles.
- B. Related Sections:
 - 1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, include the following:
 - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 - 2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

- A. Louver Face Diffuser:
 - 1. Manufacturers:
 - a. Titus.
 - b. Price Industries.
 - c. Nailor Industries.
 - d. Metalaire, Inc.
 - 2. Material: Aluminum.
 - 3. Finish: Baked enamel, white.
 - 4. Face Size: See schedule on Drawings..
 - 5. Mounting: Lay in
 - 6. Pattern: Four-way core style.
 - 7. Dampers: Radial opposed blade.
 - 8. Accessories:

- a. Square to round neck adaptor.

2.2 REGISTERS AND GRILLES

- A. Fixed Face Register:
 - 1. Manufacturers:
 - a. Titus.
 - b. Price Industries.
 - c. Nailor Industries.
 - d. Metalaire, Inc.
 - 2. Material: Aluminum.
 - 3. Finish: Baked enamel, white.
 - 4. Core Construction: Integral.
 - 5. Frame: 1 inch wide.
 - 6. Mounting: Lay in.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37

SECTION 23 74 13 – PACKAGED ROOFTOP AC UNITS

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 packaged, outdoor, central-station air-handling units (rooftop units) with the following components and accessories:
 - 1. Direct-expansion cooling.
 - 2. Electric resistance heating section.
 - 3. Outdoor air intake damper section.
 - 4. Integral, space temperature controls.
 - 5. Roof curbs.

1.3 DEFINITIONS

- A. ECM: Electrically commutated motor.
- B. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, outdoor, central-station air-handling units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.
- C. Supply-Air Fan: The fan providing supply air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.
- D. Supply-Air Refrigerant Coil: Refrigerant coil in the supply-air stream to absorb heat (provide cooling) during cooling operations and to reject heat (provide heating) during heating operations. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.

1.4 ACTION SUBMITTALS

- A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.
- B. Delegated-Design Submittal: For RTU supports 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.
 - 2. Detail mounting, securing, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system.

3. Wind-Restraint Details: Detail fabrication and attachment of wind and seismic restraints and snubbers. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 1. Structural members to which RTUs will be attached.
 2. Roof openings
 3. Roof curbs and flashing.
- B. Field quality-control test reports.
- C. Warranty: Special warranty specified in this Section.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

- A. ARI Compliance:
 1. Comply with ARI 203/110 and ARI 303/110 for testing and rating energy efficiencies for RTUs.
 2. Comply with ARI 270 for testing and rating sound performance for RTUs.
- B. ASHRAE Compliance:
 1. Comply with ASHRAE 15 for refrigeration system safety.
 2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
 3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- D. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.
- E. UL Compliance: Comply with UL 1995.
- F. 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.

1.8 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of RTUs that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers shall be one of the following:
 - 1. Johnson Controls
 - 2. Trane.
 - 3. Carrier.
 - 4. York.
 - 5. Daikin

2.2 CASING

- A. General Fabrication Requirements for Casings: Formed and reinforced single-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.
- B. Exterior Casing Material: Galvanized steel with factory-painted finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.
 - 1. Exterior Casing Thickness: 0.0626 inch thick.
- C. Casing Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.
 - 1. Materials: ASTM C 1071, Type I.
 - 2. Thickness: 1/2 inch.
 - 3. Liner materials shall have air-stream surface coated with an erosion- and temperature-resistant coating or faced with a plain or coated fibrous mat or fabric.
 - 4. Liner Adhesive: Comply with ASTM C 916, Type I.
- D. Condensate Drain Pans: Formed sections of stainless-steel sheet, a minimum of 2 inches deep, and complying with ASHRAE 62.1.
 - 1. Double-Wall Construction: Fill space between walls with foam insulation and seal moisture tight.
 - 2. Drain Connections: Threaded nipple both sides of drain pan.

2.3 FANS

- A. Direct-Driven Supply-Air Fans: Double width, forward curved, centrifugal; with permanently lubricated, motor resiliently mounted in the fan inlet. Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls.
- B. Condenser-Coil Fan: Propeller, mounted on shaft of permanently lubricated motor.

- C. Fan Motor: Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

2.4 COILS

- A. Supply-Air Refrigerant Coil:
 1. Aluminum-plate fin and seamless internally grooved copper tube in steel casing with equalizing-type vertical distributor.
 2. Condensate Drain Pan: Stainless steel formed with pitch and drain connections complying with ASHRAE 62.1.

2.5 REFRIGERANT CIRCUIT COMPONENTS

- A. Number of Refrigerant Circuits: Two.
- B. Compressor: Hermetic, scroll, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief, and crankcase heater.
- C. Refrigeration Specialties:
 1. Refrigerant: R-454b or R-32.
 2. Expansion valve with replaceable thermostatic element.
 3. Refrigerant filter/dryer.
 4. Manual-reset high-pressure safety switch.
 5. Automatic-reset low-pressure safety switch.
 6. Minimum off-time relay.
 7. Automatic-reset compressor motor thermal overload.
 8. Brass service valves installed in compressor suction and liquid lines.
 9. Low-ambient kit high-pressure sensor.
 10. Refrigerant detection system (RDS) and mitigation response, per UL safety standard 60335-2-40.

2.6 AIR FILTRATION

- A. Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
 1. Pleated: Minimum 90 percent arrestance, and MERV 7.

2.7 ELECTRIC RESISTANCE HEATER SECTION: Comply with UL 1995

- A. Casing Assembly: Slip-in type with galvanized-steel frame.
- B. Open Heating Elements: Resistance wire of 80 percent nickel and 20 percent chromium supported and insulated by floating ceramic bushings recessed into casing openings, fastened to supporting brackets, and mounted in galvanized-steel frame.
- C. Overtemperature Protection: Disk-type, automatically resetting, thermal-cutout, safety device; serviceable through terminal box without removing heater from coil section.

- D. Secondary Protection: Load-carrying, manually resetting or manually replaceable, thermal cutouts; factory wired in series with each heater stage.
- E. Control Panel: Unit mounted with disconnecting means and overcurrent protection.
 - 1. Magnetic contactor.
 - 2. Solid-state, stepless pulse controller.
 - 3. Toggle switches, one per step.
 - 4. Step controller.
 - 5. Time-delay relay.
 - 6. Pilot lights, one per step.
 - 7. Airflow proving switch.

2.8 DAMPERS

- A. Outdoor-Air Damper: Linked damper blades, for 0 to 25 percent outdoor air, with motorized damper filter.

2.9 ELECTRICAL POWER CONNECTION

- A. Provide for single connection of power to unit with unit-mounted disconnect switch accessible from adjacent to outside unit and control-circuit transformer with built-in overcurrent protection. Do not mount disconnect on outdoor unit.

2.10 CONTROLS

- A. Basic Unit Controls:
 - 1. Control-voltage transformer.
 - 2. Non programmable - Wall-mounted thermostat or sensor with the following features:
 - a. Heat-cool-off switch.
 - b. Fan on-auto switch.
 - c. Fan-speed switch.
 - d. Automatic changeover.
 - e. Adjustable deadband.
 - f. Concealed set point.
 - g. Concealed indication.
 - h. Degree F indication.
 - i. Unoccupied-period-override push button.
- B. Interface Requirements for HVAC Instrumentation and Control System:
 - 1. Interface relay for scheduled operation.
 - 2. Interface relay to provide indication of fault at the central workstation and diagnostic code storage.

2.11 ACCESSORIES

- A. Low-ambient kit using staged condenser fans for operation down to 35 deg F.

- B. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.
- C. Coil guards of painted, galvanized-steel wire.
- D. Hail guards of galvanized steel, painted to match casing.

2.12 ROOF CURBS

- A. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.
 - 1. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.
 - a. Materials: ASTM C 1071, Type I or II.
 - b. Thickness: 2 inches.
 - 2. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.
 - a. Liner Adhesive: Comply with ASTM C 916, Type I.
 - b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
 - c. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
 - d. Liner Adhesive: Comply with ASTM C 916, Type I.
- B. Curb Height: 24 inches.

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 RTUs.
- B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.
- C. Examine roofs for suitable conditions where RTUs will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Roof Curb: Install on roof structure or concrete base, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." ARI Guideline B. Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in Section 077200

"Roof Accessories." Secure RTUs to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.

3.3 CONNECTIONS

- A. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.
- B. Install piping adjacent to RTUs to allow service and maintenance.
- C. Duct installation requirements are specified in other HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:
 - 1. Install ducts to termination at top of roof curb.
 - 2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs.

END OF SECTION 23 74 13

SECTION 23 90 20 – TEMPERATURE CONTROLS

PART 1 - GENERAL

1.1 DIRECT-DIGITAL CONTROL (DDC) SYSTEM DESCRIPTION

- A. The Controls Contractor shall supply and install components required to extend and modify the existing campus wide Direct Digital Control (DDC) Building Automation System (BAS) as required to accomplish the sequences of control for heating, ventilating, air-conditioning and other building-level equipment and systems as described herein.
- B. The temperature control points indicated within this specification for each equipment shall be integrated into existing BAS system shall be visual and have full command functions.
- C. Floor plan graphics shall be developed within the BAS system for the new additions, assigned room numbers, unit tag number and all space sensors will be visible on floor plan graphics and system graphic. Dynamic color graphics shall be used to identify actual temperature vs setpoints.
 - 1. Green – Space is at setpoint
 - 2. Orange – Space is 2 degrees (adjustable) above setpoint.
 - 3. Blue – Space is 2 degrees (adjustable) below setpoint.
 - 4. Red – Space is >2 degrees (adjustable) above or below setpoint.
- D. Add new equipment to existing system settings graphics page for temperature setpoint at individual campus level. Owner personnel to use this graphics page to change temperature setpoints for all units without having to go to each individual unit.
- E. Building maintenance manufacturer shall build graphics for each piece of equipment within this specification that has indicated points. building maintenance manufacturer shall coordinate all integration requirements with the unit's manufacturer's representative.
- F. TEMPERATURE SENSORS
 - 1. All temperature sensors to have displays, override buttons, and setpoint adjust. (no override buttons required on VAV boxes).
 - 2. Override times shall be set at a default of 4hrs
 - a. **Electricians (Div. 26) responsible for all stub-ups**
 - b. Cooling/Heating ON dead-band: + .5 degrees
 - c. Cooling/Heating OFF dead band: +1 degree
 - d. Setpoint adjustments of +/-3 degrees are to default back to "0" each time the units go into unoccupied mode for all areas except for the Administration and Classrooms
- G. HUMIDITY SENSORS
 - 1. **Electricians (Div. 26) responsible for all stub-ups**
 - 2. Occupied Set-point: 60%: Unoccupied Setpoint: 68%
 - 3. Humidity ON dead-band: + 1%
 - 4. Humidity OFF dead-band: -3%
- H. DEFAULT SCHEDULES

1. Schedule: Occupied times are 6am – 6 pm
 - a. Default Setpoints:
 - 1) Occupied: 68F Heating, 72 Cooling
 - 2) Unoccupied 55 heating, 90 Cooling
 - I. SUPPLY AIR SENSORS
 1. All airside equipment shall be designed with Supply Air temperature sensors located at the discharge of the units and each individual DX Coil, and heat strips. This includes all AHU, RTUs, Terminal Units (all types), FCUs, DX Splits, etc.
 - J. EXHAUST FANS:
 1. Provide independent start/stop and status control for all Exhaust fans.
 - K. STATUS MONITORING
 1. Any unit being started and stopped by the controls system shall also monitor the status of the unit using a Current switch, amp reading, or differential pressure switch.
 - L. GENERAL SPECIFICATION ON BAS CONTROLLERS
 1. All output points have independent terminations on the BAS controller. No two points (i.e. OA damper and fan S/S) share the same output.
 2. OA dampers to remain closed during unoccupied run times and to have a separate schedule for when they open.
- 1.2 WARRANTY, MAINTENANCE, NORMAL AND EMERGENCY SERVICE
- A. BAS manufacturer shall warranty all DDC controllers and Temperature sensors to be free of defect in material and workmanship under normal operation and expected service as published by the manufacturer in the unit's performance specifications for a period of five (5) years.
 - B. As a part of this contract, the BAS Contractor shall warranty all other components of the BAS and installation to be free of defects in workmanship and material under normal expected service and use for a period of one (1) year from the date final acceptance of the BAS by the Owner.
 - C. During the one year (1) installation warranty period the Contractor shall provide all labor and materials required to repair or to replace all items or components that fail due to defects in workmanship or manufacture at no charge or reduction in service to the Owner.
 - D. Except in the event of property loss or damage, warranty service shall be provided during regular working hours Monday through Friday at no charge unless otherwise explicitly outlined in the Contract Documents.
- 1.3 RELATED DOCUMENTS
- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.4 SUMMARY

A. Section Includes:

1. Electric temperature control system by the air conditioning equipment manufacturer, to be installed by the mechanical contractor.
2. Thermostats.
3. Thermostat Covers.
4. Float Switches.
5. Motorized Dampers.
6. Exhaust Fans.
7. Smoke Detectors.
8. Control Wiring.

1.5 ACTION SUBMITTALS

A. Shop Drawings:

1. General Requirements.
2. Operating characteristics, electrical characteristics, and furnished accessories indicating process operating range, accuracy over range, calibration data specific to each unique application, electrical power requirements, and limitations of ambient operating environment, including temperature and humidity.

PART 2 - PRODUCTS

2.1 THERMOSTAT

- ##### A. Thermostat shall be by Controls Contractor.

2.2 THERMOSTAT COVER

- ##### A. Provide heavy duty plastic, key-locked thermostat covers on all thermostats. One key shall be capable of opening all covers.

2.3 FLOAT SWITCH

- ##### A. Provide float switch to emergency drain pan of each AHU. Switch shall be interlocked with AHU to de-energize the unit when the water level in the pan rises above a set level. Float switch shall meet UL 508 requirements.

2.4 EXHAUST FAN SEQUENCE OF OPERATION

- ##### A. EXHAUST FAN #1 & 2

1. Provide "on-off" switch on wall as indicated on Plans. Provide pilot light to indicate operation of fan and a solid state speed control switch mounted in fan housing shall be used for balancing air flow.
- B. EXHAUST FAN #3-5
 1. (Restrooms) Provide interlock wiring with lights. Solid state speed control switch mounted in fan housing shall be used for balancing air flow.
- C. EXHAUST FAN #6
 1. Provide interlock wiring with lights. Fan shall be on when lights are "on" and off when lights are "off". Solid state speed control switch mounted in fan housing shall be used for balancing air flow.

2.5 SMOKE DETECTOR

- A. The Mechanical Contractor shall furnish and install a smoke detector in the supply duct and return duct of all air handlers delivering 2000 C.F.M. or above. Interlock the smoke detector to de-energize fan on actuation of detector.
- B. Smoke detectors shall have auxiliary contacts for interlock with the fire alarm system. Coordinate installation and selection of smoke detectors. Entire installation shall meet UL requirements for interlock with building fire alarm and security system.
- C. Provide remote audible and visual alarm unit with remote reset (one per AHU with smoke detector) in accordance with latest N.F.P.A. 90A requirements.
- D. Dual-chamber, ionization smoke detectors: The combination detector head, and twist-lock base shall be UL listed compatible with a UL listed fire alarm panel.
- E. The smoke detector shall have a flashing status indication LED or visual supervision. When the detector is actuated, the flashing LED shall latch on steady and at full brilliance. The detector may be reset by activating the control panel remote reset switch.
- F. The sensitivity of the detector shall be monitored without removal of the detector head. Metering set points shall be accessible on the exterior of the detector head. Field adjustment the sensitivity shall be possible when conditions require a change.
- G. It shall be possible to perform a functional test of the detector without the need of generating smoke. The test method must simulate effects of products of combustion in the chamber to ensure testing of all detector circuits.
- H. Voltage and RF transient suppression techniques shall be employed to minimize false alarm potential. A gated alarm output shall be used for additional detector stability.
- I. Auxiliary SPDT relays and/or remote LED alarm indicators shall be installed as required.
- J. Duct mounted smoke detectors shall shut down the associated air handling unit fan motor and fire/smoke damper. This contractor shall provide all equipment and labor as required to accomplish same.

- K. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.6 CONTROL WIRING

- A. All wiring required in the control systems, including electrical connections for the thermostats, firestats, smoke detectors, exhaust fans and all interlocking motor control wiring shall be furnished and installed by Mechanical Contractor.
- B. All wiring shall be in conduit and in accordance with the National Electrical Code (N.E.C.).
- C. All control wiring located outdoors shall be installed in rigid or intermediate metal conduit.
- D. All control wiring located indoors where an accessible ceiling is not available shall be installed in E.M.T. conduit.
- E. All control wiring located above accessible ceilings shall be N.E.C. approved cable. All control wiring located above accessible ceilings used as air plenums shall be N.E.C. approved "plenum cable".
- F. All conductors shall be copper. Conductors used for power circuits shall be #12 TW minimum. Conductors used for control circuits shall be #18 TW (single strand) minimum. Conductors used for sensor circuits shall be #18 TW (single strand) minimum. Control wiring for DX equipment thermostats shall be 10 conductor cables.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify compatibility with and suitability of substrates.
- B. Examine roughing-in for products to verify actual locations of connections before installation.
 - 1. Examine roughing-in for instruments installed in piping to verify actual locations of connections before installation.
 - 2. Examine roughing-in for instruments installed in duct systems to verify actual locations of connections before installation.
- C. Examine walls, floors, roofs, and ceilings for suitable conditions where product will be installed.
- D. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

END OF SECTION 23 90 20

DIVISION 26 - ELECTRICAL

260500	COMMON WORK RESULTS FOR ELECTRICAL
260519	LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
260526	GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
260529	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
260533	RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
260553	IDENTIFICATION FOR ELECTRICAL SYSTEMS
260923	LIGHTING CONTROL DEVICES
262416	PANELBOARDS
262726	WIRING DEVICES
262813	FUSES
262816	ENCLOSED SWITCHES AND CIRCUIT BREAKERS
264313	SURGE PROTECTION DEVICES FOR SERVICE ENTRANCE AND BRANCH PANELS
265100	INTERIOR LIGHTING
265600	EXTERIOR LIGHTING

SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Supporting devices for electrical components.
 2. Electricity-metering components.
 3. Concrete equipment bases.
 4. Touchup painting.

1.2 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. FMC: Flexible metal conduit.
- C. IMC: Intermediate metal conduit.
- D. LFMC: Liquidtight flexible metal conduit.
- E. RNC: Rigid nonmetallic conduit.

1.3 QUALITY ASSURANCE

- A. 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.
- B. Comply with NFPA 70.

1.4 COORDINATION

- A. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.
1. Set inserts and sleeves in poured-in-place concrete, masonry work, and other structural components as they are constructed.
- B. Sequence, coordinate, and integrate installing electrical materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.



- C. Coordinate electrical service connections with buildings and grounds.
- D. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.
- E. Where electrical identification markings and devices will be concealed by acoustical ceilings and similar finishes, coordinate installation of these items before ceiling installation.
- F. Coordinate connecting to all equipment with equipment provider. This includes mechanical, plumbing, owner provided and contractor provided equipment. Contractor to refer to equipment installation documents prior to any rough-in.
- G. Contractor to coordinate with door hardware provider, architect and owner prior to installation of any devices associated with doors to verify door operational requirement, placement of proximity readers, motion sensors, door switches, fire alarm control, magnetic locks, hold open devices, etc..
- H. Contractor to coordinate with architectural millwork shop drawings prior to rough-in for locations of under counter lighting to be installed in and around millwork. No receptacles shall be installed in an enclosed cabinet unless noted on the drawings. Outlets for refrigerators, microwaves, etc. shall be installed in the space identified on the millwork shop drawings.
- I. Contractor shall not penetrate any stair wall assemble with conduit, boxes, cabling and the like, except for items that serve the stairwell.
- J. The contractor shall label the main service disconnecting means with the maximum available fault current shall be listed on the device to meet the requirements of NFPA 70:110.24. The labeling shall be engraved plastic. The maximum available fault current shall be obtained from the electrical utility for the secondary side of the utility transformer.

PART 2 - PRODUCTS

2.1 SUPPORTING DEVICES

- A. Material: Cold-formed steel, with corrosion-resistant coating acceptable to authorities having jurisdiction.
- B. Metal Items for Use Outdoors or in Damp Locations: Hot-dip galvanized steel.
- C. Slotted-Steel Channel Supports: Flange edges turned toward web, and 9/16-inch- (14-mm-) diameter slotted holes at a maximum of 2 inches (50 mm) o.c., in webs.
- D. Raceway and Cable Supports: Manufactured clevis hangers, riser clamps, straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring-steel clamps or click-type hangers.
- E. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for nonarmored electrical cables in riser conduits. Plugs have number and size of conductor gripping holes as required to suit individual risers. Body constructed of malleable-iron casting with hot-dip galvanized finish.

- F. Expansion Anchors: Carbon-steel wedge or sleeve type.
- G. Toggle Bolts: All-steel springhead type.
- H. Powder-Driven Threaded Studs: Heat-treated steel.

2.2 EQUIPMENT FOR ELECTRICITY METERING BY CONTRACTOR

- A. Meter: Contractor shall provide metering per the local utility. Contractor shall provide all necessary enclosures, meter cans, etc. per the local utility requirements including any fees associated with the service.

2.3 CONCRETE BASES

- A. Concrete: 3000-psi (20.7-MPa), 28-day compressive strength as specified

2.4 TOUCH-UP PAINT

- A. For Equipment: Equipment manufacturer's paint selected to match installed equipment finish.
- B. Galvanized Surfaces: Zinc-rich paint recommended by item manufacturer.

PART 3 - EXECUTION

3.1 ELECTRICAL EQUIPMENT INSTALLATION

- A. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide the maximum possible headroom.
- B. Materials and Components: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.
- C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components. Connect for ease of disconnecting, with minimum interference with other installations.
- D. Right of Way: Give to raceways and piping systems installed at a required slope.

3.2 ELECTRICAL SUPPORTING DEVICE APPLICATION

- A. Damp Locations and Outdoors: Hot-dip galvanized materials or nonmetallic, U-channel system components.
- B. Dry Locations: Steel materials.

- C. Support Clamps for PVC Raceways: Click-type clamp system.
- D. Selection of Supports: Comply with manufacturer's written instructions.
- E. Strength of Supports: Adequate to carry present and future loads, times a safety factor of at least four; minimum of 200-lb (90-kg) design load.

3.3 SUPPORT INSTALLATION

- A. Install support devices to securely and permanently fasten and support electrical components.
- B. Install individual and multiple raceway hangers and riser clamps to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assemblies and for securing hanger rods and conduits.
- C. Support parallel runs of horizontal raceways together on trapeze- or bracket-type hangers.
- D. Size supports for multiple raceway installations so capacity can be increased by a 25 percent minimum in the future.
- E. Support individual horizontal raceways with separate, malleable-iron pipe hangers or clamps.
- F. Install 1/4-inch- (6-mm-) diameter or larger threaded steel hanger rods, unless otherwise indicated.
- G. Spring-steel fasteners specifically designed for supporting single conduits or tubing may be used instead of malleable-iron hangers for 1-1/2-inch (38-mm) and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings and for fastening raceways to slotted channel and angle supports.
- H. Arrange supports in vertical runs so the weight of raceways and enclosed conductors is carried entirely by raceway supports, with no weight load on raceway terminals.
- I. Simultaneously install vertical conductor supports with conductors.
- J. Separately support cast boxes that are threaded to raceways and used for fixture support. Support sheet-metal boxes directly from the building structure or by bar hangers. If bar hangers are used, attach bar to raceways on opposite sides of the box and support the raceway with an approved fastener not more than 24 inches (610 mm) from the box.
- K. Install metal channel racks for mounting cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices unless components are mounted directly to structural elements of adequate strength.
- L. Install sleeves for cable and raceway penetrations of concrete slabs and walls unless core-drilled holes are used. Install sleeves for cable and raceway penetrations of masonry and fire-

rated gypsum walls and of all other fire-rated floor and wall assemblies. Install sleeves during erection of concrete and masonry walls.

- M. Securely fasten electrical items and their supports to the building structure, unless otherwise indicated. Perform fastening according to the following unless other fastening methods are indicated:
1. Wood: Fasten with wood screws.
 2. Masonry: Toggle bolts on hollow masonry units and expansion bolts on solid masonry units.
 3. New Concrete: Concrete inserts with machine screws and bolts.
 4. Existing Concrete: Expansion bolts.
 5. Instead of expansion bolts, threaded studs driven by a powder charge and provided with lock washers may be used in existing concrete.
 6. Steel: Welded threaded studs or spring-tension clamps on steel.
 - a. Field Welding: Comply with AWS D1.1.
 7. Welding to steel structure may be used only for threaded studs, not for conduits, pipe straps, or other items.
 8. Light Steel: Sheet-metal screws.
 9. Fasteners: Select so the load applied to each fastener does not exceed 25 percent of its proof-test load.

3.4 FIRESTOPPING AND FIRE RATED WALLS/CEILINGS/FLOORS

- A. Apply firestopping to cable and raceway penetrations of fire-rated floor and wall assemblies to achieve fire-resistance rating of the assembly. Firestopping materials and installation requirements are specified.
- B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.5 CONCRETE BASES

- A. Provide a concrete base for all floor mounted equipment. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger, in both directions, than supported unit. Follow supported equipment manufacturer's anchorage recommendations and setting templates for anchor-bolt and tie locations, unless otherwise indicated. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Section "Cast-in-Place Concrete."

3.6 CUTTING AND PATCHING

- A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved.
- B. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

3.7 REFINISHING AND TOUCH-UP PAINTING

A. Refinish and touch up paint.

1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

3.8 CLEANING AND PROTECTION

- A. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
- B. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

END OF SECTION 26 05 00

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SECTION 26 05 19 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes building wires and cables and associated connectors, splices, and terminations for wiring systems rated 600 V and less.
- B. Related Sections include the following:
 - 1. Section "Medium-Voltage Cables" for single-conductor and multiconductor cables, cable splices, and terminations for electrical distribution systems with 2001 to 35,000 V.

1.3 QUALITY ASSURANCE

- A. 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.
- B. Comply with NFPA 70- Latest edition or edition enforced by state and local code authority.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Refer to Part 3 "Conductor and Insulation Applications" Article for insulation type, cable construction, and ratings.
- B. Conductor Material: Copper; stranded conductor or solid conductor for No. 10 AWG and smaller, stranded for No. 8 AWG and larger.
- C. Conductor Insulation Types: Type THHN-THWN.

2.2 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR AND INSULATION APPLICATIONS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and in Crawlspace: Type THHN-THWN, single conductors in raceway.
- E. Exposed Branch Circuits, including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway or MC Cable is allowed for concealed lighting and receptacle branch circuits.
- G. Branch Circuits Concealed in Concrete and below Slabs-on-Grade: Type THHN-THWN, single conductors in raceway.
- H. Fire Alarm Cabling: Plenum rated in plenum areas, exposed above accessible ceilings and in conduit when concealed in finished walls, inaccessible ceilings. Secured per NFPA 70-760.
- I. Low Voltage Cabling: Plenum rated in plenum areas, exposed above accessible ceilings and in conduit when concealed in finished walls, inaccessible ceilings. Secured per NFPA 70-760.
- J. Single Phase Circuits: Provide a dedicated neutral. Sharing of neutrals is not allowed.

3.2 INSTALLATION

- A. Conceal cables in conduit in finished walls, inaccessible ceilings, and floors.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Support cables according to Section "Basic Electrical Materials and Methods."
- E. Identify and color-code conductors and cables according to Section "Electrical Identification."
- F. Use #10 AWG conductors for 20 amperage 120 circuits when the circuit conductors are longer than 75 feet. Use #10 AWG conductors for 20 amperage 277 circuits when the circuit conductors are longer than 200 feet.

3.3 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.
 - 1. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

END OF SECTION 26 05 19

SECTION 26 05 26 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes methods and materials for grounding systems and equipment.
 - 1. Underground grounding.
 - 2. Common ground bonding with lightning protection system.

1.3 QUALITY ASSURANCE

- A. 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.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
- C. Bare Grounding Conductor and Conductor Protector for Wood Poles:
 - 1. No. 4 AWG minimum, soft-drawn copper.

2. Conductor Protector: Half-round PVC or wood molding. If wood, use pressure-treated fir or cypress or cedar.
- D. Grounding Bus: Rectangular bars of annealed copper, 1/4 by 2 inches by 24" minimum in cross section, unless otherwise indicated; with insulators.

2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel, sectional type; 3/4 inch by 10 feet (19 mm by 3 m) in diameter.

2.4 GROUND ACCESS WELLS

- A. Molded high density polyethylene well with 9" diameter twist-lock cover and locking bolt. Two knock-outs (mouse holes) for routing conductor to inside. Harger #GAW910 or equal.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare tinned-copper conductor, No. 2/0 AWG minimum.
 1. Bury at least 24 inches below grade.
 2. Duct-Bank Grounding Conductor: Bury 12 inches above duct bank when indicated as part of duct-bank installation.
- C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

- D. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Install bus on insulated spacers 1 inch, minimum, from wall 6 inches above finished floor, unless otherwise indicated.
 - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, down to specified height above floor, and connect to horizontal bus.
- E. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors, except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING UNDERGROUND DISTRIBUTION SYSTEM COMPONENTS

- A. Comply with IEEE C2 grounding requirements.
- B. Grounding Manholes and Handholes: Install a driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.
- C. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits
- D. Pad-Mounted Transformers and Switches: The following is a minimum if the utility company does not have requirements, otherwise meet the utility company requirements. Install two ground rods and ground ring around the pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than No. 2 AWG for ground ring and for taps to equipment grounding terminals. Bury ground ring not less than 6 inches (150 mm) from the foundation.

3.3 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.
- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
 - 1. Feeders and branch circuits.
 - 2. Lighting circuits.
 - 3. Receptacle circuits.

4. Single-phase motor and appliance branch circuits.
 5. Three-phase motor and appliance branch circuits.
 6. Flexible raceway runs.
 7. Armored and metal-clad cable runs.
 8. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
 9. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.
 10. X-ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
- F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
- G. Signal and Communication Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch grounding bus.
 2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.
- H. Metal Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and a separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.

3.4 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

- B. Common Ground Bonding with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade, unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
 - 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
 - 3. Install ground access well with cover for each ground rod (mounted flush with finished grade).
- D. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
 - 1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 - 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
 - 3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.
- E. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 - 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 - 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- F. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.
- G. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet apart.
- H. Ground Ring: Install a grounding conductor, electrically connected to each building structure ground rod and to each indicated item, extending around the perimeter of building as indicated on detail or drawings.

1. Install tinned-copper conductor not less than No. 2/0 AWG for ground ring and for taps to building steel.
 2. Bury ground ring not less than 24 inches from building foundation.
- I. Ufer Ground (Concrete-Encased Grounding Electrode): Fabricate according to NFPA 70, using a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG.
1. If concrete foundation is less than 20 feet long, coil excess conductor within base of foundation.
 2. Bond grounding conductor to reinforcing steel in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to grounding electrode external to concrete.

3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections and prepare test reports:
1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 2. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance not less than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
 3. Prepare dimensioned drawings locating each test well, ground rod and ground rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- B. Report measured ground resistances that exceed the following values:
1. Power and Lighting Equipment or System with Capacity 500 kVA and less: 10 ohms.
 2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 5 ohms.
 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
 4. Manhole Grounds: 10 ohms.
- C. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

END OF SECTION 26 05 26

SECTION 26 05 29 – HANGERS AND SUPPORTS FOR ELECTRICAL 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 the following:
 - 1. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.
- B. Related Sections include the following:
 - 1. Division 26 Section "Vibration and Seismic Controls for Electrical Systems" for products and installation requirements necessary for compliance with seismic criteria.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.5 SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.
 - 2. Nonmetallic slotted support systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.
 - 2. Steel slotted channel systems. Include Product Data for components.
 - 3. Equipment supports.
- C. Welding certificates.

1.6 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

1.7 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 5. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened Portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - 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:
 - 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
 2. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - 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:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.

6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with two-bolt conduit clamps / single-bolt conduit clamps using spring friction action for retention in support channel.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT IMC RMC EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.
- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 1. To Wood: Fasten with lag screws or through bolts.
 2. To New Concrete: Bolt to concrete inserts.

3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 or Spring-tension clamps.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base.
 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

- B. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 26 05 29

SECTION 26 05 33 – RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- B. Related Sections include the following:
 - 1. Refer to architectural for firestopping materials and installation at penetrations through walls, ceilings, and other fire-rated elements.
 - 2. "Basic Electrical Materials and Methods" for supports, anchors, and identification products.
 - 3. "Wiring Devices" for devices installed in boxes and for floor-box service fittings.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. FMC: Flexible metal conduit.
- D. IMC: Intermediate metal conduit.
- E. LFMC: Liquidtight flexible metal conduit.
- F. LFNC: Liquidtight flexible nonmetallic conduit.
- G. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

- A. Product Data: For surface raceways, floor boxes, and cabinets.

1.5 QUALITY ASSURANCE

- A. 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.
- B. Comply with NFPA 70-Latest edition or edition enforced by state and local code authority.

1.6 COORDINATION

- A. Coordinate layout and installation of raceways, boxes, enclosures, cabinets, and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 METAL WIREWAYS

- A. Material and Construction: Sheet metal sized and shaped as indicated, NEMA 1 or 3R.
- B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- C. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.
- D. Wireway Covers: Hinged type.
- E. Finish: Manufacturer's standard enamel finish.

2.2 NONMETALLIC WIREWAYS

- A. Description: Fiberglass polyester, extruded and fabricated to size and shape indicated, with no holes or knockouts. Cover is gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections are flanged, with stainless-steel screws and oil-resistant gaskets.
- B. Description: PVC plastic, extruded and fabricated to size and shape indicated, with snap-on cover and mechanically coupled connections with plastic fasteners.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Select features, unless otherwise indicated, as required to complete wiring system and to comply with NFPA 70.

2.3 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating and two coats of paint. Color by Architect.
- B. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceways.

2.4 BOXES, ENCLOSURES, AND CABINETS

- A. Floor Boxes: Cast metal, fully adjustable, rectangular with four separate wiring compartments for power outlets, voice and data outlets, and/or AV devices as indicated on the drawing. Wiremold RFB4 Series, T&B 665 Series or approved equal. Covers shall be UL Listed to U.S. and Canadian safety standards for tile, carpet, wood, bare concrete and terrazzo floors. Covers shall be selected by the architect and shall be of Nickel, Brass, Black, Gray or Bronze.
- B. Poke Thru Floor Boxes: Two hour rated poke thru floor unit with capabilities of two duplex power receptacles, data and AV devices. Provide power, data and phone outlets indicated on drawing. Wiremold Evolution Series 6AT or prior approved equal. Covers shall be selected by the architect and shall be of Nickel, Brass, Black, Gray or Bronze. Poke thru floor boxes are to be utilized on upper floors unless noted otherwise. There must be accessibility in the space below the poke thru box.
- C. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- D. Cast-Metal Pull and Junction Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- E. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous hinge cover and flush latch.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Plastic, finished inside with radio-frequency-resistant paint.
- F. Cabinets: NEMA 250, Type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage and include accessory feet where required for freestanding equipment.
- G. Exterior Outlet Lock Box: Cast aluminum with self closing door withlock. All units shall be keyed alike. 16 gauge steel housing. Unit for Interior and Exterior installation. Cole: TL-310 or equivalent.
- H. In grade enclosures, boxes and covers are required to conform to all test provisions of the most current ANSI/SCTE 77 "Specification For Underground Enclosure Integrity" for Tier 22 applications. When multiple "Tiers" are specified the boxes must physically accommodate and structurally support compatible covers while possessing the highest Tier rating. All covers are required to have the Tier level rating embossed on the surface. In no assembly can the cover design load exceed the design load of the box. All components in an assembly (box & cover) are manufactured using matched surface tooling. Independent third party verification or test reports stamped by a registered Professional Engineer certifying that all test provisions of this specification have been met are required with each submittal. Cover to be labeled per use of box, ie "Electrical, Communications, etc". Communications pull boxes shall be a minimum of 24" w x 36" l x 36" d.

2.5 FACTORY FINISHES

- A. Finish: For raceway, enclosure, or cabinet components, provide manufacturer's standard prime-coat finish ready for field painting.

2.6 METAL CONDUIT AND TUBING

- A. Rigid Steel Conduit: ANSI C80.1.
- B. Aluminum Rigid Conduit: ANSI C80.5.
- C. IMC: ANSI C80.6.
- D. Plastic-Coated Steel Conduit and Fittings: NEMA RN 1.
- E. Plastic Coated IMC and Fittings: NEMA RN 1.
- F. EMT and Fittings: ANSI C 80.3.
- G. EMT and Fittings: ANSI C80.3.
- H. FMC: Aluminum
- I. LFMC: Flexible steel conduit with PVC jacket.
- J. Fittings: NEMA FB 1; compatible with conduit and tubing materials.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors:
 - 1. Exposed: Rigid steel or IMC.
 - 2. Concealed: Rigid steel or IMC.
 - 3. Underground, Single Run: RNC.
 - 4. Underground, Grouped: RNC.
 - 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
 - 6. Boxes and Enclosures: NEMA 250, Type 4.
- B. Indoors:
 - 1. Exposed: EMT in non finished areas. Surface metal raceway in existing finished unaccessible areas unless noted otherwise.
 - 2. Concealed: EMT. MC Cable is allowed for concealed lighting and receptacle branch circuits.
 - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC; except use LFMC in damp or wet locations.
 - 4. Damp or Wet Locations above Ground: Rigid steel conduit.
 - 5. Boxes and Enclosures: NEMA 250, Type 1, except as follows:
 - a. Damp or Wet Locations: NEMA 250, Type 4, stainless steel.
- C. Minimum Raceway Size: 3/4-inch trade size (DN 21) below grade and 1/2 inch trade size above grade. When combining circuits, min. 3/4-inch trade size required.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.

- E. Contractor to provide metal raceway in Patient Care Areas per 517.13. Raceway shall be installed as a redundant ground. Raceway shall be a considered a ground.

3.2 INSTALLATION

- A. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- B. Complete raceway installation before starting conductor installation.
- C. Support raceways as specified in "Basic Electrical Materials and Methods."
- D. Install temporary closures to prevent foreign matter from entering raceways.
- E. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portions of bends are not visible above the finished slab.
- F. Make bends and offsets so ID is not reduced. Keep legs of bends in the same plane and keep straight legs of offsets parallel, unless otherwise indicated.
- G. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
 - 1. Install concealed raceways with a minimum of bends in the shortest practical distance, considering type of building construction and obstructions, unless otherwise indicated.
- H. Raceways Embedded in Slabs: Install in middle 1/3 of slab thickness where practical and leave at least 2 inches (50 mm) of concrete cover. Conduits larger than 1" shall not be installed in the slab.
 - 1. Secure raceways to reinforcing rods to prevent sagging or shifting during concrete placement.
 - 2. Space raceways laterally to prevent voids in concrete.
 - 3. Run conduit larger than 1-inch trade size (DN 27) parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
- I. Install exposed raceways parallel or at right angles to nearby surfaces or structural members and follow surface contours as much as possible.
 - 1. Run parallel or banked raceways together on common supports.
 - 2. Make parallel bends in parallel or banked runs. Use factory elbows only where elbows can be installed parallel; otherwise, provide field bends for parallel raceways.
- J. Join raceways with fittings designed and approved for that purpose and make joints tight.
 - 1. Use insulating bushings to protect conductors.
- K. Tighten set screws of threadless fittings with suitable tools.
- L. Terminations:

1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
 2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.
- M. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.
- N. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.
- O. Flexible Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use LFMC in damp or wet locations. Install separate ground conductor across flexible connections.
- P. Surface Raceways: Install a separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals.
- Q. Set floor boxes level and flush with finished floor surface.
- R. Install hinged-cover enclosures and cabinets plumb. Support at each corner.
- 3.3 PROTECTION
- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.
- 3.4 CLEANING
- A. After completing installation of exposed, factory-finished raceways and boxes, inspect exposed finishes and repair damaged finishes.

END OF SECTION 26 05 33

SECTION 26 05 53 – IDENTIFICATION FOR ELECTRICAL 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 the following:
 - 1. Identification for conductors and communication and control cable.
 - 2. Warning labels and signs.
 - 3. Instruction signs.
 - 4. Equipment identification labels.
 - 5. Miscellaneous identification products.

1.3 SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.
- C. Samples: For each type of label and sign to illustrate size, colors, lettering style, mounting provisions, and graphic features of identification products.

1.4 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 and ANSI C2.
- B. Comply with NFPA 70.

1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes and standards. Use consistent designations throughout Project.

- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 CONDUCTOR AND COMMUNICATION- AND CONTROL-CABLE IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- B. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

2.2 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
- C. Baked-Enamel Warning Signs: Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 7 by 10 inches.
- D. Warning label and sign shall include, but are not limited to, the following legends:
 - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
 - 2. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

2.3 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.
 - 1. Engraved legend with black letters on white face.
 - 2. Punched or drilled for mechanical fasteners.
 - 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.4 EQUIPMENT IDENTIFICATION LABELS

- A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a dark-gray background. Minimum letter height shall be 3/8 inch.

2.5 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength: 50 lb, minimum.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black, except where used for color-coding.
- B. Paint: Paint materials and application requirements are specified in Division 09 painting Sections.
 - 1. Exterior Concrete Unit Masonry:
 - a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a block filler.
 - 1) Block Filler: Concrete unit masonry block filler.
 - 2) Finish Coats: Exterior semigloss acrylic enamel.
 - 2. Exterior Ferrous Metal:
 - a. Semigloss Alkyd-Enamel Finish: Two finish coat(s) over a primer.
 - 1) Primer: Exterior ferrous-metal primer.
 - 2) Finish Coats: Exterior semigloss alkyd enamel.
 - 3. Exterior Zinc-Coated Metal (except Raceways):
 - 1) Primer: Exterior zinc-coated metal primer.
 - 2) Finish Coats: Exterior semigloss alkyd enamel.
 - 4. Interior Ferrous Metal:
 - a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
 - 1) Primer: Interior ferrous-metal primer.
 - 2) Finish Coats: Interior semigloss acrylic enamel.
 - 5. Interior Zinc-Coated Metal (except Raceways):
 - a. Semigloss Acrylic-Enamel Finish: Two finish coat(s) over a primer.
 - 1) Primer: Interior zinc-coated metal primer.
 - 2) Finish Coats: Interior semigloss acrylic enamel.
- C. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to source and circuit number.
- B. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source and circuit number.

- C. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.
 - 1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 - 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 - 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.

- D. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
 - 1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.
 - 2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

- E. Instruction Signs:
 - 1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
 - 2. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/8-inch- high letters for emergency instructions at equipment used for power transfer.

- F. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
 - 1. Labeling Instructions:
 - a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where 2 lines of text are required, use labels 2 inches high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - 2. Equipment to Be Labeled:
 - a. Panelboards, electrical cabinets, and enclosures.
 - b. Access doors and panels for concealed electrical items.
 - c. Electrical switchgear and switchboards.
 - d. Transformers.

- e. Emergency system boxes and enclosures.
- f. Receptacles with panel and circuit numbers.
- g. Disconnect switches.
- h. Enclosed circuit breakers.
- i. Power transfer equipment.
- j. Contactors.

3.2 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.
- F. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service feeder branch-circuit service, feeder, and branch-circuit conductors.
 - 1. Color shall be factory applied factory applied or, for sizes larger than No. 10 AWG if authorities having jurisdiction permit, field applied.
 - 2. Colors for 208/120-V Circuits:
 - a. Phase A: Black.
 - b. Phase B: Red.
 - c. Phase C: Blue.
 - 3. Colors for 480/277-V Circuits:
 - a. Phase A: Brown.
 - b. Phase B: Orange.
 - c. Phase C: Yellow.
 - 4. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

END OF SECTION 26 05 53

SECTION 26 09 23 – LIGHTING CONTROL DEVICES

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 lighting control devices:
 - 1. Time switches.
 - 2. Outdoor photoelectric switches.
 - 3. Daylight-harvesting controls.
 - 4. Indoor occupancy sensors.
 - 5. Lighting contactors.
 - 6. Emergency shunt relays.
- B. Related Sections include the following:
 - 1. Division 26 Section "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3 DEFINITIONS

- A. LED: Light-emitting diode.
- B. PIR: Passive infrared.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show installation details for occupancy and light-level sensors.
 - 1. Interconnection diagrams showing field-installed wiring.
 - 2. Layout of all devices on floor plan. Work to be done in electronic form such as AutoCAD. Manufacture shall provide a design to accommodate proper coverage throughout.
- C. Field quality-control test reports.
- D. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. 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.
- B. Color of all wall mounted devices of this section shall match color of devices and plates of the wiring device section.

1.6 COORDINATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 TIME SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Intermatic, Inc.
 - 2. Leviton Mfg. Company Inc.
 - 3. TORK.
 - 4. Watt Stopper (The).
 - 5. Sensor Switch, Inc.
- B. Electronic Time Switches: Electronic, solid-state programmable units with alphanumeric display; complying with UL 917.
 - 1. Contact Configuration: DPDT.
 - 2. Contact Rating: 30-A inductive or resistive, 240-V ac.
 - 3. Program: 8 on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.
 - 4. Programs: 2 channels; each channel shall be individually programmable with 8 on-off set points on a 24-hour schedule.
 - 5. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program on selected channels.
 - 6. Astronomic Time: All channels.
 - 7. Battery Backup: For schedules and time clock.
- C. Electromechanical-Dial Time Switches: Type complying with UL 917.
 - 1. Contact Configuration: DPDT.
 - 2. Contact Rating: 30-A inductive or resistive, 240-V ac.
 - 3. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
 - 4. Astronomic time dial.
 - 5. Eight-Day Program: Uniquely programmable for each weekday and holidays.

6. Skip-a-day mode.
7. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

- D. Preset Countdown Wall Switches:
1. Self-Contained Relay
 2. Self-Grounding Mounting Strap
 3. No Minimum Load Requirement
 4. Push-Button Programmable w/o Removing Switch Plate
 5. Fixed or Adjustable Preset Times
 6. 60 Minute Max.

2.2 OUTDOOR PHOTOELECTRIC SWITCHES

- 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:
1. Area Lighting Research, Inc.; Tyco Electronics.
 2. Grasslin Controls Corporation; a GE Industrial Systems Company.
 3. Intermatic, Inc.
 4. Lithonia Lighting; Acuity Lighting Group, Inc.
 5. GreenGate.
 6. Paragon Electric Co.; Invensys Climate Controls.
 7. Square D; Schneider Electric.
 8. TORK.
 9. Touch-Plate, Inc.
 10. Watt Stopper (The).
- B. Description: Solid state, with DPST dry contacts rated for 1800-VA tungsten or 1000-VA inductive, to operate connected relay, contactor coils, or microprocessor input; complying with UL 773A.
1. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lx), with an adjustment for turn-on and turn-off levels within that range, and a directional lens in front of photocell to prevent fixed light sources from causing turn-off.
 2. Time Delay: 15-second minimum, to prevent false operation.
 3. Surge Protection: Metal-oxide varistor, complying with IEEE C62.41.1, IEEE C62.41.2, and IEEE 62.45 for Category A1 locations.
 4. Mounting: Twist lock complying with IEEE C136.10, with base-and-stem mounting or stem-and-swivel mounting accessories as required to direct sensor to the north sky exposure.
- C. Description: Solid state, with DPST dry contacts rated for 1800 VA to operate connected load, relay, or contactor coils; complying with UL 773.
1. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lx), with an adjustment for turn-on and turn-off levels within that range.
 2. Time Delay: 30-second minimum, to prevent false operation.
 3. Lightning Arrester: Air-gap type.
 4. Mounting: Twist lock complying with IEEE C136.10, with base.

2.3 DAYLIGHT-HARVESTING DIMMING CONTROLS

- A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hubbell Lighting.
 - 2. Leviton Mfg. Company Inc.
 - 3. Lithonia Lighting; Acuity Lighting Group, Inc.
 - 4. GreenGate.
 - 5. Sensor Switch, Inc.
 - 6. Watt Stopper (The).
- B. Description: Sensing daylight and electrical lighting levels, the system adjusts the indoor electrical lighting levels. As daylight increases, the lights are dimmed.
 - 1. Lighting control set point is based on two lighting conditions:
 - a. When no daylight is present (target level).
 - b. When significant daylight is present.
 - 2. System programming is done with two hand-held, remote-control tools.
 - a. Initial setup tool.
 - b. Tool for occupants to adjust the target levels by increasing the set point up to 25 percent, or by minimizing the electric lighting level.
- C. Ceiling-Mounted Dimming Controls: Solid-state, light-level sensor unit, with power pack, to detect changes in indoor lighting levels that are perceived by the eye.
- D. Electrical Components, Devices, and Accessories:
 - 1. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 - 2. Sensor Output: zero to 10 V dc to operate luminaires. Sensor is powered by switch/controller.
 - 3. Light-Level Sensor Set-Point Adjustment Range: 20 to 60 fc (120 to 640 lx).
- E. Relay Unit:
 - 1. Analog System: Dry contacts rated for 20 A LED load at 120 and 277 V ac, for 13 A tungsten at 120 V(ac), and for 1 hp at 120 V ac. Sensor has 24 V dc, 150 mA, Class 2 power source.
 - a. Plenum rated.
 - 2. Digital System: Digital controller capable of accepting three or four 8PSJ inputs with two outputs rated for 20 A incandescent or LED load at 120 and 277 V ac , for 16 A LED at 120 and 277 V ac, and for 1 hp at 120 Vac. Sensor has 24 V(dc) Class 2 power source.
 - a. With integral current monitoring.
 - b. Compatible with digital addressable lighting interface.
 - c. Plenum rated.

2.4 INDOOR OCCUPANCY AND VACANCY SENSORS

- A. Available Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Hubbell Lighting.
 2. Leviton Mfg. Company Inc.
 3. Lithonia Lighting; Acuity Lighting Group, Inc.
 4. GreenGate.
 5. Sensor Switch, Inc.
 6. Watt Stopper (The).
- B. General Requirements for Sensors:
 1. Wall- or Ceiling-mounted, solid-state indoor occupancy and vacancy sensors.
 2. Separate relay unit.
 3. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
 4. Operation:
 - a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 - c. Combination Sensor: Unless otherwise indicated, sensor must be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
 5. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
 6. Relay Unit: Dry contacts rated for 20-A ballast or LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
 7. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 8. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
 9. Bypass Switch: Override the "on" function in case of sensor failure.
 10. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lx); turn lights off when selected lighting level is present.
 11. Wall mounted devices color shall match color selected for switches and receptacles. Refer to other sections in specifications.
 12. Meet Nema WD 7-2011 requirements.

- C. PIR Type: Ceiling-mounting; detect occupancy by sensing a combination of heat and movement in area of coverage.
 - 1. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm).
 - 2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
 - 3. Detection Coverage (Corridor): Detect occupancy within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling.

- D. Ultrasonic Type: Ceiling mounting; detect occupancy by sensing a change in pattern of reflected ultrasonic energy in area of coverage.
 - 1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
 - 2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. (56 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
 - 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
 - 4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. (186 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
 - 5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling in a corridor not wider than 14 feet (4.3 m).

- E. Dual-Technology Type: Ceiling-mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. The particular technology or combination of technologies that controls on-off functions shall be selectable in the field by operating controls on unit.
 - 1. Sensitivity Adjustment: Separate for each sensing technology.
 - 2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
 - 3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

- F. System and Design Requirements:
 - 1. Products supplied shall be from a single manufacturer that has been continuously involved in manufacturing of occupancy sensors for a minimum of five (5) years. Mixing of manufacturers shall not be allowed.
 - 2. All components shall be U.L. listed, offer a five (5) year warranty and meet all state and local applicable code requirements.
 - 3. Products shall be manufactured by an ISO 9002 certified manufacturing facility and shall have a defect rate of less than 1/3 of 1%.
 - 4. The objective of this section is to ensure the proper installation of the occupancy sensor based lighting control system so that lighting is turned off automatically after reasonable

time delay when a room or area is vacated by the last person to occupy said room or area.

5. The occupancy sensor based lighting control shall accommodate all conditions of space utilization and all irregular work hours and habits
6. Where specified, sensor shall have an internal additional isolated relay with Normally Open, Normally Closed and Common outputs for use with HVAC control, Data Logging and other control options. Sensors utilizing separate components or specially modified units to achieve this function are not acceptable.
7. Meet Nema WD 7-2011 requirements.

2.5 LIGHTING CONTACTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Allen-Bradley/Rockwell Automation.
2. ASCO Power Technologies, LP; a division of Emerson Electric Co.
3. Eaton Electrical Inc.; Cutler-Hammer Products.
4. GE Industrial Systems; Total Lighting Control.
5. Grasslin Controls Corporation; a GE Industrial Systems Company.
6. Hubbell Lighting.
7. Lithonia Lighting; Acuity Lighting Group, Inc.
8. MicroLite Lighting Control Systems.
9. Square D; Schneider Electric.
10. TORK.
11. Touch-Plate, Inc.
12. Watt Stopper (The).
13. Siemens

- B. Description: Electrically operated and mechanically held, combination type with nonfused disconnect, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.
4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.

2.6 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Shielded multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

- C. Class 1 Control Cable: Shielded multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

- A. It shall be the contractor's responsibility to locate and aim sensors in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas per the manufacturer's recommendations. Rooms shall have ninety (90) to one hundred (100) percent coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room(s). The drawings indicate only the rooms which are to be provided with sensors. The contractor shall provide sensors as required to properly and completely cover the respective room.
- B. It is the contractor's responsibility to arrange a pre-installation meeting with manufacturer's factory authorized representative, at owner's facility, to verify placement of sensors and installation criteria.
- C. It is the contractor's responsibility to arrange a pre-installation meeting with manufacturer's factory authorized representative, at owner's facility, to verify placement of sensors and installation criteria.
- D. Contractor's work to include all labor, materials, tools, appliances, control hardware, sensor, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational occupancy sensor lighting control system, as described herein. Drawings may indicate the room in which occupancy sensor control is required. The contractor and manufacture shall provide a device to provide proper coverage of the area.

3.2 CONTACTOR INSTALLATION

- A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 WIRING INSTALLATION

- A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size shall be 1/2 inch (13 mm).
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

- A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."
 - 1. Identify controlled circuits in lighting contactors.
 - 2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
 - 2. Operational Test: Verify operation of each lighting control device, and adjust time delays.
- B. Lighting control devices that fail tests and inspections are defective work.
- C. Upon completion of the installation, the system shall be completely commissioned by the manufacturer's factory authorized technician who will verify all adjustments and sensor placement to ensure a trouble-free occupancy-based lighting control system.

3.6 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 26 09 23

SECTION 26 24 16 – PANELBOARDS

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. Distribution panelboards.
 - 2. Lighting and appliance branch-circuit panelboards.
 - 3. Load centers.

1.3 DEFINITIONS

- A. ATS: Acceptance testing specification.
- B. GFCI: Ground-fault circuit interrupter.
- C. GFEP: Ground-fault equipment protection.
- D. HID: High-intensity discharge.
- E. MCCB: Molded-case circuit breaker.
- F. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
 - 1. Include materials, switching and overcurrent protective devices, accessories, and components indicated.
 - 2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
 - 1. Include dimensioned plans, elevations, sections, and details.
 - 2. Show tabulations of installed devices with nameplates, conductor termination sizes, equipment features, and ratings.

3. Detail enclosure types including mounting and anchorage, environmental protection, knockouts, corner treatments, covers and doors, gaskets, hinges, and locks.
4. Detail bus configuration, current, and voltage ratings.
5. Short-circuit current rating of panelboards and overcurrent protective devices.
6. Include evidence of NRTL listing for series rating of installed devices.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
8. Include wiring diagrams for power, signal, and control wiring.
9. Key interlock scheme drawing and sequence of operations.
10. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device. Include an Internet link for electronic access to downloadable PDF of the coordination curves.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

1.7 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. Keys: Two spares for each type of panelboard cabinet lock.
 2. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 3. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: ISO 9001 or 9002 certified.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NECA 407.

1.10 FIELD CONDITIONS

- A. Environmental Limitations:
 - 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
 - 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
 - b. Altitude: Not exceeding 6600 feet.
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
 - 1. Ambient temperatures within limits specified.
 - 2. Altitude not exceeding 6600 feet.
- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 - 1. Notify Architect no fewer than two days in advance of proposed interruption of electric service.
 - 2. Do not proceed with interruption of electric service without Architect's written permission.
 - 3. Comply with NFPA 70E.

1.11 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
 - 1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANELBOARDS AND LOAD CENTERS COMMON REQUIREMENTS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 26 05 48.16 "Seismic Controls for Electrical Systems."

- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NEMA PB 1.
- E. Comply with NFPA 70.
- F. Enclosures: Flush and Surface-mounted, dead-front cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
 - b. Outdoor Locations: NEMA 250, Type 3R.
 - c. Kitchen and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 - d. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.
 - e. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 5.
 - 2. Height: 84 inches maximum.
 - 3. Front: Secured to box with concealed trim clamps. For surface-mounted fronts, match box dimensions; for flush-mounted fronts, overlap box. Trims shall cover all live parts and shall have no exposed hardware.
 - 4. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
 - 5. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
 - 6. Finishes:
 - a. Panels and Trim: Steel and galvanized steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Galvanized steel.
- G. Incoming Mains:
 - 1. Location: Convertible between top and bottom.
 - 2. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.
- H. Phase, Neutral, and Ground Buses:
 - 1. Material: Hard-drawn copper, 98 percent conductivity.
 - a. Plating shall run entire length of bus.
 - b. Bus shall be fully rated the entire length.
 - 2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.

3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
4. Isolated Ground Bus: Adequate for branch-circuit isolated ground conductors; insulated from box.
5. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
6. Split Bus: Vertical buses divided into individual vertical sections.

I. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Terminations shall allow use of 75 deg C rated conductors without derating.
3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
7. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
8. Gutter-Tap Lugs: Mechanical type suitable for use with conductor material and with matching insulating covers. Locate at same end of bus as incoming lugs or main device.

J. NRTL Label: Panelboards or load centers shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

K. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

1. Percentage of Future Space Capacity: 20 percent.

L. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

2.2 POWER PANELBOARDS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. [Eaton.](#)
2. [ABB.](#)
3. [Siemens Industry, Inc., Energy Management Division.](#)
4. [Square D; by Schneider Electric.](#)

- B. Panelboards: NEMA PB 1, distribution type.
- C. Doors: Secured with vault-type latch with tumbler lock; keyed alike.
 1. For doors more than 36 inches high, provide two latches, keyed alike.
- D. Mains: As per schedule
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- F. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on electronic circuit breakers.

2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:
 1. [Eaton.](#)
 2. [ABB.](#)
 3. [Siemens Industry, Inc., Energy Management Division.](#)
 4. [Square D; by Schneider Electric.](#)
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: As indicated on the schedules.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.
- F. Column-Type Panelboards: Single row of overcurrent devices with narrow gutter extension and overhead junction box equipped with ground and neutral terminal buses.
 1. Doors: Concealed hinges secured with multipoint latch with tumbler lock; keyed alike.

2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:

1. [Eaton.](#)
2. [ABB.](#)
3. [Siemens Industry, Inc., Energy Management Division.](#)
4. [Square D; by Schneider Electric.](#)

B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers:
 - a. Inverse time-current element for low-level overloads.
 - b. Instantaneous magnetic trip element for short circuits.
 - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic Trip Circuit Breakers:
 - a. RMS sensing.
 - b. Field-replaceable rating plug or electronic trip.
 - c. Digital display of settings, trip targets, and indicated metering displays.
 - d. Multi-button keypad to access programmable functions and monitored data.
 - e. Ten-event, trip-history log. Each trip event shall be recorded with type, phase, and magnitude of fault that caused the trip.
 - f. Integral test jack for connection to portable test set or laptop computer.
 - g. Field-Adjustable Settings:
 - 1) Instantaneous trip.
 - 2) Long- and short-time pickup levels.
 - 3) Long and short time adjustments.
 - 4) Ground-fault pickup level, time delay, and I squared T response.
4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).
6. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
7. Arc-Fault Circuit Interrupter Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
8. Subfeed Circuit Breakers: Vertically mounted.
9. MCCB Features and Accessories:
 - a. Standard frame sizes, trip ratings, and number of poles.
 - b. Breaker handle indicates tripped status.
 - c. UL listed for reverse connection without restrictive line or load ratings.
 - d. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
 - e. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and HID lighting circuits.
 - f. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
 - g. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in Section 26 09 13 "Electrical Power Monitoring and Control."

- h. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
 - i. Auxiliary Contacts: Two, SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts and "b" contacts operate in reverse of circuit-breaker contacts.
 - j. Alarm Switch: Single-pole, normally open contact that actuates only when circuit breaker trips.
 - k. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key shall be removable only when circuit breaker is in off position.
 - l. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function with other upstream or downstream devices.
 - m. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in on or off position.
- C. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
- 1. Fuses and Spare-Fuse Cabinet: Comply with requirements specified in Section 26 28 13 "Fuses."
 - 2. Fused Switch Features and Accessories:
 - a. Standard ampere ratings and number of poles.
 - b. Mechanical cover interlock with a manual interlock override, to prevent the opening of the cover when the switch is in the on position. The interlock shall prevent the switch from being turned on with the cover open. The operating handle shall have lock-off means with provisions for three padlocks.

2.5 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Directory card inside panelboard door, mounted in metal frame with transparent protective cover. Typed written.
 - 1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.
- D. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
 - 1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

2.6 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.
- B. Receive, inspect, handle, and store panelboards according to NECA 407.
- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.
- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Comply with NECA 1.
- C. Install panelboards and accessories according to NECA 407.
- D. Equipment Mounting:
 - 1. Install panelboards on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 03 30 00 "Cast-in-Place Concrete."
 - 2. Attach panelboard to the vertical finished or structural surface behind the panelboard.
 - 3. Comply with requirements for seismic control devices specified in Section 26 05 48.16 "Seismic Controls for Electrical Systems."
- E. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- F. Comply with mounting and anchoring requirements specified in Section 26 05 48.16 "Seismic Controls for Electrical Systems."
- G. Mount panelboard cabinet plumb and rigid without distortion of box.
- H. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- I. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.
 2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.
- J. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.
- K. Install filler plates in unused spaces.
- L. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch empty conduits into raised floor space or below slab not on grade.
- M. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.
- N. Mount spare fuse cabinet in accessible location.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in power panelboards with a nameplate complying with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
- E. Install warning signs complying with requirements in Section 26 05 53 "Identification for Electrical Systems" identifying source of remote circuit.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Acceptance Testing Preparation:

1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
2. Test continuity of each circuit.

D. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
3. Perform the following infrared scan tests and inspections and prepare reports:
 - a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each panelboard. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each panelboard 11 months after date of Substantial Completion.
 - c. Instruments and Equipment:
 - 1) Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

E. Panelboards will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results, with comparisons of the two scans. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as specified in Section 26 05 73.16 "Coordination Studies."
- C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes. Prior to making circuit changes to achieve load balancing, inform Architect of effect on phase color coding.
 1. Measure loads during period of normal facility operations.
 2. Perform circuit changes to achieve load balancing outside normal facility operation schedule or at times directed by the Architect. Avoid disrupting services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
 3. After changing circuits to achieve load balancing, recheck loads during normal facility operations. Record load readings before and after changing circuits to achieve load balancing.
 4. Tolerance: Maximum difference between phase loads, within a panelboard, shall not exceed 20 percent.

3.6 PROTECTION

- A. Temporary Heating: Prior to energizing panelboards, apply temporary heat to maintain temperature according to manufacturer's written instructions.

END OF SECTION 26 24 16

SECTION 26 27 26 – WIRING DEVICES

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. Single and duplex receptacles, ground-fault circuit interrupters and isolated-ground receptacles.
 - 2. Single- and double-pole snap switches.
 - 3. Device wall plates.
 - 4. Pin and sleeve connectors and receptacles.
 - 5. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. PVC: Polyvinyl chloride.
- D. RFI: Radio-frequency interference.
- E. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Receptacles, switches, plates, floor outlets, poke through assemblies, service poles and multioutlet assemblies.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device through one source from a single manufacturer.
- 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. Comply with NFPA 70 latest edition or edition enforced by state or local code authority.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Outlets - Duplex:
 - a. Hubbell Incorporated- HBL 5362.
 - b. Leviton Mfg. Company Inc.-5362.
 - c. Pass & Seymour-CRB5362.
 - d. Pass & Seymour -PT5362A (Plug Tail Device).
 - 2. Switches-Single Pole:
 - a. Hubbell Incorporated - HBL 1221.
 - b. Pass & Seymour - PS20AC1.
 - c. Leviton Mfg. Company, Inc.- 1221-1
 - 3. Switches-Three Pole:
 - a. Hubbell Incorporated - HBL1223
 - b. Leviton Mfg. Company, Inc.-1223-2.
 - c. Pass & Seymour-PS20AC3.
 - 4. Dimmer Switches Line Voltage:
 - a. Lutron Nova T
 - b. Pass & Seymour CD2000

* Dimmer must be compatible with Ballast or LED Driver.
 - 5. Dimmer Switches 0-10V:
 - a. Synergy ISD
 - b. Cooper SF10P

* Dimmer must be compatible with Ballast or LED Driver.
 - 6. GFCI Receptacles: Weather Resistant:
 - a. Hubbell Incorporated - GFWRST20
 - b. Leviton Mfg. Company Inc.-GFWR2
 - c. Pass & Seymour- 2097TRWR
 - 7. GFCI Receptacles: Weather Resistant and Tamper Resistant:
 - a. Hubbell Incorporated - GFTWRST20

- b. Leviton Mfg. Company Inc.-GFWT2
- c. Pass & Seymour- 2097TRWR

- 8. Receptacles: Tamper Resistant:
 - a. Hubbell Incorporated - BR20TR.
 - b. Leviton Mfg. Company Inc.-TBR20
 - c. Pass & Seymour- TR5362.

- 9. USB Charger Duplex Receptacles:
 - a. Hubbell Incorporated – USB20AC5
 - b. Leviton – T5834
 - c. Pass & Seymour - TR20USBAC6

2.2 RECEPTACLES

- A. Straight-Blade-Type Receptacles: Comply with UL 498, 20 amp.
- B. Straight-Blade and Locking Receptacles: Heavy-Duty grade 20 amp.
- C. GFCI Receptacles: Straight blade, feed-through type, Heavy-Duty grade, with integral NEMA WD 6, Configuration 5-20R duplex receptacle; complying with UL 498 and UL 943. Design units for installation in a 2-3/4-inch- (70-mm-) deep outlet box without an adapter.

2.3 CORD AND PLUG SETS

- A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.
 - 1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
 - 2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.4 SWITCHES

- A. Single- and Double-Pole Switches: Comply with UL 20, 20 amp.
- B. Snap Switches: Heavy-Duty grade, quiet type 20 amp, 120/277 volt.
- C. Line Voltage Dimmer: 120V, 2000 watt, slide to-off. Dimmer must be compatible with ballast or driver.
- D. 0-10V Dimmer: 120/277VAC, capable of three way, max wattage 1200 w 120VAC, 150000 277 VAC, Dimmer must be compatible with ballast or driver. 100% to 1% continuous.

2.5 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: **As selected by Architect.**
3. Material for Unfinished Spaces: Galvanized steel.
4. Material for Wet Locations: Heavy duty die-cast metal, gasketed with powdercoat finish and lockable tab. Listed and labeled "extra duty", "in-use", for use in "wet locations".

2.6 POKE-THROUGH ASSEMBLIES

- A. Description: Factory-fabricated and -wired assembly of below-floor junction box with multi-channelled, through-floor raceway/firestop unit and detachable matching floor service outlet assembly.
 1. Service Outlet Assembly: Recessed type with three (3) compartments that allow for up to three (3) duplex receptacles and/or 12 communication ports and/or 10 AV devices.
 2. Size: Selected to fit nominal 6-inch (100-mm) cored holes in floor and matched to floor thickness.
 3. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
 4. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors; and a minimum of four, 4-pair, Category 6 voice and data communication cables.

2.7 FINISHES

- A. Color:
 1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70.2.
 2. Wiring Devices Connected to Emergency Power System: Red.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install devices and assemblies level, plumb, and square with building lines.
- B. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
- C. Remove wall plates and protect devices and assemblies during painting.
- D. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.
- E. Install weather resistant receptacles in damp and wet locations per N.E.C. requirements.
- F. Install tamper resistant receptacles in homes, apartments, hotel rooms and daycares per N.E.C. requirements.

3.2 CONNECTIONS

- A. Ground equipment according to Division 16 Section "Grounding and Bonding."
- B. Connect wiring according to Division 16 Section "Conductors and Cables."
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

3.3 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing wiring devices and after electrical circuitry has been energized, test for proper polarity, ground continuity, and compliance with requirements.
 - 2. Test GFCI operation with both local and remote fault simulations according to manufacturer's written instructions.
- B. Remove malfunctioning units, replace with new units, and retest as specified above.

END OF SECTION 26 27 26

SECTION 26 28 13 – FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Cartridge fuses rated 600 V and less for use in switches.

1.3 SUBMITTALS

- A. Product Data: Include the following for each fuse type indicated:
 - 1. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
 - 2. Fuse size for elevator feeders and elevator disconnect switches.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain fuses from a single manufacturer.
- 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. Comply with NFPA 70.

1.5 PROJECT CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F (5 deg C) or more than 100 deg F (38 deg C), apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.6 COORDINATION

- A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size. Extra materials may not be allowed for publicly funded projects.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ferraz Shawmut, Inc.
2. Little Fuse.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuse; class and current rating indicated; voltage rating consistent with circuit voltage.
- B. End Caps: End caps shall be capable of being tested if fuse is blown.
- C. Indicating Feature: Fuse shall have an indicating feature which clearly indicates when fuse is blown.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- B. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

- A. Motor Branch Circuits: Class RK1, time delay.

3.3 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.4 IDENTIFICATION

- A. Install labels indicating fuse replacement information on inside door of each fused switch.

END OF SECTION 26 28 13

SECTION 26 28 16 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes individually mounted enclosed switches and circuit breakers used for the following:
 - 1. Feeder and branch-circuit protection.
 - 2. Motor and equipment disconnecting means.

1.3 DEFINITIONS

- A. GFCI: Ground-fault circuit interrupter.
- B. RMS: Root mean square.
- C. SPDT: Single pole, double throw.

1.4 SUBMITTALS

- A. Product Data: For each type of switch, circuit breaker, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each switch and circuit breaker.
 - 1. Dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings. Include the following:
 - a. Enclosure types and details for types other than NEMA 250, Type 1.
 - b. Current and voltage ratings.
 - c. Short-circuit current rating.
 - d. UL listing for series rating of installed devices.
 - e. Features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

2. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.
3. Qualification Data: Submit data for testing agencies indicating that they comply with qualifications specified in "Quality Assurance" Article.

1.5 QUALITY ASSURANCE

- A. 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.
- B. Comply with NFPA 70- Latest edition or edition enforced by state and local code authority.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

1.6 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with other construction, including conduit, piping, equipment, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

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:
 1. Fusible Switches:
 - a. Eaton Corp.; Cutler-Hammer Products, K-Series.
 - b. General Electric Co.; Electrical Distribution & Control Division, TH.
 - c. Siemens Energy & Automation, Inc., VBII.
 - d. Square D Co, 3110.

2.2 ENCLOSED SWITCHES

- A. Enclosed, Nonfusible Switch: NEMA KS 1, Type HD, with lockable handle.
- B. Enclosed, Fusible Switch, 800 A and Smaller: NEMA KS 1, Type HD, with clips to accommodate specified fuses, lockable handle with two padlocks, and interlocked with cover in closed position.

2.3 ENCLOSURES

- A. NEMA AB 1 and NEMA KS 1 to meet environmental conditions of installed location.

1. Outdoor Locations: NEMA 250, Type 3R.
2. Other Wet or Damp Indoor Locations: NEMA 250, Type 4.

2.4 FACTORY FINISHES

- A. Manufacturer's standard prime-coat finish ready for field painting.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance.
1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs as specified in "Basic Electrical Materials and Methods."
- B. Enclosure Nameplates: Label each enclosure with engraved metal or laminated-plastic nameplate mounted with corrosion-resistant screws.
- C. If the disconnect or enclosed circuit breaker is used as a Main Service Disconnect then the maximum available fault current shall be listed on the device to meet the requirements of NFPA 70:110.24. The labeling shall be engraved plastic. The maximum available fault current shall be obtained from the electrical utility for the secondary side of the utility transformer.

3.3 CONNECTIONS

- A. Install equipment grounding connections for switches and circuit breakers with ground continuity to main electrical ground bus.
- B. Install power wiring. Install wiring between switches and circuit breakers, and control and indication devices.
- C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.
- D. Maintain all necessary clearances per NFPA-70.

3.4 FIELD QUALITY CONTROL

A. Prepare for acceptance tests as follows:

1. Test insulation resistance for each enclosed switch, circuit breaker, component, and control circuit.
2. Test continuity of each line- and load-side circuit.

3.5 ADJUSTING

A. Set field-adjustable switches and circuit-breaker trip ranges.

3.6 CLEANING

- A. On completion of installation, inspect interior and exterior of enclosures. Remove paint splatters and other spots. Vacuum dirt and debris; do not use compressed air to assist in cleaning. Repair exposed surfaces to match original finish.

END OF SECTION 26 28 16

SECTION 26 43 13 – SURGE PROTECTION DEVICES FOR SERVICE ENTRANCE AND BRANCH PANELS

PART 1 - GENERAL

1.1 DESCRIPTION/SCOPE

- A. The Surge Protection Device (SPD) covered under this section includes all service entrance type surge protection devices suitable for use as Type 1 or Type 2 devices per UL1449 4th Edition, applied to the line or load side of the utility feed inside the facility.
- B. A SPD located at Service Entrance and Distribution and Branch Panels, Switchgear, Motor Control Centers, and Switchboard assemblies as indicated on the drawings.
- C. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to finish and install surge protection devices.

1.2 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 4th Edition.
 - 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. UL96A
 - 6. IEEE 1100 Emerald Book.
 - 7. National Fire Protection Association (NFPA 70: National Electrical Code).

1.3 SUBMITTALS/QUALITY ASSURANCE – SUBMIT THE FOLLOWING:

- A. Package must include shop drawings complete with all technical information, unit dimensions, detailed installation instructions, maintenance manual, recommended replacement parts list and wiring configuration.
- B. Copies of Manufacturer's catalog data, technical information and specifications on equipment proposed for use.
- C. Copies of documentation stating that the Surge Protection Device is listed by UL to UL1449 4th Edition, category code VZCA.
- D. Copies of actual let through voltage data in the form of oscillograph results for both ANSI/IEEE C62.41 Category C3 (combination wave) and B3 (Ring wave) tested in accordance with ANSI/IEEE C6245.

- E. Copies of Noise Rejection testing as outlined in NEMA LS1-1992 (R2000) Section 3.11. Noise rejection is to be measured between 50 kHz and 100 MHz verifying the devices noise attenuation. Must show multiple attenuation levels over a range of frequencies.
- F. Copies of test reports from a recognized independent testing laboratory, capable of producing 200kA surge current waveforms, verifying the suppressor components can survive published surge current rating on a per mode basis using the ANSI/IEEE C62.41 impulse waveform C3 (8 x 20 microsecond, 20kV/10kA). Test data on an individual module is not acceptable.
- G. Copy of warranty statement clearly establishing the terms and conditions to the building/facility owner/operator.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURER FOR **TYPE C SPD's for Service Entrance Application:**

- A. Current Technology – Transguard3 or TG3 Series **150kA** per mode surge rating or ASCO 560 series.
- B. Approved equivalent. Submission package must be received by engineer 2 weeks prior to bid date shall fully comply with all performance characteristics included in this specification.

2.2 MANUFACTURED UNITS/ ELECTRICAL REQUIREMENTS

- A. Refer to drawing for operating voltage, configuration and surge current capacity per mode for each location, or you may list locations and information here.
- B. 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 4th Edition, section 37.7.3. 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.
- C. Unit shall have no more than 10% deterioration or degradation of the UL1449 4th Edition Voltage Protection Rating (VPR) when exposed to a minimum of 5,000 repeated category C3 (20kV/10kA) surges. The SPD manufacturer must provide a test report validating the repetitive surge test was performed.
- D. Protection Modes UL1449 4th 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 circuits, (120/240) split phase shall be as follows and comply with test procedures outlined in UL1449 4th Edition section 37.6:

System Voltage	Mode	MCOV	B3 Ringwave 6kV, 500A	C3 Comb. Wave 20kV, 10kA	UL 1449 Third Edition VPR Rating
120/240, 120/208	L-N	150	490	980	700
	L-G	150	570	980	700
	N-G	150	640	1170	700
	L-L	300	500	1600	1200
277/480	L-N	320	450	1420	1200
	L-G	320	540	1540	1200
	N-G	320	570	1600	1000
	L-L	552	530	2600	2000

- E. Electrical Noise Filter- each unit shall include a high performance EMI/RFI noise rejection filter with a maximum attenuation of 54dB per MIL-STD-220B.
1. SPD shall include an EMI/RFI noise rejection filter for all L-N modes as well as a removable filter in the N-G mode.
- F. Integral Disconnect Switch (IF REQUIRED)
1. The device shall have an optional NEMA compliant safety interlocked integral disconnect switch with an externally mounted metal manual operator.
 2. The switch shall disconnect all ungrounded circuit conductors from the distribution system to enable testing and maintenance without interruption to the facility's distribution system.
 3. The switch shall be rated for 600Vac.
 4. The SPD device shall be tested to UL1449 4th Edition listed with the integral disconnect switch and the UL1449 VPR ratings shall be provided.
 5. The integral disconnect switch shall be capable of withstanding, without failure, the published maximum surge current magnitude without failure or damage to the switch.
 6. The line side of the integral disconnect shall be blocked off so that when the SPD is opened there is no direct access to the voltage present on the line side of the disconnect.
- G. The UL1449 Voltage Protective Rating (VPR) shall be permanently affixed to the SPD unit.
- H. The UL1449 Nominal Discharge Surge Current Rating shall be 20Ka
- I. The SCCR rating of the SPD shall be 200kAIC without the need for upstream over current protection.
- J. The SPD shall be listed as Type1 SPD, suitable for use in Type1 or Type2 applications.
- K. The SPD shall have the following monitoring options.
1. Time Date stamp, duration and magnitude for the following power quality events (sags, swells, surges, dropouts, outages, THD, frequency, Volts RMS per phase)
 2. SPD monitoring shall track surge protection and display it as a percentage
 3. SPD shall provide a surge counter with three categories to be defined as
Low Level surge (100A-500A) Medium Level surge (500A-3,000A) High Level surge (>3,000A)

2.3 APPROVED MANUFACTURER FOR **TYPE B SPD's for Branch Panel Application:**

- A. Current Technology – Transguard3 or TG3 Series 50 **kA** per mode surge rating or ASCO 560 series.
- B. Approved equivalent. Submission package must be received by engineer 2 weeks prior to bid date shall fully comply with all performance characteristics included in this specification.

2.4 MANUFACTURED UNITS/ ELECTRICAL REQUIREMENTS

- A. Refer to drawing for operating voltage, configuration and surge current capacity per mode for each location, or you may list locations and information here.
- B. 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 4th Edition, section 37.7.3. 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.
- C. Unit shall have no more than 10% deterioration or degradation of the UL1449 4th Edition Voltage Protection Rating (VPR) when exposed to a minimum of 5,000 repeated category C3 (20kV/10kA) surges. The SPD manufacturer must provide a test report validating the repetitive surge test was performed.
- D. Protection Modes UL1449 4th 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 circuits, (120/240) split phase shall be as follows and comply with test procedures outlined in UL1449 4th Edition section 37.6:

System Voltage	Mode	MCOV	B3 Ringwave 6kV, 500A	C3 Comb. Wave 20kV, 10kA	UL 1449 Third Edition VPR Rating
120/240, 120/208	L-N	150	490	980	700
	L-G	150	570	980	700
	N-G	150	640	1170	700
	L-L	300	500	1600	1200
277/480	L-N	320	450	1420	1200
	L-G	320	540	1540	1200
	N-G	320	570	1600	1000
	L-L	552	530	2600	2000

- E. Electrical Noise Filter- each unit shall include a high performance EMI/RFI noise rejection filter with a maximum attenuation of 54dB per MIL-STD-220B.
 - 1. SPD shall include an EMI/RFI noise rejection filter for all L-N modes as well as a removable filter in the N-G mode.

F. Integral Disconnect Switch (IF REQUIRED)

1. The device shall have an optional NEMA compliant safety interlocked integral disconnect switch with an externally mounted metal manual operator.
2. The switch shall disconnect all ungrounded circuit conductors from the distribution system to enable testing and maintenance without interruption to the facility's distribution system.
3. The switch shall be rated for 600Vac.
4. The SPD device shall be tested to UL1449 4th Edition listed with the integral disconnect switch and the UL1449 VPR ratings shall be provided.
5. The integral disconnect switch shall be capable of withstanding, without failure, the published maximum surge current magnitude without failure or damage to the switch.
6. The line side of the integral disconnect shall be blocked off so that when the SPD is opened there is no direct access to the voltage present on the line side of the disconnect.

G. The UL1449 Voltage Protective Rating (VPR) shall be permanently affixed to the SPD unit.

H. The UL1449 Nominal Discharge Surge Current Rating shall be 20kA

I. The SCCR rating of the SPD shall be 200kAIC without the need for upstream over current protection.

J. The SPD shall be listed as Type1 SPD, suitable for use in Type1 or Type2 applications.

K. The SPD shall have the following monitoring options available.

1. Time Date stamp, duration and magnitude for the following power quality events (sags, swells, surges, dropouts, outages, THD, frequency, Volts RMS per phase)
2. SPD monitoring shall track surge protection and display it as a percentage
3. SPD shall provide a surge counter with three categories to be defined as Low Level surge (100A-500A) Medium Level surge (500A-3,000A) High Level surge (>3,000A)

PART 3 - EXECUTION/INSTALLATION

3.1 STARTUP - 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:

- A. Verify voltage clamping levels utilizing a diagnostic test kit, comparing factory readings to installed readings.
- B. Verify N-G connection.
- C. Record information to a product signature card for each product installed.

- 3.2 Unit may be installed on either the line or load side of the main service disconnect. If installed on the line side unit shall be installed with an integral disconnect. If installed on the load side the unit shall be installed on the largest breaker size available. If installed lead length exceeds 5' installer shall use a low impedance (HPI) cable to reduce the lead lengths effect on the installed performance of the SPD.

PART 4 - PRODUCT WARRANTY

- 4.1 Warranty on defective material and workmanship shall be for 15 years.

- 4.2 Copy of Warranty to be sent with submittal.

END OF SECTION 26 43 13

SECTION 26 51 00 – INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 REFERENCES

- A. ANSI/NFPA 70, National Electrical Code
- B. IEEE C62.41, Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits
- C. FCC 47 CFR Part 15, Federal Code of Regulation (CFR) testing standard for electronic equipment
- D. IESNA LM-79, Electrical and Photometric Measurements of Solid-State Lighting Products
- E. IESNA LM-80, Approved Method for Measuring Lumen Maintenance of LED Light Sources
- F. UL1598, Standard for Safety of Luminaires
- G. NEMA SSL 3-2010, High-Power White LED Binning for General Illumination

1.3 SUMMARY

- A. This Section includes interior lighting fixtures, lighting fixtures mounted on exterior building surfaces, lamps, ballasts, emergency lighting units, and accessories.

1.4 SUBMITTALS

- A. Product Data: For each type of lighting fixture indicated, arranged in order of fixture designation. Include data on features, accessories, and the following:
 - 1. Dimensions of fixtures.
 - 2. Certified results of independent laboratory tests for fixtures and lamps for electrical ratings and photometric data.
 - 3. Certified results of laboratory tests for fixtures and lamps for photometric performance.
 - 4. Emergency lighting unit battery and charger.
 - 5. Fluorescent and high-intensity-discharge ballasts.
 - 6. Types of lamps.

- B. Shop Drawings: Show details of nonstandard or custom fixtures. Indicate dimensions, weights, method of field assembly, components, features, and accessories.
 - 1. Wiring Diagrams: Detail wiring for fixtures and differentiate between manufacturer-installed and field-installed wiring.
- C. Submit product data on luminaires. Product data to include, but not limited to materials, finishes, approvals, photometric performance, and dimensional information.
- D. Maintenance Data: For lighting fixtures to include in maintenance manuals specified in the front-end documents.

1.5 DRAWINGS

- A. The drawings, which constitute a part of these specifications, indicate the general location of the luminaires. Data presented on these drawings is as accurate as preliminary surveys and planning can determine until final equipment selection is made. Accuracy is not guaranteed and field verification of all dimensions, routing, etc., is required.
- B. Photometric layout shall meet or exceed the criteria of the fixtures indicated on drawings.

1.6 QUALITY ASSURANCE

- A. Fixtures, Emergency Lighting Units, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- B. Comply with NFPA 70- Latest edition or edition enforced by state and local code authority.
- C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.
- D. LED Luminaires
 - 1. Manufactures of LED luminaires shall demonstrate a suitable testing program incorporating high heat, high humidity, and thermal shock test regimens to ensure system reliability and to substantiate lifetime claims.
 - 2. The use of IESNA LM-80 data to predict luminaire lifetime is not acceptable.
 - 3. At time of manufacture, electrical and light technical properties shall be recorded for each luminaire. At a minimum, this should include lumen output, CCT, and CRI. Each luminaire shall utilize a unique serial numbering scheme. Technical properties must be made available for a minimum of 5 years after the date of manufacture.
 - 4. Luminaires shall be provided with a 5-year warranty covering LEDs, drivers, paint, and mechanical components.

1.7 COORDINATION

- A. Fixtures, Mounting Hardware, and Trim: Coordinate layout and installation of lighting fixtures with ceiling system and other construction.

1.8 WARRANTY

- A. General Warranty: The contractor shall warranty all work for one year after acceptance of project.

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 products indicated in the Fixture schedule on the drawings. Manufacture shall submit for prior approval where required at least (10) days prior to bid.
- B. Subject to compliance with these specifications, luminaires shall be manufactured by the manufacturer indicated on the drawings or prior approved equivalent.

2.2 FIXTURES AND FIXTURE COMPONENTS, GENERAL

- A. Metal Parts: Free from burrs, sharp corners, and edges.
- B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.
- C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position.

2.3 EXIT SIGNS

- A. Internally Lighted Signs: As follows:
 - 1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum rated lamp life.

2.4 LAMPS

- A. Fluorescent Color Temperature and Minimum Color-Rendering Index: Refer to drawings.
- B. 4-foot lamps shall be 28-watt, 68,000 rated life 12 hour on with instant start ballast and 90,000 12 hours on with programmable start. Initial lumens 2650, minimum CRI of 82 and 96% lumen maintenance. The approved lamp is Philips Energy Advantage.
- C. All fluorescent lamps shall be low on mercury.

2.5 LED LUMINAIRES

- A. General: Except as otherwise indicated, provide LED luminaires, of types and sizes indicated on fixture schedules.
- B. Material and specifications for each luminaire are as follows:
 - 1. Each luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply)
 - 2. Each luminaire shall be rated for a minimum operational life of 50,000 hours and to LM-70 lumen depreciation standards. This life rating must be conducted at 40°C ambient temperature.
 - 3. The rated operating temperature range shall be -30°C to +40°C.
 - 4. Each luminaire can operate above 100°F [37°C], but not expected to comply with photometric requirements at elevated temperatures.
 - 5. Photometry must be compliant with IESNA LM-79 and shall be conducted at 25°C ambient temperature.
 - 6. The individual LEDs shall be constructed such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.
 - 7. Luminaire shall be constructed such that LED modules may be replaced or repaired without replacement of whole luminaire.
 - 8. Each luminaire shall be listed with Underwriters Laboratory, Inc. under UL1598 for luminaires, or an equivalent standard from a nationally recognized testing laboratory.
- C. Technical Requirements
 - 1. Electrical
 - a. Power Consumption: Maximum power consumption allowed for the luminaire shall be determined by application. The luminaire shall not consume power in the off state.
 - b. Operation Voltage: The luminaire shall operate from a 60 HZ \pm 3 HZ AC line over a voltage ranging from 108 VAC to 305 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.
 - c. Power Factor: The luminaire shall have a power factor of 0.90 or greater.
 - d. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20 percent.
 - e. Each Luminaire shall have UL Listed Class II power supplies. Class I power supplies will not be acceptable.
 - f. Operational Performance: The LED circuitry shall prevent visible flicker to the unaided eye over the voltage range specified above.
 - g. RF Interference: LED Drivers must meet Class A emission limits referred to in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise.
 - h. Drivers shall have a Class A sound rating.
 - 2. Thermal Management
 - a. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.
 - b. The LED manufacturer's maximum thermal pad temperature for the expected life shall not be exceeded.
 - c. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.

- d. The luminaire shall have a minimum heat sink surface such that LED manufacturer's maximum junction temperature is not exceeded at maximum rated ambient temperature.
- e. The heat sink material shall be aluminum.

2.6 FIXTURE SUPPORT COMPONENTS

- A. Comply with "Basic Electrical Materials and Methods," for channel- and angle-iron supports, and nonmetallic channel and angle supports.
- B. Rod Hangers: 3/16-inch- (5-mm-) minimum diameter, cadmium-plated, threaded steel rod.
- C. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.
- D. Aircraft Cable Support: Use cable, anchorages, and intermediate support recommended by fixture manufacturer.

2.7 FINISHES

- A. Fixtures: Manufacturer's standard, unless otherwise indicated.
 - 1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
 - 2. Metallic Finish: Corrosion resistant.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Fixtures: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer's written instructions and approved submittal materials. Install lamps in each fixture.
- B. Support for Fixtures in or on Grid-Type Suspended Ceilings: Use grid for support.
 - 1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches (150 mm) from fixture corners.
 - 2. Fixtures of Sizes Less Than Ceiling Grid: Arrange as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.
- C. Suspended Fixture Support: As follows:
 - 1. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.

3.2 CONNECTIONS

- A. Ground equipment.
 - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

3.3 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Provide instruments to make and record test results.
- C. Tests: As follows:
 - 1. Verify normal operation of each fixture after installation.
 - 2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation.
 - 3. Verify normal transfer to emergency source and retransfer to normal.
 - 4. Report results in writing.
- D. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.
- E. Corrosive Fixtures: Replace during warranty period.

3.4 CLEANING AND ADJUSTING

- A. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.

END OF SECTION 26 51 00

SECTION 26 56 00 – EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes exterior lighting units with luminaires, lamps, ballasts, poles/support structures, and accessories.

1.3 DEFINITIONS

- A. Lighting Unit: A luminaire or an assembly of luminaires complete with a common support, including pole, post, or other structure, and mounting and support accessories.
- B. Luminaire (Light Fixture): A complete lighting device consisting of lamp(s) and ballast(s), when applicable, together with parts designed to distribute light, to position and protect lamps, and to connect lamps to power supply.

1.4 SUBMITTALS

- A. Product Data: For each type of lighting unit indicated, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:
 - 1. Materials and dimensions of luminaires and poles.
 - 2. Certified results of independent laboratory tests for fixtures and lamps for electrical ratings and photometric data.
 - 3. Certified results of laboratory tests for fixtures and lamps for photometric performance.
 - 4. High-intensity-discharge luminaire ballasts.
 - 5. LED and Driver information.
- B. Shop Drawings: Anchor-bolt templates keyed to specific poles and certified by manufacturer.
- C. Maintenance Data: For lighting units to include in maintenance manuals specified in specifications.

1.5 QUALITY ASSURANCE

- A. Luminaires and Accessories: Listed and labeled as defined in NFPA 70, Article 100, for their indicated use, location, and installation conditions by a testing agency acceptable to authorities having jurisdiction

- B. Comply with NFPA 70- Latest edition or edition enforced by state and local code authority.

1.6 DELIVERY, STORAGE, AND HANDLING OF POLES

- A. Store poles on decay-resistant treated skids at least 12 inches (300 mm) above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.
- B. Retain factory-applied pole wrappings on metal poles until just before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

1.7 WARRANTY

- A. General Warranty: The contractor shall warranty all work for one year after acceptance of the project for HID and fluorescent and (5) year after acceptance of the project for LED.

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 products indicated in the Fixture schedule on the drawings. Products indicated in the fixture schedule shall meet the requirements of this specification. Manufacture shall submit for prior approval where required at least (10) days prior to bid.

2.2 HID / FLUORESCENT LUMINAIRES

- A. Metal Parts: Free from burrs, sharp corners, and edges.
- B. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.
- C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames, lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in operating position. Provide for door removal for cleaning or replacing lens. Arrange to disconnect ballast when door opens.
- D. High-Intensity-Discharge Ballasts: Comply with ANSI C82.4. Constant wattage autotransformer or regulating high-power-factor type, unless otherwise indicated.
 - 1. Ballast Fuses: One in each ungrounded supply conductor. Voltage and current ratings as recommended by ballast manufacturer.
 - 2. Single-Lamp Ballasts: Minimum starting temperature of minus 40 deg C.
 - 3. Open-circuit operation will not reduce average life.

4. High-Pressure Sodium Ballasts: Equip with a solid-state igniter/starter having an average life in pulsing mode of 10,000 hours at an igniter/starter case temperature of 90 deg C.
5. Noise: Uniformly quiet operation, with a noise rating of B or better.

2.3 LUMINAIRE SUPPORT COMPONENTS

- A. Wind-Load Strength of Total Support Assembly: Adequate to carry support assembly plus luminaires at indicated heights above grade without failure, permanent deflection, or whipping in steady winds of 110 mph (160 km/h) with a gust factor of 1.3. Support assembly includes pole or other support structures, brackets, arms, appurtenances, base, and anchorage and foundation.
- B. Finish: Match finish of pole/support structure for arm, bracket, and Tenon mount materials.
- C. Mountings, Fasteners, and Appurtenances: Corrosion-resistant items compatible with support components.
 1. Materials: Will not cause galvanic action at contact points.
 2. Mountings: Correctly position luminaire to provide indicated light distribution.
 3. Anchor Bolts, Nuts, and Washers: Hot-dip galvanized after fabrication unless stainless-steel items are indicated.
 4. Anchor-Bolt Template: Plywood or steel.
- D. Pole/Support Structure Bases: Anchor type with hold-down or anchor bolts, leveling nuts, and bolt covers.
- E. Pole-Top Tenons: Fabricated to support luminaire or luminaires and brackets indicated, and securely fastened to pole top.
- F. Concrete for Pole Foundations: Comply with "Cast-in-Place Concrete."
 1. Design Strength: 3000-psi (20.7-MPa), 28-day compressive strength.

2.4 LED LUMINAIRES

- A. General: Except as otherwise indicated, provide LED luminaires, of types and sizes indicated on fixture schedules. The luminaires need to meet the requirements below.
- B. Material and specifications for each luminaire are as follows:
 1. Each luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply).
 2. Each luminaire shall be rated for a minimum operational life of 50,000 hours at an average operating time of 11.5 hours per night. This life rating must be conducted 40C ambient temperature.
 3. The rated operating temperature range shall be -30°C to +40°C.

4. Each luminaire is capable of operating above 100°F [37°C], but not expected to comply with photometric requirements at elevated temperatures.
5. Photometry must be compliant with IESNA LM-79 and shall be conducted at 25°C ambient temperature.
6. The individual LEDs shall be constructed such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.
7. Luminaire shall be constructed such that LED modules may be replaced or repaired without replacement of whole luminaire.
8. Each luminaire shall be listed with Underwriters Laboratory, Inc. under UL1598 for luminaires, or an equivalent standard from a nationally recognized testing laboratory.

C. Technical Requirements

1. Electrical
 - a. Power Consumption: Maximum power consumption allowed for the luminaire shall be determined by application. The luminaire shall not consume power in the off state.
 - b. Operation Voltage: The luminaire shall operate from a 60 HZ \pm 3 HZ AC line over a voltage ranging from 108 VAC to 305 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.
 - c. Power Factor: The luminaire shall have a power factor of 0.90 or greater.
 - d. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20 percent.
 - e. Surge Suppression: The luminaire on-board circuitry shall include fused surge protection devices (SPD) to withstand high repetition noise transients as a result of utility line switching, nearby lightning strikes, and other interference. The SPD shall protect the luminaire from damage and failure for common mode transient peak voltages up to 10 kV (minimum) and transient peak currents up to 5 kA (minimum). SPD shall conform to UL 1449 depending of the components used in the design. SPD performance shall be tested per the procedures in ANSI/IEEE C62.41-1992 (or current edition) for category C (standard). The SPD shall fail in such a way as the Luminaire will no longer operate. The SPD shall be field replaceable.
 - f. Each Luminaire shall have integral UL Listed Class II power supplies. Class I power supplies will not be acceptable.
 - g. Operational Performance: The LED circuitry shall prevent visible flicker to the unaided eye over the voltage range specified above.
 - h. RF Interference: LED Drivers must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise.
 - i. Drivers shall have a Class A sound rating.

2. Photometric Requirements

- a. Optical Assemblies: LEDs shall be provided with discreet over optical elements to provide IESNA Type II, III, IV or V distributions. Additional distributions for spill light control shall be utilized when light trespass must be mitigated. Mitigation must take place without external shielding elements. Optical assemblies shall have a minimum efficiency of 85% regardless of distribution type. For Type II and Type III distributions street side efficiencies shall be a minimum of 80%. All LEDs and optical assemblies shall be mounted parallel to the ground. All LEDs shall provide the same optical pattern such that catastrophic failures of individual LEDs will not constitute a loss in the distribution pattern.
- b. Illuminance: The illuminance shall not decrease by more than 30% over the expected operating life. The measurements shall be calibrated to standard photopic calibrations.
- c. Light Color/Quality: The luminaire shall have a correlated color temperature (CCT) range of 4,000K to 4,500K. The color rendition index (CRI) shall be 70 or greater. Binning of LEDs shall conform to ANSI/ G. NEMA SSL 3-2010.
- d. Backlight-Uplight-Glare: The luminaire shall not allow more than 10 percent of the rated lumens to project above 80 degrees from vertical. The luminaire shall not allow more than 2.5 percent of the rated lumens to project above 90 degrees from vertical. Backlight and Glare ratings as per fixture schedule and calculated per IESNA TM-15.

3. Thermal Management

- a. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.
- b. The LED manufacturer's maximum thermal pad temperature for the expected life shall not be exceeded.
- c. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.
- d. The luminaire shall have a minimum heat sink surface such that LED manufacturer's maximum junction temperature is not exceeded at maximum rated ambient temperature.
- e. The heat sink material shall be aluminum.

4. Physical and Mechanical Requirements

- a. The luminaire shall be a single, self-contained device, not requiring on-site assembly for installation. The power supply for the luminaire shall be integral to the unit.
- b. The assembly and manufacturing process for the LED luminaire shall be designed to assure all internal components are adequately supported to withstand mechanical shock and vibration from high winds and other sources.
- c. Luminaires shall be capable of withstanding cyclical loading in (G = Acceleration of Gravity): a minimum peak acceleration level of 3.0 G peak-to-peak sinusoidal loading with the internal driver installed, for a minimum of 100,000 cycles without failure of any luminaire parts. Testing to be performed in three planes: a horizontal plane parallel to

the direction of mounting, a horizontal plane perpendicular to the direction of mounting and the vertical plane.

- d. The housing shall be designed to prevent the buildup of water on the top of the housing. Exposed heat sink fins shall be oriented so that water can freely run off the luminaire, and carry dust and other accumulated debris away from the unit.
- e. The optical assembly of the luminaire shall be protected against dust and moisture intrusion per the requirements of IP-66 (minimum) to protect all optical components
- f. The electronics/power supply enclosure shall meet the requirements for NEMA/UL wet location.
- g. Each mounted luminaire may be furnished with or without a photoelectric unit receptacle as per fixture schedule.
- h. Door shall be hinged and secured to the housing in a manner to prevent its accidental opening.
- i. The circuit board and power supply shall be contained inside the luminaire. Electrolytic capacitors used in the power supplies shall be rated for -40°F to 220°F (-40°C to +105°C), long life (> 5000 hours), and operated at no more than 70% of their rated voltage, and 70% of rated current.

5. Materials

- a. Housings shall be fabricated from materials that are designed to withstand a 3000-hour salt spray test as specified in ASTM Designation: B117.
- b. Each refractor or lens shall be made from UV inhibited high impact plastic such as acrylic and be resistant to scratching.
- c. Polymeric materials (if used) of enclosures containing either the power supply or electronic components of the luminaire shall be made of UL94VO flame retardant materials. The len(s) of the luminaire are excluded from this requirement.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Concrete Foundations: Construct according to Section "Cast-in-Place Concrete."
 - 1. Comply with details for reinforcement and for anchor bolts, nuts, and washers. Verify anchor-bolt templates by comparing with actual pole bases furnished.
 - 2. Finish for Parts Exposed to View: Trowel and rub smooth. Comply with Section "Cast-in-Place Concrete" for exposed finish.
- B. Install poles as follows:

1. Use web fabric slings (not chain or cable) to raise and set poles.
2. Mount pole to foundation with leveling nuts, and tighten top nuts to torque level recommended by pole manufacturer.
3. Secure poles level, plumb, and square.
4. Grout void between pole base and foundation. Use nonshrinking or expanding concrete grout firmly packed in entire void space.
5. Use a short piece of 1/2-inch- (13-mm-) diameter pipe to make a drain hole through grout. Arrange to drain condensation from interior of pole.

- C. Lamp luminaires with indicated lamps according to manufacturer's written instructions. Replace malfunctioning lamps.

3.2 CONNECTIONS

- A. Ground equipment.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.

- B. Ground metal poles/support structures according to Section "Grounding."

3.3 FIELD QUALITY CONTROL

- A. Inspect each installed unit for damage. Replace damaged units.
- B. Advance Notice: Give dates and times for field tests.
- C. Provide instruments to make and record test results.
- D. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

3.4 CLEANING AND ADJUSTING

- A. Clean units after installation. Use methods and materials recommended by manufacturer.
- B. Contractor to aim any adjustable luminaries per architect, engineer or owner's requirements. Contractor to provide aiming at night and provide all necessary equipment needed to aim luminaires.

END OF SECTION 26 56 00

DIVISION 27 - COMMUNICATIONS

270526	GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS
271300	VOICE AND DATA SYSTEMS

SECTION 27 05 26 – GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Contract Drawings.

1.2 RELATED SECTIONS

- A. Applicable Division 27 and 28 sections.

1.3 SUMMARY

- A. Work Included:
 - 1. Communications equipment power system grounding.
 - 2. Communications system grounding.
 - 3. Communications equipment and raceway grounding and bonding.
 - 4. Equipment grounding.
 - 5. Conductor shield grounding.
 - B. Related work specified elsewhere. Refer to individual Division 26, 27 and 28 sections for specific grounding requirements in addition to those included in this specification.
- #### 1.4 CODES, STANDARDS AND REFERENCES
- A. NFPA-70: National Electric Code (NEC)
 - B. NEC Article 250
 - C. NEC Article 800
 - D. ANSI J-STD-607A
 - E. UL Compliance: Applicable requirements of UL Standards Nos. 467 "Electrical Grounding and Bonding Equipment," and 869, "Electrical Service Equipment," pertaining to grounding and bonding of systems, circuits and equipment. In addition, compliance with UL Std. 486A, "Wire Connectors." Grounding and bonding products are to be UL listed and labeled for their intended usage.
 - F. IEEE Compliance: Applicable requirements and recommended installation practices of IEEE Standards 80, 81, 141 and 142 pertaining to grounding and bonding of systems, circuits and equipment.
 - G. Comply with requirements in Section 26 05 26 - Grounding and Bonding for Electrical Systems for additional grounding requirements.



1.5 PROJECT COORDINATION

- A. Coordination with other Divisions.
- B. Refer to Basic Telecommunications Requirements.

1.6 SUBMITTALS

- A. Procedures
 - 1. Submit product data under provisions of Division 1.
 - 2. Refer to Section 27 05 00 - Basic Telecommunications Requirements for specific submittal requirements.
- B. Submittals General:
 - 1. Provide grounding product data cut sheets.
 - 2. Provide grounding product samples as requested.
 - 3. Provide one line diagram of grounding system including all points of connection and routing of grounding or conductors.
- C. Record Drawings
 - 1. Provide as-built drawings of the installed grounding system
 - 2. Refer to requirements in 27 05 00 - Basic Telecommunications Requirements.

1.7 QUALITY ASSURANCE

- A. Manufacturer: Each manufacturer shall have been in the business of manufacturing the specified system(s) equipment and software for at least five years.
- B. Contractor experience: Contractor shall have at least five years' experience in installing grounding systems for electronic systems and equipment of the type used for projects of similar size and complexity; and shall provide documentation id requested on three successful projects completed over the past five years of similar size and complexity.

1.8 WARRANTY

- A. Refer to 27 05 00 - Basic Telecommunication Requirements for specific Warranty Requirements.

1.9 RELATED WORKS COORDINATION

- A. Coordinate with Division 26 Contractor.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Bonding equipment, including exothermic or removable screw type.
- B. Ground Bus Bars:

1. Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
2. Ground Bus Bar: Each Telecommunications Room (TR) depicted in the drawings shall be provisioned with a Telecommunications Grounding Busbar (TGB) meeting or exceeding the following requirements:
 - a. Each bar shall be installed with isolated standoff mounts.
 - b. Minimal bar size is 1/4" thick x 2" wide x 10" long.
 - c. The TGB's shall be electroplated and pre-drilled for connector attachment to 6 AWG ground cables.
 - d. Holes spaced 1-1/8 inches (28 mm) apart.
3. Stand-Off Insulators: Comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.
- C. Ground conductor shall be provided, installed and utilized for equipment, termination, cable tray, equipment rack and computer equipment grounding, conduits, racks and other equipment including telephone systems.
- D. All grounding material and work shall comply with the National Electric Code (NEC Chapter 8), Local and State regulations as well as ANSI-J-STD-607-A.
- E. Coordinate with the electrical power trades for grounding wiring interface to an approved connection to the building electrical power service panel ground source. Provide #6 AWG stranded copper bonding conductor extending from the electrical ground source to the Telecommunication Main Grounding Busbar (TMGB) located in the Telecommunications or equipment room.
- F. 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. Design Selection: B-Line #SB-477-K or equal.
- G. Telecommunications Bonding Backbone (TBB) Conductors:
 1. The TBB shall be installed to connect the TMGB to each TGB located in Telecommunications or equipment rooms. Separate TBB conductors shall run from the TMGB to each Telecommunications or equipment rooms on other building levels. TBB can be extended to TGB in Telecommunications or equipment rooms on the same level.
 2. TBB Conductors shall be installed in 1/2" EMT.
 3. TBB conductors shall green and sized according to distance as follows:
 - a. #6 AWG for distances less than 13'
 - b. #4 AWG for distances less than 13' to 20'
 - c. #3 AWG for distances less than 20' to 26'
 - d. #2 AWG for distances less than 26' to 33'
 - e. #1 AWG for distances less than 33' to 44'
 - f. #1/0 AWG for distances less than 44' to 52'
 - g. #2/0 AWG for distances less than 52' to 66'
 - h. #3/0 AWG for distances greater than 66'

4. #6 AWG stranded TBB with green jacket shall be installed between the TGB in each telecommunications or equipment room and each:
 - a. Enclosed equipment cabinet
 - b. Tray and ladder rack systems

PART 3 - EXECUTION

3.1 General

- A. Provide a separate, insulated, equipment grounding conductor in all branch circuit conduits.
- B. Use minimum No. 6 AWG copper conductor for communications service grounding conductor. Leave 10 feet slack conductor at terminal board or cabinet.
- C. Provide isolated and insulated ground conductors for all microprocessor and data processing equipment. The isolated Equipment Ground Conductor (EGG) and neutral conductor for a given branch circuit shall not be shared across branch circuits.
- D. Tighten grounding and bonding connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values for connectors and bolts. Where manufacturer's torque requirements are not indicated, connections are to be tightened to comply with tightening torque values specified in UL 486A to assure permanent and effective grounding.
- E. Provide code-sized ground cable bonding jumpers, installed with ground clamps, across all conduit expansion couplings and fittings, including flexible steel conduit used as expansion fittings.
- F. Provide a corrosion-resistant finish to field connections where factory applied protective coatings have been destroyed.
- G. All continuous runs of cable tray and all isolated sections of cable tray shall be bonded and grounded.
- H. Provide an equipment grounding conductor in all nonmetallic conduits.
- I. All receptacles and switches shall be provided with ground jumper from outlet box to ground terminal of the device. Exception isolated ground receptacles.
- J. Provide parallel equipment bonding jumper for parallel conduit feeders.
- K. Provide bonding jumpers around all concentric or eccentric knockouts.
- L. The tops of ground rods driven outdoors shall be 6-inches below final grade. Prior to bonding rods, measure and record the earth resistance to each rod and document.

END OF SECTION 27 05 26

SECTION 27 13 00 – VOICE AND DATA SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY:

- A. This section includes the following: Inside station cables, multi-pair inside telephone cables, fiber optic cable, backboards, racks, inner duct, cross connects and outlets for voice and data use to each station outlet location as shown on the Drawings.
 - 1. Conduits for voice and data between buildings as shown on the Drawings or as indicated in specifications.
 - 2. Backboards, telephone cable connecting patch panels, relay rack, mounting brackets, splice closures, building protectors, and associated hardware for bundling, racking and cross-connecting voice cables as shown on the Drawings or indicated in specifications. Provide 20 percent future capacity on all patch panels and connecting blocks.
 - 3. Backboards, relay rack, mounting brackets and associated hardware for bundling, racking and cross-connecting data cables as shown on the Drawings or as indicated in specifications.
 - 4. Fiber cables, fiber distribution panels, and associated hardware for bundling, racking and terminating fiber cable as shown on the Drawings.
 - 5. Category 6, four-pair communications cable (for voice) and Category 6 (Cat 6), four-pair communications cable (for data) to each voice/data outlet location as indicated on Drawings. Furnish a four (4) position face plate at each location.
 - 6. 4 position, 8 conductor (4 pair) modular voice/data jacks at each telephone/data outlet shown on Drawings and as specified herein.
 - 7. Single, 8 conductor (4 pair) modular voice jack at each telephone only outlet shown on Drawings and as specified herein.
 - 8. Relay racks with patch panels, and wire management frame for terminating data and voice station cables.
 - 9. Duplex receptacles and ground bus, and connection of ground bus to building system.
 - 10. Station wiring conduit and conduits between communication closets, and inner duct as described on the Drawings.

1.2 QUALITY ASSURANCE:

- A. All work and equipment shall conform to the applicable portions of the following specifications, codes and regulations:

1. Building Industry Consulting Services International (BICSI)
2. Telecommunications Distribution Methods Manual
3. BOCS and AT&T Plant Standards
4. ANSI/EIA/TIA Standards
5. National Electrical Code (NEC)
6. State Codes

B. Maintenance Considerations:

1. The cable and wire system shall be installed to maximize the safety, maintainability, and performance effectiveness of maintenance personnel and minimize the demands upon skills, training, and manpower. Splices/terminations shall be placed and supported with convenient accessibility so as to maximize the efficiency and ease with which it can be maintained. No cables shall be spliced unless as shown on plans or approved by Engineer.

C. Cable and wire identification, testing, and documentation shall be specified in Part 3.00 herein.

1.3 SHOP DRAWINGS:

- A. Shop drawings shall be submitted for review and shall include complete catalog and other information shown to describe the cables, wire, and equipment proposed to be furnished and numbered locations for all data and voice locations.

PART 2 - PRODUCTS

2.1 MULTI-PAIR INSIDE TELEPHONE CABLE (RISER):

- A. Inside telephone, multi-pair, voice cable shall be 24 AWG copper, communications riser cable (CMR), unshielded twisted pair, Category 3. Cable shall contain pair quantity as shown on the drawings. Cable shall comply with the following standards and be suitable for the following applications:

-Digital Voice
-ISDN

-IBM 36/38/AS400
-IEEE 802.3 (1 Base 5, 10BaseT)

2.2 VOICE/DATA STATION CABLE:

- A. Industry standard Category 6 communications wire and cable shall be used for all telephone applications. Station Cable shall be four-pair, unshielded, twisted pair, Category 6, Inside-station cable, and shall be constructed of solid 23 gauge annealed copper. Cable shall have Category 6 transmission characteristics as specified by ANSI/EIA/TIA-568B. Each conductor shall be insulated with a continuous layer of fluorinated ethylene propylene (FEP). The sheath shall be all weather, flame resistant. Station wire shall be constructed of 4 twisted pair sharing one sheath. General Cable GenSpeed 6500, Hubbell NEXTSPEED or prior approved equal.
- B. Voice/Data station wiring shall be Category 6 (Cat 6) communications wire and cable. Station Cable shall be four-pair, unshielded, twisted pair, inside-station cable, and shall be constructed of solid 23 gauge annealed copper. Each conductor shall be insulated with a continuous layer

of fluorinated ethylene propylene (FEP). The sheath shall be all weather, flame resistant, polyvinyl chloride. Station wire shall be constructed of 4 twisted pair sharing one sheath. Voice/Data cable shall be terminated in a 110 rack mounted patch panel. The use of 66 or 110 patch panels is not allowed for station. Cable shall have Category 6 transmission characteristics as specified by ANSI/EIA/TIA-568B and meet the following performance characteristics. General Cable GenSpeed 6500, Hubbell NEXTSPEED or prior approved equal.

Highest Test Freq.	350 MHz
Min. 10dB ACR Power Sum	100 MHz
Min. 0dB ACR Power Sum	165 MHz
Attenuation less than/equal to 33dB	200 MHz

- C. Cables routed in air plenum shall have a sheath and conductor insulation constructed of material so as to be classified as type CMP as defined by the NEC 800-3(b)(3).

- D. Cable jacket color shall be as follows:

White	Voice
Blue	Data

Final color shall be approved by the engineer in shop drawings. Engineer has the right to change color of the cables.

2.3 CROSS-CONNECT WIRE:

- A. Cross-connect wire and fiber jumpers shall be furnished and installed by Contractor. Contractor shall provide enough patch cables and fiber jumpers for all possible connections. Cross-connect must be factory certified Category 6 for voice connections and compatible with Category 6 for data wiring. The fiber jumper shall be a duplex, buffered, graded-index fiber, Kevlar yarn over each fiber cladding, and a flame-retardant PVC jacket.

2.4 COMMUNICATIONS OUTLET:

- A. Telephone and data outlets shall be a combination voice/data communication unit. Wall mounted outlets shall be flush mounted in a double gang utility box and covered with voice and data device plates. Raceway mounted outlets shall be flush mounted and covered with voice and data device plates. Complete outlet shall consist of utility box, communication assembly devices, cover plate, and jack inserts. All voice/data outlet inserts shall be eight (8) position/eight (8) conductor, insulation displacement, Hubbell part number HXJ6xx only, EIA/TIA 568B Category 6 compliant.
- B. Communications outlets shall be furnished by one manufacturer. Outlet shall be furnished with 4-position, Category 6 compliant, RJ-45 modular jacks. Each outlet shall consist of voice jacks and data jacks in the locations as shown on Drawings. Voice only outlets shall consist of one (1) voice jack. Data jacks shall be compatible with Category 6 wiring.
- C. Outlets shall consist of the following items:
1. Face Plate.
 2. Data Jack Inserts.
 3. Voice Jack Inserts.
 4. Blank Inserts.

- D. The device plate colors shall be as selected by architect per space.

2.5 CONNECTING BLOCKS:

- A. Voice feeder and station cables shall be terminated on Category 6 compliant, type 110 patch panels. All panels shall be 48-port type.
- B. The patch panels shall support 100 MHz cross connect transmission for UTP cabling systems utilizing Category 6 performance rated cable. Terminations shall use 110-IDC (Insulating Displacement Connector) field made continuous to the 8-pin modular jack on front of panel via Printed Circuit interconnections. The panel shall mount on nineteen (19") inch rack and be fully EIA/TIA T568B compliant. Panels will be T568B wiring.
- C. Outlets shall have circuit identification holders and labels. The labels shall be used to identify outlets per the face plate detail on drawings.

2.6 RELAY RACK:

- A. Relay rack shall be open frame design, tubular metal, 19" wide x 84" high for 19" rack mounting equipment. Panel mounting holes are to be #12-24 tapped on EIA universal spacing on both front and rear of rack. Rack to be self supporting with base suitable to floor mount. Rack shall be suitable for front and rear mounting of patch panels and/or Owner furnished concentrator hubs. Rack shall be furnished with 3.5" high wire management frames and supports as shown on the Drawings, or as required for installation. Rack will be furnished with a horizontal manager for each patch panel, 2 vertical managers and a Chatsworth cable run kit.
- B. Relay rack to be Bud Industries ARR-1272, Homaco 19-84-T2S, ICCMSR1984 or approved equal. Wire management support shall be two-position organizer panel.

2.7 CABLE MANAGEMENT:

- A. Cable management or cable organizers shall be metal panels equipped with distributing rings and are to be used to provide vertical and horizontal paths between terminal blocks for routing cables. Cable management or cable organizers shall be a combination style to handle front, rear, vertical and horizontal cable/patch cords pathways in a standard nineteen (19") inch rack space. The oversized front rings meet larger-capacity requirements for Category 6 patch cords and rear management reduces tension stress/bending radius of cables routed from inside or outside of vertical channels. The panel will have metal legs to allow cables to pass behind the panel. A white, fire-retardant polycarbonate plastic frame 110-type jumper trough shall be provided. Trough shall be designed to accommodate patch cords and outlet cables. Troughs shall be installed between each 100 pair wiring block and at the top and bottom of each column for routing purposes. Cable organizers shall be Leviton 49252-PCM, Homaco HFM-19-2 or approved equal.

2.8 FIBER DISTRIBUTION PANEL:

- A. Fiber cables shall be routed to FIBER DISTRIBUTION UNIT. Unit shall be rack mounted with total capacity of twelve (12) or twenty-four (24) bulkheads and /or splices.

- B. The MAIN FIBER DISTRIBUTION FRAME shall be placed on the first floor. This frame shall provide a termination and service access point for fiber optic circuits, cross-connect or interconnect fiber cables to the equipment by means of jumper cables, and centralized all access to the fiber terminations in the building. This fiber distribution system shall consist of a frame, shelves, modules and associated hardware. Main distribution frame shall be Panduit #FRME72, or Siecor #FDF-576-20, Corning CCH-04U (72port) CCH-02U (24port) or approved equal.
- C. The FIBER COMBINATION SHELVES shall allow termination of buffered cables or direct termination of outside plant cables. The shelf is to be used as a termination shelf only (direct connector termination) or used as a splice and termination shelf by using pigtails. The shelf will be equipped with the following: twenty-four (24) or seventy-two (72) fiber capacity, hinged front and rear doors, knockout for optional lock mechanism, universal shelf mounting brackets, cable clamp brackets for termination for cables, blank labels for identifying fiber splices and terminations, splice tray housing, splice tray housing that slides out for easy access, and other associated hardware. These shelves will be rack mount. AVAYA Technologies #LSC2U-024/5 (24 fiber combination), Hubbell #4W311-0TE (24 fiber combination), AVAYA Technologies #LSC1U-072/12 (72 fiber combination), Hubbell #4W711-0TE (72 fiber combination), Corning CCH-04U (72port) CCH-02U (24port) or equal.

2.9 FIBER BREAK-OUT KIT:

- A. Fiber break-out kits shall be used to terminate fiber into protective buffer tubes. Kit permits separation and protection of individual fiber elements. Kits shall be Siecor, Belden, AT&T, Corning or approved equal.

2.10 CORRUGATED FLEXIBLE CONDUIT:

- A. Corrugated flexible conduit, or INNER DUCT, shall be a non-metallic, flexible conduit intended for power and communications applications. Duct shall be suitable for underground installations, and suitable for installation inside larger power or communications conduits.
- B. The corrugated duct shall be sized as shown on the Drawings. Duct shall be orange in color and shall be furnished on 250' reels or in 250' coils. Duct manufacturer shall furnish required PVC fittings.
- C. All vertical fiber optic riser cables shall be installed in riser rated inner duct. The inner duct shall extend to the relay rack as near as practical to the fiber termination shelf.

2.11 PATCH PANELS:

- A. The patch panels shall support 100 MHz cross connect transmission for UTP cabling systems utilizing Category 6 performance rated cable. Terminations shall use 110-IDC (Insulating Displacement Connector) field made continuous to the 8-pin modular jack on front of panel via Printed Circuit interconnections. The panel shall mount on nineteen (19") inch rack and be fully EIA/TIAT568B compliant. Panels will be T568B wiring.

2.12 FIBER OPTIC CABLE:

- A. Fiber optic cable shall be as shown on the Drawings, breakout style suitable for indoor/outdoor

applications. Each individually jacketed fiber shall contain Kevlar strength member to allow direct termination of cable. Cable shall be UL listed and constructed in accordance with EIA/TIA 568 requirements.

- B. Fiber optic cables shall meet the following requirements:
Single Mode shall be OS2
Multi-Mode shall be OM3 for up to 500 meters and OM4 for over 500 meters

2.13 FIBER CONNECTORS

- A. Fiber cable connectors shall be SC style connectors, Panduit, Siecor, Corning or approved equal.

2.14 OUTDOOR IN-GRADE BOXES

- A. Furnish and install lightweight pre-fabricated pull box where shown on the Drawings. Power service box shall be nominal 24" x 36" size with cover for light traffic duty. Box shall be stack able to obtain required depth. Cover shall be marked with TELEPHONE logo. A bottom is required on box.
- B. Pull box shall be pre-cast concrete construction or pre-cast heavy weave fiberglass and polymer concrete. Pull box shall be equal to Quazite Composite "PC" Style, or Associated Plastics PH3660/36 VAULT Series.

2.15 VIDEO CABLING

- A. The contractor shall provide RG6 coaxial cabling from the video jack locations indicated by the TV symbols on the drawings. The RG6 shall be plenum rated and shall be homerun to the nearest access control communications room.
- B. The contractor shall provide an RG11 coaxial cable between access control communications rooms the main communications room.
- C. Provide and "F" connector at every jack.
- D. Cable shall be plenum in plenum rated ceilings.

PART 3 - EXECUTION

3.1 INSTALLATION:

- A. Unless otherwise specified, all communications systems shall be permanently installed and connected to the wiring systems. The systems must be installed according to manufacturer standards and recommendations.

3.2 TELEPHONE/DATA SYSTEM GENERAL REQUIREMENTS:

- A. All cables, wires, and equipment shall be securely and neatly installed. Inside routing shall be installed parallel and perpendicular to existing structural lines and members.
- B. Each station wire shall be plainly marked at its patch panel end with the room number to which it is connected, and terminated on the termination blocks or patch panel.
- C. Voice/data cables shall be routed above ceilings utilizing cable hooks. Cables must not be secured to hooks. Provide hooks a minimum of four feet on center.
- D. Contractor shall maintain recommended Category 6 bending radius, pulling tension, and cable support requirements. Cable ties may be finger tight, however, not so tight so they distort the outer jacket of the cable.
- E. Cable suspended above an open ceiling shall not rest on ceiling tiles or lighting fixtures, and shall be supported from roof structure at 4' intervals.
- F. Voice/data system wiring shall be installed in accordance with NEC Article 800-5 and 6 requirements.

3.3 TELEPHONE/DATA CABLE INSTALLATION:

- A. Station cable installation shall consist of the following:
 - 1. All conduits stubbed up in ceiling spaces shall have conduit bushing at end of conduit.
 - 2. From the outlet location to the telephone backboard, Contractor shall furnish and install voice and data cables as per Drawings. Voice only stations shall have one (1), four (4) pair station cable.
 - 3. Each cable shall also be labeled per face plate detail.
 - 4. Voice jack shall be installed in top left position at each location.
 - 5. At modular furniture locations contractor shall provide outlets and cable indicated on the drawings. Cable shall be installed and terminated in the modular furniture complete from outlet to patch panel. Contractor to install cable in modular furniture raceway then to flexible conduit and to a junction box in adjacent wall. Refer to detail on drawings.
 - 6. Provide 4'-0" of slack at each outlet location. Slack shall be in ceiling space.

3.4 FIBER CABLE INSTALLATION:

- A. Fiber cables shall be terminated using SC type connectors. Connectors shall be attached using hot melt, ultraviolet, epoxy or heat curable.
- B. All multi-mode fiber cables shall be terminated at both ends and Contractor shall coordinate termination of fibers at source end.

3.5 COMMUNICATIONS SYSTEM QUALIFICATIONS:

- A. The communications system installer shall be experienced in the design, fabrication and installation of communications premise distribution systems of similar size and scope to this project. Installation technicians shall be manufacturer certified in At & T Systimax Structured

Cabling System, AMP Netconnect Cabling System, Siecor wiring systems, or equal.

3.6 CABLE/WIRE IDENTIFICATION:

- A. The following labeling procedure shall be completed by the Contractor after each cable has been installed and connected:
 - 1. Each cable pair shall be plainly marked at the patch panel end.
 - 2. All outlets shall be permanently marked or labeled on the jack faceplate ID number.
 - 3. All cables shall be legibly and permanently labeled at each end using wrap-around/stick-on label systems or approved equal.
 - 4. In rooms where more than one jack exists, the jacks shall be labeled per the faceplate detail.
 - 5. All conduits, except those used for individual station jacks, shall be clearly and permanently marked or labeled at both ends, indicating the location of the other end of the conduit.
- B. All cable and wiring identification shall be in compliance with ANSI/TIA/EIA 606 Structured Cabling System standards. No hand-written labels will be accepted on face place and patch panels.

3.7 DOCUMENTATION AND TESTING:

- A. Upon completion of construction, the Contractor shall provide "as installed" drawings showing the exact placement of all outlets, cables, conduits and connecting hardware called for in this section.
- B. Voice and data wiring shall be tested upon completion of installation. In order for any voice cable to be accepted, the number of defective pairs shall be limited to a maximum of one percent (1%) of the total number of pairs in the cable. Any cable having more than the maximum acceptable number of defective pairs shall be replaced at the Contractor's expense. The cable test results shall be provided with the "as installed" drawings upon the completion of construction.
- C. Voice and Data station cables shall contain no defective pairs.
- D. Testing Procedures
 - 1. Testing shall be performed in the presence of a representative as designated by the architect or engineer. Sufficient advanced notice of test dates shall be provided to coordinate test dates.
 - 2. All voice (station, riser & outside plant) cables and associated connection hardware shall be tested and documented by the Contractor. The test procedure shall demonstrate as a minimum:
 - a. Continuity (more than 2,600 ohms is considered an open)
 - b. Shorts (60,000 ohms or less is considered a short)

- c. Proper polarity (tip and ring correct) Proper polarity (tip and ring correct)
 - d. Proper termination (splits & wrong terminations)
 - e. Proper ground and shield bonding
 - f. Grounded conductors (60,000 ohms or less to ground is considered a fault)
 - g. Detection of A/C or DC power on any conductor (power fault test)
 - h. User's equipment must function normally when connected to the installed wiring

- 3. All UTP data station and riser cables and associated connection hardware shall be tested to certify the performance category of the link as installed. All Category 6 station cables shall be tested in accordance with procedures laid out in EIA/TIA 568B.2-1. Written (printed) test results for each cable shall include all of the field test parameter results. Any cable that fails testing shall be reported along with the procedures used to rectify the failure (IE. Replaced cable, re-terminated the jack, etc.). Contractor tests shall utilize a category six (6) complaint cable tester. Fluke and HP are approved tester. Electronic results for each UTP Category 6 four pair cable shall be submitted as a part of the Contractors as built project performance acceptance records. In addition to the above information the documentation shall include a pass/fail indication for the specified cable, the test date, the serial number and software version of the scanner used, and a copy of the calibration certificate of the scanner. Necessary applications for reading the results shall be provided by the Contractor. This document can be found in the EIA/TIA Telecommunications Building Wiring Standards.

- 4. The Contractor shall test, certify and document each fiber optic conductor to meet the following attenuation specifications:
 - a. Power meter test: $(\text{cable length per } 1000' \times 1.22) + \text{connector loss} + \text{splice loss} = \text{acceptable loss in dB@850 nm, nominal}$. End-to-end testing shall include all connectors and jumpers. The Contractor shall supply all required meters, jumpers and light sources for this test.
 - b. OTDR Test shall be performed by the Contractor on each fiber strand and on each fiber segment installed at both 850 nm and 1300 nm for multimode cable. If single mode cable is installed OTDR tests shall be performed at both 1310 nm and 1510 nm. Two sets of hard copy printouts of the OTDR graphs for each fiber strand shall be presented to the A/E. Fiber termination made on site shall be of factory quality and tested for attenuation loss not to exceed 0.5 dB per mated connection at 1300 nm for multimode fiber and 1550 nm for single mode fiber. Fiber connector terminations shall be made by a factory trained technician with ample field experience. Fiber technician certification shall be submitted to the A/E with the fiber test documentation.

- E. Prior to testing of any communications cable/wire and hardware, the Contractor shall notify The Architect in writing, at least two (2) weeks in advance of testing. Contractor shall furnish hard copy of all test reports to Architect for approval prior to completion and final acceptance of project.

- F. Submit documentation regarding the manufacturer's extended warranty. The length of the extended warranty shall be a minimum of twenty (20) years. The documentation shall include a sample of the warranty that shall be provided to the Owner when the installation is complete, as well as procedures for handling warranty issues. The warranty shall be for the complete system.

END OF SECTION 27 13 00

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

283111 FIRE ALARM SYSTEM WITH VOICE EVACUATION

SECTION 28 31 11 – FIRE ALARM SYSTEM WITH VOICE EVACUATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes fire alarm systems.
- B. Definitions:
 - 1. FACP: Fire alarm control panel.
 - 2. LED: Light-emitting diode.
 - 3. Definitions in NFPA 72 apply to fire alarm terms used in this Section.
- C. System Description:
 - 1. Existing voice evac Notifier NFS-640
- D. Performance Requirements:
 - 1. Comply with NFPA 72 latest edition or edition enforced by state or local code authority.
 - 2. Fire alarm signal initiation shall be by one or more of the following devices:
 - a. Manual stations.
 - b. Heat detectors.
 - c. Smoke detectors.
 - 3. Fire alarm signal shall initiate the following actions:
 - a. Alarm notification appliances shall operate continuously and be synchronized as required per code.
 - b. Identify alarm at the FACP and remote annunciators.
 - c. Transmit an alarm signal to the remote alarm receiving station.
 - d. Shut down heating, ventilating, and air-conditioning equipment over 2000 cfm.
 - 4. Resetting of other systems:
 - a. Resetting of duct detectors shall be from the panel.



1.2 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:

1. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operations for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
 2. Device Address List: Coordinate with final system programming.
 3. System riser diagram with device addresses, conduit sizes, and cable and wire types and sizes.
 4. Wiring Diagrams: Power, signal, and control wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Show wiring color code.
 5. Batteries: Size calculations.
 6. CAD drawings with device locations, device ratings, cable routing, cable size/type, etc. indicated on floor plans.
 7. All shop drawings are to be electronic in nature and submitted in PDF form. Paper shop drawings will not be reviewed.
- C. Field quality-control test reports per NFPA 72.
- D. Operation and maintenance data.
- E. Submittals to Authorities Having Jurisdiction: In addition to distribution requirements for submittals specified in "Submittals," make an identical submittal to authorities having jurisdiction. To facilitate review, include copies of annotated Contract Drawings as needed to depict component locations. Complete all required form. Contractor is responsible for all required fees. Resubmit if required to make clarifications or revisions to obtain approval. On receipt of comments from authorities having jurisdiction, submit them to Architect for review. All drawings shall be done in AutoCAD R14 format or newer.
- F. All fire alarm drawings are to be submitted digitally. Fire alarm devices with any notation are to clearly stand out from the floor plan by using a bolder line width contrasting a screened floorplan. Devices and notation are to be proportionally sized to the scale of the drawing. Fire alarm devices only are to be indicated on drawings, drawings are not to be shared with electrical devices or any other discipline.
- G. Documentation:
1. Approval and Acceptance: Provide the "Record of Completion" form according to NFPA 72 to Owner, Architect, and authorities having jurisdiction.
 2. Record of Completion Documents: Provide the "Permanent Records" according to NFPA 72 to Owner, Architect, and authorities having jurisdiction. Format of the written sequence of operation shall be the optional input/output matrix.
 - a. Electronic media shall be provided to Architect and authorities having jurisdiction.
- 1.3 QUALITY ASSURANCE
- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project and shall be supervised by a Nicet Level III Supervisor.
- 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with existing Notifier NFS-640 system.

1. Wire and Cable:

- a. Comtran Corporation.
- b. Helix/HiTemp Cables, Inc.; a Draka USA Company.
- c. Rockbestos-Suprenant Cable Corporation; a Marmon Group Company.
- d. West Penn Wire/CDT; a division of Cable Design Technologies.
- e. Coleman Cable.

2.2 MANUAL FIRE ALARM PULL STATION

A. Description: UL 38 listed; finished in red with molded, raised-letter operating instructions in contrasting color. Station shall show visible indication of operation. Mounted on recessed outlet box; if indicated as surface mounted, provide manufacturer's surface back box.

1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type. With integral addressable module, arranged to communicate manual-station status (normal, alarm, or trouble) to the FACP.
2. Station Reset: Key- or wrench-operated switch.

2.3 SYSTEM SMOKE DETECTORS

A. General Description:

1. UL 268 listed, operating at 24-V dc, nominal.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
3. Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status.

B. Multi Criteria Detectors:

1. Minimum of photoelectric and heat.
2. Sensor: LED or infrared light source with matching silicon-cell receiver.
3. Photoelectric Detector Sensitivity: Between 2.5 and 3.5 percent/foot (0.008 and 0.011 percent/mm) smoke obscuration when tested according to UL 268A.
4. Thermal detection.

C. Photoelectric Smoke Detectors:

1. Sensor: LED or infrared light source with matching silicon-cell receiver.

2. Detector Sensitivity: Between 2.5 and 3.5 percent/foot (0.008 and 0.011 percent/mm) smoke obscuration when tested according to UL 268A.

D. Duct Smoke Detectors:

1. Photoelectric Smoke Detectors:
 - a. Sensor: LED or infrared light source with matching silicon-cell receiver.
 - b. Detector Sensitivity: Between 2.5 and 3.5 percent/foot (0.008 and 0.011 percent/mm) smoke obscuration when tested according to UL 268A.
2. UL 268A listed, operating at 24-V dc, nominal.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
4. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. The fixed base shall be designed for mounting directly to the air duct. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type. Indicating detector has operated and power-on status.
7. Sampling Tubes: Design and dimensions as recommended by manufacturer for the specific duct size, air velocity, and installation conditions where applied.
8. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.4 HEAT DETECTORS

- A. General: UL 521 listed.
- B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or rate-of-rise of temperature that exceeds 15 deg F (8 deg C) per minute, unless otherwise indicated.
 1. Mounting: Plug-in base, interchangeable with smoke-detector bases.
 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.
- C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F (88 deg C).
 1. Mounting: Plug-in base, interchangeable with smoke-detector bases.
 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to the FACP.

2.5 NOTIFICATION APPLIANCES

- A. Description: Equipped for mounting as indicated and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly. Factory standard color by Architect (Red or Beige).

B. Voice/Tone Speakers:

1. UL 1480 listed.
2. High-Range Units: Rated 2 to 15 W.
3. Low-Range Units: Rated 1 to 2 W.
4. Mounting: Flush, semi-recessed, or surface mounted; bidirectional as indicated.
5. Matching Transformers: Tap range matched to the acoustical environment of the speaker location.

C. Visible Alarm Devices: Xenon strobe lights listed under UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

1. Rated Light Output: Candela indicated on drawings.
2. Strobe Leads: Factory connected to screw terminals.
3. Where multiple visual notification appliances can be seen from any location, circuitry shall be incorporated for the synchronization of flash rate.
4. Adjustable Strobes-Field selectable from 15cd, 30cd, 75cd, 110cd.

2.6 WIRE AND CABLE

A. Wire and cable for fire alarm systems shall be UL listed and labeled as complying with NFPA 70, Article 760.

B. Signaling Line Circuits: Twisted, shielded pair, size as recommended by system manufacturer.

1. Twisted shielded pair, NFPA 70 Article 760, UL listed as Type FPLP, plenum rated and complying with requirements in UL 1424.

C. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.

2.12 Station Smoke and Carbon Monoxide Detectors:

1. Nonsystem smoke detectors shall be listed as compatible with the fire-alarm equipment installed or shall have a contact closure interface listed for the connected load.
2. Nonsystem smoke detectors shall meet the monitoring for integrity requirements in NFPA 72
3. Comply with UL 217; suitable for NFPA 101, residential occupancies; operating at 120-V ac with 9-V dc battery as the secondary power source. Provide with "low" or "missing" battery chirping-sound device.
4. Auxiliary Relays: One Form C, rated at 0.5 A.
5. Audible Notification Appliance: Piezoelectric sounder rated at 90 dBA at 10 feet (3 m) according to UL 464.
6. Visible Notification Appliance: 177-cd strobe.
7. Heat sensor, 135 deg F (57 deg C) combination rate-of-rise and fixed temperature.

8. Test Switch: Push to test; simulates smoke at rated obscuration.
9. Tandem Connection: Allow tandem connection of number of indicated detectors; alarm on one detector shall actuate notification on all connected detectors.
10. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
11. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
12. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
13. Detector shall send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
14. Comply with UL 2075

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. HVAC: Locate detectors not closer than 3 feet (1 m) from air-supply diffuser or return-air opening.
- B. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of the duct.
- C. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.
- D. Audible Alarm-Indicating Devices: Install per NFPA 72. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.
- E. Visible Alarm-Indicating Devices: Install per NFPA 72.
- F. The contractor shall provide the following spare devices at a location determined by the engineer or fire marshal prior to final approval of shop drawings. Contractor shall be responsible for all conduit, wire, battery, cards etc. needed to install these spare devices. Devices not used shall be delivered to the owner as spare. Devices: 6 - horn/strobes (any candela), 4 - pull stations, 4 - smoke detectors, 4 - duct detectors, and 4 - control modules.

3.2 WIRING INSTALLATION

- A. Install wiring according to the following:
 1. NECA 1.
 2. TIA/EIA 568-A.
- B. Wiring Method:
 1. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable. Cable

installed in plenum ceiling spaces shall be plenum rated. Fire alarm cable installed in walls, exposed areas or in inaccessible spaces shall be in conduit. All cable and conduit shall be concealed where possible.

2. Signaling Line Circuits: Power-limited fire alarm cables shall not be installed in the same cable or raceway as signaling line circuits.

- C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
- E. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals according to "Basic Electrical Materials and Methods Electrical Identification."

3.4 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 1. Before requesting final approval of the installation, submit a written statement using the form for Record of Completion shown in NFPA 72.
 2. Perform each electrical test and visual and mechanical inspection listed in NFPA 72. Certify compliance with test parameters.
 3. Visual Inspection: Conduct a visual inspection before any testing. Use as-built drawings and system documentation for the inspection. Identify improperly located, damaged, or nonfunctional equipment, and correct before beginning tests.
 4. Testing: Follow procedure and record results complying with requirements in NFPA 72.
 - a Detectors that are outside their marked sensitivity range shall be replaced.
 5. Test and Inspection Records: Prepare according to NFPA 72, including demonstration of sequences of operation by using the matrix-style form in Appendix A in NFPA 70.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain the fire alarm system, appliances, and devices. Provide a minimum of 2 hours of training to the Owner's Representative.

M & E Consulting, Inc.
1304 Bertrand Drive, Suite F-7
Lafayette, LA 70506
Ph: (337)234-7474
cad@meconsulting.com

CADD/Electronic File Transfer to Contractor for M&E Drawings.

Dear Contractor:

At your request, we will provide electronic files for your convenience and use in the preparation of shop drawings related to _____, subject to the following terms and conditions:

(Name of project)

Our electronic files are compatible with **Auto Cad (latest version)**. We make no representation as to the compatibility of these files with your hardware or your software beyond the specified release of the referenced specifications.

Data contained on these electronic files are part of our instruments of service and shall not be used by you or anyone else receiving these data through or from for any purpose other than as a convenience in the preparation of shop drawings for the referenced project. Any other use or reuse by you or by others will be at your sole risk and without liability or legal exposure to us. You agree to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against us, our officers, directors, employees, agents or sub-consultants that may arise out of or in connection with your use of the electronic files.

Furthermore, you shall, to the fullest extent permitted by law, indemnify and hold us harmless against all damages, liabilities or costs, including reasonable attorneys' fees and defense costs, arising out of or resulting from your use of these electronic files.

These electronic files are not construction documents. Differences may exist between these electronic files and corresponding hard-copy construction documents. We make no representation regarding the accuracy or completeness of the electronic files you receive. In the event that a conflict arises between the signed or sealed hard-copy construction documents shall govern. You are responsible for determining if any conflict exists. By your use of these electronic files, you are not relieved of your duty to fully comply with the contract documents, including, and without limitation, the need to check, confirm and coordinate all dimensions and details, take field measurements, verify field conditions and coordinate your work with that of other contractors for the project.

Because information presented on the electronic files can be modified, unintentionally or otherwise, we reserve the right to remove all indicia of ownership and/or involvement from each electronic display.

We will furnish you electronic files of the following drawing sheets:

(PLEASE INDICATE DRAWINGS NEEDED):

Under no circumstances shall delivery of the electronic files for use by you be deemed a sale by us, and we make no warranties, either express or implied, of merchantability and fitness for any particular purpose. In no event shall we be liable for any loss of profit or any consequential damages as a result of your use or reuse of these electronic files.

(Date)

(Contractor name and firm name)

(e-mail address)

(Contractor signature)

Please complete this form completely and email to cad@meconsulting.com

END OF SECTION 28 31 11

DIVISION 31 - EARTHWORK

311100	CLEARING, GRUBBING AND STRIPPING
312000	EARTHWORK (UNDER BUILDINGS)
312210	EXCAVATION, FILLING AND BACKFILLING
312216	FILLING AND GRADING
312317	TEST PITS
312319	DEWATERING
312333	EXCAVATION, BACKFILL AND COMPACTION FOR TRENCHES
312514	EROSION CONTROL AND SOIL STABILIZATION
313116	TERMITE CONTROL
316329	FOUNDATION SHAFTS

SECTION 31 11 00

CLEARING, GRUBBING AND STRIPPING

PART 1 - GENERAL

1.1 Scope: This Section covers all clearing, grubbing and stripping work required for the construction of the project.

1.2 Clearing and Grubbing:

A. The CONTRACTOR shall clear and grub areas as designated on the Drawings or required by the ENGINEER.

B. Care shall be taken to leave nothing of material size or accumulated mass which thereafter may float or obstruct any pipe or waterway.

C. The CONTRACTOR shall not cut or injure any trees or other vegetation outside the limits of the areas on which work is to be done without permission and he shall guard against like action by his employees.

1.3 Stripping: The CONTRACTOR shall strip areas which are designated by the ENGINEER. The limits of the stripping shall be within the area so designated.

PART 2 - PRODUCTS

2.1 Equipment:

A. Equipment used for clearing and grubbing shall be at the CONTRACTOR'S option.

B. Blasting will not be permitted.

PART 3 - EXECUTION

3.1 Clearing:

A. The CONTRACTOR shall cut or otherwise remove all trees, saplings, brush and vines, (except those trees and other vegetation marked for retention by the OWNER); windfalls, logs and trees lying on the ground; dead trees and stubs more than one foot high above the ground surface, but not their stumps; trees which have been partially uprooted by natural or other causes, including their stumps; and other matter such as snags, leaves, sawdust, bark and refuse.

B. Except where clearing is done by uprooting with machinery or where stumps are left longer to facilitate subsequent grubbing operations, trees, stumps, and stubs to be cleared shall be cut as close to the ground surface as practicable, with no more than six (6) inches remaining above the ground surface in the case of small trees, and twelve (12") inches in the case of large trees. Saplings, brush, and vines shall be cut off close to the ground.

3.2 Grubbing: The CONTRACTOR shall remove all stumps within the designated area completely, remove all roots larger than three (3") inches in diameter to a depth of eighteen inches (18"), and remove all roots larger than one-half inch (1/2") in diameter to a depth of six (6) inches. Such depths shall be measured from the existing ground surface or the proposed finished grade, whichever is lower.

3.3 Stripping: Topsoil shall be removed to a minimum depth of six inches (6") or to its full depth (whichever is greater) where it occurs in areas to be filled or excavated and shall be stockpiled for use in finish grading. All precautions shall be taken to avoid contamination of topsoil by other excavated material and to prevent washing of topsoil by other excavated material and to prevent washing of topsoil into excavations, drainage or watercourses.

3.4 Depressions: Except in areas to be excavated for buildings and/or paved areas, depressions caused by grubbing operations shall be filled with native suitable material if acceptable to Engineer which shall be compacted to conform to the surrounding ground.

3.5 Disposal:

A. All material collected in the course of the clearing and grubbing that will not remain shall become the property of the CONTRACTOR and shall be disposed of in a manner satisfactory to the OWNER. Such disposal shall be carried on after removal of the materials in the clearing and grubbing operations and shall not be left until the final clean up period.

B. Prior to depositing surplus material at any off site location, the CONTRACTOR shall obtain a written agreement between himself and the owner of the property on which the disposal is proposed giving permission for the CONTRACTOR to enter and deposit the material at no expense to the project OWNER. A copy of the agreement shall be furnished to the OWNER.

- END OF SECTION -

SECTION 312000 – EARTHWORK (UNDER BUILDINGS)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Comply with requirements of the Contract Documents and all applicable codes and regulations to provide earthwork, in the types and arrangements shown on the Drawings, as specified herein and as needed for a complete and proper installation. The extent of work of this Section includes, but is not necessarily limited to:
 - a. Preparation of subgrade for buildings, ballfield areas, parking areas and walk(s).
 - b. Excavation, fill and backfill of trenches.
 - c. Grading and compaction testing.
2. Related Work: Comply with the relative requirements of other Divisions, Sections, the General and Supplementary Conditions and the Drawings of the entire Contract Documents. The breakdown of this project manual into Divisions and Sections shall not define any limit of work.
3. Earthwork for areas 5' beyond the limits of the building perimeters shall comply with Section 312210 EXCAVATION, FILLING AND BACKFILLING.

1.2 QUALITY ASSURANCE

- A. General:** Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Testing and Inspection Services:** The Owner shall engage and pay for soil testing and inspection services for quality control, during fill operations.

1.3 REFERENCES

- A.** "Louisiana Standard Specifications for Roads and Bridges, Current Edition, published by the Louisiana Department of Transportation and Development.
- B.** Wherein Louisiana Department of Transportation and Development (LDOTD) Specifications are referred to, the reference is to the "Louisiana Standard Specifications for Roads and Bridges", Current Edition, published by the Louisiana Department of Transportation and Development. Such incorporation is with regard to methods and materials only. LDOTD provisions as to methods of payment, extra haulage mileage, and pay quantities do not apply. This section covers a complete and finished installation as shown. Quantity requirements necessary for the work are the responsibility of the Contractor.

1.4 SITE CONDITIONS

- A. Existing Utilities: Contractor shall locate existing underground utilities in areas of work. Refer to Civil, Mechanical and Electrical Drawings. If utilities are to remain, provide adequate protection during earthwork operations. Do not interrupt existing utilities serving occupied facilities, except when and as permitted by Owner. Provide temporary service if required by Owner.
- B. Uncharted Utilities: Should uncharted utility lines be uncovered, consult Architect immediately for directions. Cooperate with Owner in keeping respective services in operation and repair damaged lines to satisfaction of Owner.
- C. Removal of Utilities: Demolish and completely remove those services indicated to be removed. Coordinate with utilities companies for shut-off of services if lines are active.
- D. Safety: Barricade open excavations occurring as part of this work and post with warning lights at night.
- E. Protection: Protect adjacent structures, utilities, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by building earthwork operations.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide imported satisfactory soil materials when sufficient satisfactory soil materials are not available from excavations or grading on-site.
- B. Satisfactory Fill:
 - 1. Under Building Structures: Select silty-clayey sands, low-plasticity sandy clay or clayey sand material. Place in accordance with Drawings. Earth moved on-site as part of the grading operation is acceptable around the perimeter of the new building, but not acceptable fill material underneath the building.
 - a. Liquid Limit: 39 or less.
 - b. Plasticity Index: between 8 and 20.
- C. Backfill at Building Retaining Walls: Washed free-draining concrete sand, ASTM 33, SW or SP as noted in the Geotechnical Report, Addendum #1.
- D. Drainage Course under Slabs: Clean washed pea gravel as noted on the Structural Drawings.

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 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.

3.3 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). 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. Pile Foundations (if applicable): Stop excavations 6 to 12 inches (150 to 300 mm) above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.

3.4 EXCAVATION FOR UTILITY TRENCHES UNDER BUILDINGS

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- 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 (300 mm) higher than top of pipe or conduit unless otherwise indicated.
 - 1. Clearance: As required by other sections of the specifications.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of

pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.5 SUBGRADE INSPECTION

- A. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired dump truck to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades. Replace any soft, wet or unsuitable soils.
- B. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.6 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 (17.2 MPa), may be used when approved by Architect.
 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.7 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.

3.8 UTILITY TRENCH BACKFILL UNDER BUILDINGS

- 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 (450 mm) 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. Initial Backfill: Place and compact initial backfill of subbase material, or satisfactory soil, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the pipe or conduit.

1. 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.
- E. Final Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.

3.9 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 1 percent to 3 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 1 percent to 3 percent and is too wet to compact to specified dry unit weight.

3.10 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment and not more than 6 inches (100 mm) 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 D 1557:
 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 92 percent.
 2. Under roads and walkways, scarify and recompact top 6 inches (150 mm) 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 (150 mm) 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.

3.11 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.
- B. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.12 BACKFILL AT BUILDING RETAINING WALLS

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact free-draining backfill in trench behind cast-in-place concrete retaining walls as follows:
 - 1. Place backfill that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
 - 2. Compact each layer of backfill material to required cross sections and thicknesses to not less than 92 percent of maximum dry unit weight according to ASTM D 698.

3.13 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. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
 - 2. Compact each layer of drainage course to required cross sections and thicknesses to not less than 92 percent of maximum dry unit weight according to ASTM D 698.

3.14 FIELD QUALITY CONTROL

- A. Testing Agency: The Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
 - 1. 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.
 - 2. Perform field density tests in accordance with ASTM D1556 (sand cone method) or AASHTO T-238 (Nuclear Probe), as applicable. Make densities of proposed fill material and field tests of compacted fill. The minimum requirement for fill compaction tests shall be 4 tests for each 10,000 square feet for each lift of fill. Tests shall be made on the subgrade at the same rate prior to commencing fill operations. Test all backfill at rate of 1 per 10 c.y.
- B. 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.
- C. Top layer of compacted material which has previously passed density testing shall be re-tested if material has received measurable rainfall since initial testing.

3.15 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.

3.16 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 31 22 10 - EXCAVATION, FILLING AND BACKFILLING

PART 1 - GENERAL

1.1 Scope: This Section covers all excavation, filling and backfilling as required for the proposed project.

1.2 Reference Standard: Work shall conform to the following Section of the State of Louisiana, Department of Transportation and Development, "Louisiana Standard Specifications for Roads and Bridges", 2006 Edition, except as may be modified herein:

Section 203 - Excavation and Embankment

1.3 Applicable Publications: The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.
American Society for Testing and Materials (ASTM) Publications.

D 698	Test Methods for Moisture - Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb. (2.49 kg) Rammer and 12 inch (304.8 mm) Drop
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1.4 Submittals: Submit product data under provisions of Section 01 33 00 – Submittal Procedures.

PART 2 - PRODUCTS

2.1 Suitable Fill Materials: Suitable fill materials shall conform to the following, and as further specified in the Drawings:

A. Usable Soils (Imported): "Usable Soils" shall be as defined in Paragraph 203.06(a.) of the Reference Standard.

B. Select Fill Material (Imported): Select fill material shall be free of organic or other deleterious materials, homogeneous mixture, have a maximum particle size of three (3) inches, have a liquid limit less than 40 and a plasticity index between 8 and 20, and consist of silty-clayey sands (SM-SC), low plasticity sandy clays (CL) or clayey sands (SC) as defined by the Unified Soil Classification System. The material shall have a minimum of 30% retained on the 200 mesh sieve.

PART 3 – EXECUTION

3.1 General: All excavation, embankment and backfill work shall be in accordance with the Reference Standard except as modified herein.

3.2 Stripping: Excess topsoil shall be stockpiled for reuse as needed. Any remaining topsoil shall be removed from the site.

3.3 Filling and Embankment:

A. Imported fill to complete the required grading at the site may consist of "Usable Soils" or "Select Fill" as described in Paragraph 2.1.A and 2.1.B above, except that "Select Fill" shall be required under new drives and as noted on the Drawings. Fill shall be placed in horizontal layers not exceeding eight (8") inches in loose thickness, or six (6") inches when hand operated compactors are used. After placing, each layer shall be plowed, disked, or otherwise broken up, moistened or aerated as necessary, thoroughly mixed and compacted as specified using rubber-tired, and/or pneumatic rollers using strict moisture control.

B. Embankment shall not begin until construction below finish grade has been approved, underground utilities systems have been inspected, tested and approved, forms removed, and the excavation cleaned of trash and debris. Embankment shall not be placed in wet areas. Fill shall not be placed against structures prior to seven (7) days after completion of the structures. As far as practicable, backfill shall be brought up evenly on each side of the structure and sloped to drain away from the structure.

3.4 Compaction: Compaction requirements as set forth in the Reference Standard are hereby deleted. Fill and embankment shall be compacted the following maximum dry density as determined by the Standard Proctor (ASTM D698) test within one percentage point (1%) below to three percentage points (3%) above optimum moisture content:

A. Structure and/or Paved Areas: 95% (Min.)

B. Other Areas: 90% (Min.)

If water must be added, it should be uniformly applied and thoroughly mixed into the soil by disking or scarifying.

3.5 Subgrade Preparation for Concrete Pavement Repair:

A. Subgrade soils should be compacted to a density of at least 95 percent of the Standard Proctor (ASTM D-698) maximum dry density for a depth of at least eight (8) inches below the surface.

3.6 Excavation Near Existing Structures:

A. Excavation near an existing structure shall not be allowed closer to the structure than the depth of the excavation below the bottom of the structure without shoring the excavation with sheeting.

B. The CONTRACTOR'S attention is directed to the fact that storm drains and other underground utilities may exist within or immediately adjacent to the areas of proposed construction. Some of these utilities are indicated on the Drawings; however, no attempt has been made to show all of the services, and the completeness and accuracy of the information is supplied for the purpose of providing the CONTRACTOR with an indication as to the approximate locations of utilities at the work areas so that the he will be made aware of their presence.

C. All utility lines shall be located on the ground with pipe locator equipment well ahead of the work at all times. All such locations shall be plainly marked by coded paint symbols on pavement or by marked stakes in the ground. Such locations shall be established at least 50 feet in advance of all excavation. All such location work shall be provided by the CONTRACTOR, to the satisfaction of the ENGINEER.

D. As the excavation approaches pipe, conduits, or other underground structures, digging by conventional trenching machine methods shall be discontinued. Only manual methods of excavating shall be employed around buried utilities. The CONTRACTOR shall include manual excavation in the work to be done under this contract.

3.7 Protection of Existing Structures:

A. All existing pipes, poles, wires, fences, walls, curbing, property line markers, and other structures which in the opinion of the OWNER must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from damage by the CONTRACTOR. In case of damage, the CONTRACTOR shall notify the property Owner so that the proper steps may be taken to repair any and all damage done. When the property Owners do not wish to make the repairs themselves, all damage shall be repaired by the CONTRACTOR; or, if not promptly done by him, the Owner may have the repairs made at the expense of the CONTRACTOR.

B. All utility services shall be supported by suitable means so that the services do not fail when tamping and settling occurs.

3.8 Sheeting and Bracing:

A. The CONTRACTOR shall furnish, place, and maintain such sheeting and bracing as may be required to support the sides of excavation, to prevent any movements which might in any way diminish the width of the excavation below that necessary for proper construction, and to protect adjacent structures from undermining or other damage.

B. Wherever possible, sheeting shall be driven ahead of the excavation to avoid loss of material from behind the sheeting. If it is necessary to excavate below the sheeting, care shall be taken to avoid trimming behind the face along which the sheeting shall be driven. Care shall be taken to prevent voids outside the sheeting; but, if voids are formed, they shall be filled immediately with sand and compacted.

C. The ENGINEER may direct that any timber used for sheeting and bracing be cut off at any specified elevation.

D. Sheeting and bracing not left in place shall be removed carefully so as not to endanger the work or other structures, utilities, or property. All voids left or caused by withdrawal of sheeting and bracing shall immediately be backfilled with sand and compacted by ramming with tools especially adapted to that purpose, or by other means as may be directed.

E. Sheeting and bracing that is ordered to be left in place by the ENGINEER shall be separately paid at a negotiated price and a change order issued for the work. Sheeting and bracing not left in place will not be measured and paid.

3.9 Drainage:

A. At all times during construction, the CONTRACTOR shall temporarily provide, place and maintain ample means and devices with which to remove promptly, and dispose properly of, all water entering trenches and other excavations, or water that may flow along or across the site of the work. Excavations shall be kept dry until the structures, pipes and appurtenances to be built therein have been completed, to such extent that they will not be damaged. At that time, the CONTRACTOR may remove such temporary means and devices.

B. All water pumped or drained from the work shall be disposed of in a manner satisfactory to the ENGINEER, without undue interference with other work or damage to pavements, other surfaces, or property.

3.10 Grading:

A. Grading of filled and unfilled areas shall be to the lines and grades indicated on the Drawings or as specified by the ENGINEER. Grading shall be performed in conjunction with all the necessary clearing, grubbing, stripping, filling and compacting operations to the satisfaction of the ENGINEER. Grading shall be performed to such lines and grades as may be necessary to allow for the addition of loam, if required, to the proposed finished grade.

B. Grading shall be done by bulldozer or other approved means. Areas adjacent to structures and other areas inaccessible to heavy grading equipment shall be graded by manual methods.

C. Final grading shall be performed in such manner as to provide proper drainage from the project site. Finished grades shall be pitched to drain away from structures completed under this contract as indicated on the Drawings or as directed by the ENGINEER. In no case shall drainage from the project site be so altered or controlled as to result in damage, or the potential for damage, to adjacent property or to any portion of the work executed under this contract from erosion or flooding.

3.11 Finishing: The surface of all excavations, fills, embankments, and raw subgrades shall be finished to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. The degree of finish for all graded areas shall be within 0.1 foot of the grade and elevations indicated. Ditches shall be finished in a manner that will result in effective drainage. The surface of areas to be seeded shall be furnished to a smoothness suitable for the application.

3.12 Protection: Settlement or washing that occurs in graded, topsoiled, or embankment areas prior to acceptance of the work shall be repaired and grades reestablished to the required elevations and slopes.

3.13 Field Density Testing: Each lift of compacted soil should be tested by geotechnical engineer/laboratory prior to placement of subsequent lifts. Field density test shall be taken at a frequency of not less than one (1) test per 5,000 square feet of surface area per lift. Costs for required field density testing shall be borne by the OWNER.

END OF SECTION 312210

SECTION 31 22 16 - FILLING AND GRADING

PART 1 - GENERAL

1.1 Scope: This Section covers filling and grading as required to achieve final site contours indicated on the Drawings or as authorized by the ENGINEER.

1.2 Applicable Publications: The publications listed below form a part of this Specification to the extent referenced. The publication may be referred to in the text by basic designation only:

A. American Society for Testing and Materials

D698 Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort

D2487 Classification of Soils for Engineering Purposes (Unified Soil Classification System)

1.3 Submittals: Submittals shall be provided in accordance with Section 01 33 00 – Submittal Procedures.

PART 2 - PRODUCTS

2.1 Suitable Materials:

A. Approved suitable materials available from excavations and not required for backfill under, around or against structures may be used for filling except as otherwise specified. Surplus excavated materials to be used as fill shall meet the requirements of these Specifications, as appropriate for intended use.

B. All fill materials, whether from the excavations or from borrow, shall be of such nature as to provide a dense, stable fill after placement and compaction by accepted procedures. Fill shall be essentially free of organic and porous materials, shall contain no visible vegetation, masses of roots, or individual roots longer than 18 inches or more than ½ inch in diameter, and shall be free of stones greater than three (3") inches in longest dimension.

C. Borrow material for filling and grading shall be approved by the ENGINEER for any type of work.

D. Unless otherwise noted on the Drawings, all fill material for filling and grading shall have a Unified Soil Classification of "ML", "SC" or "CL" with a maximum liquid limit of 45 and P.I. range of 6 to 20.

PART 3 - EXECUTION

3.1 Moisture Control:

A. Moisture in fill materials shall be equal to that found in the natural unexcavated condition insofar as is practicable. If the ENGINEER determines that the fill material to be used is excessively wet, the CONTRACTOR shall spread the material on the areas to be filled and fill shall be permitted to dry to an allowable moisture content. The drying process shall be assisted by harrowing where necessary.

B. If, in the opinion of the ENGINEER, additional moisture is required, water shall be applied by sprinkler tanks or other sprinkling devices in such a way as to provide uniform distribution over

the area to be treated with accurate control of the rate and quantity of water applied. If excessive amounts of water are added or if rain should cause excessive wetness, the area shall be allowed to dry as provided above.

C. The moisture content of the fill shall be sufficient to permit proper compaction but not so great as to cause loss of soil stability.

3.2 Preparation of Subgrade: The CONTRACTOR shall remove loam and topsoil, loose vegetable matter, stumps, large roots, etc., from all areas which are to receive placement of fill. The subgrade shall be prepared by forking, furrowing, or plowing in order that the new material to be placed thereon shall be well bonded to the subgrade (refer to Section 31 11 00 – Clearing, Grubbing and Stripping)

3.3 Filling and Compaction:

A. After the subgrade has satisfactorily been prepared, the fill material shall be placed thereon and built-up in successive layers until the required elevation is reached.

B. The filling operation shall begin in the deepest part of the area to be filled, and fill shall be brought up in essentially level lifts.

C. Fill shall be placed in layers by bulldozer or other approved method. The entire surface of the work shall be maintained free from ruts and in a condition that will permit construction equipment to travel over any section readily.

D. During the spreading process, all roots, debris, and stones greater in size than those specified in Paragraph 2.1 shall be removed from the fill areas. The CONTRACTOR shall assign a suitable number of persons to this work to guarantee satisfactory compliance with this requirement.

E. Layers of fill shall not exceed eight inches (8") in depth before compaction.

F. The top surface of each layer shall be made level or slightly sloped away from the center of the filled area. In general, the finer and less pervious materials shall be placed toward the center and the coarser and more pervious materials toward the outer limits of the filled area.

G. Each spread layer of material shall be compacted by the use of rollers, rubber-tire equipment, or other approved means so as to secure a dense, stable, and thoroughly compacted mass. The ENGINEER may require that compaction be provided by a minimum of four (4) complete coverages of the area to be compacted by the tire treads in contact with the flat earth surface.

H. Area adjacent to structures and other area inaccessible to mobile compaction equipment shall be compacted with suitable power driven tampers or other approved devices. Compaction by the latter method shall be done in six (6) inch layers, unless otherwise directed by the ENGINEER or shown on the Drawings.

I. Previously placed or new materials shall be moistened by sprinkling, if required, to ensure proper bond and compaction. No compaction shall be done when the material is too wet. If the compaction surface of the fill layer is determined to be too smooth to provide an adequate bond with the succeeding layer, the surface shall be loosened by harrowing or by some other approved method of compaction used.

J. If at any time the ENGINEER judges that the degree of compaction being obtained is insufficient, he may halt operations. Areas found deficient in degree of compaction shall be recompacted and regraded, if required, at the sole expense of the CONTRACTOR.

3.4 Grading:

A. Grading of filled and unfilled area shall be to the lines and grades indicated on the Drawings or as specified by the ENGINEER. Grading shall be performed in conjunction with all of the necessary stripping, filling, and compacting operations to the satisfaction of the ENGINEER. Grading shall be performed to such lines and grades as may be necessary to allow for the addition of loam, if required, to the proposed finished grade.

B. Grading shall be done by bulldozer or other approved means. Areas adjacent to structures and other areas inaccessible to the listed grading equipment shall be graded by manual methods.

C. Final grading shall be performed in such manner as to provide proper drainage from the project site. Finished grades shall be pitched to drain away from structures completed under this contract as indicated on the Drawings or as directed by the ENGINEER. In no case shall drainage from the project site be so altered or controlled as to result in damage, or the potential for damage, to adjacent property or to any portion of the work executed under this contract from erosion or flooding.

END OF SECTION 312216

SECTION 31 23 17 - TEST PITS

PART 1 - GENERAL

1.1 Scope: This Section covers all operations necessary to dig test pits in order to determine the exact location of existing utilities.

PART 2 - PRODUCTS - NOT USED

PART 3 - EXECUTION

3.1 Test Pits: Test pits for the purpose of locating underground utilities which may interfere with installation of the Work shall be excavated in advance of the Work and backfilled by the CONTRACTOR. For the purpose of bidding, the CONTRACTOR shall include ten (10) test pits. Test pits shall be backfilled immediately after their purpose has been satisfied and maintained in a manner satisfactory to the ENGINEER. Backfill shall comply with Section 31 23 33 - Excavation, Backfill and Compaction of Trenches.

END OF SECTION 312317

SECTION 31 23 19 - DEWATERING

PART 1 - GENERAL

1.1 Scope: This Section covers all work required to install and maintain drainage systems for handling groundwater and surface water encountered during construction of the project.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 Dewatering:

- A. The CONTRACTOR shall, at all times during construction, provide and maintain proper equipment and facilities to promptly remove and dispose of all water entering excavations and keep such excavations dry so as to obtain a satisfactory undisturbed subgrade foundation condition, until the fill, structure, or pipes to be built thereon are installed or constructed.
- B. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade soils to proposed bottom of excavation.
- C. The CONTRACTOR shall furnish all materials and equipment and perform all work required to install and maintain the drainage systems he proposes for handling groundwater and surface water encountered during construction of structures, pipelines, and compacted fills.
- D. Any dewatering methods must meet the approval of the ENGINEER.

END OF SECTION 312319

SECTION 31 23 33 - EXCAVATION, BACKFILL AND COMPACTION FOR TRENCHES

PART 1 - GENERAL

1.1 Scope: This Section covers excavation, backfill and compaction associated with the installation of all underground storm drainage piping (downspout header piping).

1.2 General:

A. Work specified under this section shall be satisfactorily executed, regardless of subsurface materials encountered, as shown on the Drawings or as otherwise directed by the ENGINEER.

B. Although it is the intention to adhere to the Drawings, the CONTRACTOR is informed that the locations of proposed utilities and other structures shown on the Drawings are approximate. The ENGINEER reserves the right to make changes in location, lines, and grades where such adjustments may be necessary or advantageous.

C. Excavation, dewatering, sheeting, and bracing shall be carried out in such a manner as to eliminate any possibility of undermining or disturbing the foundations of any existing structure or any work previously completed under this contract.

1.3 Care and Restoration of Property:

A. Excavating machinery and all other heavy equipment shall be operated with care to prevent damage to trees that are not designated for removal. Where required, trees not designated for removal within or adjacent to the work site shall be braced by suitable means at the ENGINEER'S direction.

B. Branches, limbs, trunks and roots of remaining vegetation shall not be cut except by permission of the ENGINEER. All cutting shall be smoothly and neatly done without splitting or crushing. In case of cutting or unavoidable damage to branches, limbs and trunks of trees, the cut or damaged portions shall be neatly trimmed and covered with an application of grafting wax or tree healing paint as directed.

C. Cultivated hedges, shrubs, and plants not designated for removal which might be injured by the CONTRACTOR'S operations shall be protected by suitable means or shall be dug up and temporarily replanted and maintained. After the construction operations have been substantially completed, they shall be replanted in their original positions and cared for until growth is re-established. If cultivated hedges, shrubs, and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced by items of kind and quality at least equal to the kind and quality existing at the start of the work.

D. On paved surfaces, the CONTRACTOR shall not use or operate tractors, bulldozers, or other power operated equipment of which the treads of which are so shaped as to cut or otherwise damage such surfaces.

E. All lawns, paved surfaces, roadways, and structures which have been damaged by the CONTRACTOR'S operations shall be restored to a condition at least equal to that in which they were found immediately prior to the beginning of operations. The restoration of existing property and structures shall be done as promptly as practicable and shall not be left until the end of the construction period.

1.4 Applicable Publications: The publication listed below forms a part of this specification to extent referenced. The publication is referred to in the text by the basic designation only:

American Society for Testing and Material (ASTM) Publications

D 698 Test Methods for Moisture - Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb. Rammer and 12 in. Drop

PART 2 - PRODUCTS

2.1 Backfill Materials for Trenches: Backfill materials for utility trenches shall be "Suitable Material" in accordance with Section 31 22 16 - Filling and Grading; except that "Select Fill" material in accordance with Section 31 22 10 - Excavation, Filling and Backfilling shall be required under all areas to be paved (drives, walks, etc.).

PART 3 - EXECUTION

3.1 General Preparation:

A. The CONTRACTOR shall make excavations in such a manner and to such a width as will give suitable room for or laying and adjoining pipe; shall furnish and place all sheeting, bracing, and supports; shall do all pumping, and draining; and shall render the bottom of the excavation firm and dry and in all respects acceptable.

B. In no case shall the earth be plowed, scraped, or dug by machinery so near to the finished grade at the bottom of the excavations as to result in disturbance of material below said grade. The last of the material to be excavated shall be removed with pick and shovel just before placing pipe. All loose materials shall be removed from the bottom of the excavation so that the bottom shall be in an undisturbed condition.

3.2 Separation of Surface Materials:

A. From areas within which excavations are made, loam and topsoil shall be carefully removed and separately stored to be used again as directed. When excavations are made in paved surfaces, the pavement shall be saw-cut and removed so as to provide a straight, clean uniform edge with a minimum disturbance of remaining pavement.

3.3 Drainage:

A. At all times during construction, the CONTRACTOR shall temporarily provide, place and maintain ample means and devices with which to remove promptly, and dispose properly of, all water entering trenches and other excavations, or water that may flow along or across the site of the work. Excavations shall be kept dry until the pipes and appurtenances to be built therein have been completed, to such extent that they will not be damaged. At that time, the CONTRACTOR may remove such temporary means and devices.

B. All water pumped or drained from the work shall be disposed of in a manner satisfactory to the ENGINEER, without undue interference with other work or damage to pavements, other surfaces, or property.

3.4 Trench Excavation in Fill: Before laying pipe or conduit in areas of fill, the following procedure shall be required:

- A. Fill material shall be placed and properly compacted to final grade or to three feet above the top elevation of the pipe, whichever is less. Under certain circumstances the CONTRACTOR may request modification of this requirement. Any modification must be detailed in writing and approved by the ENGINEER.
- B. Particular care shall be taken to ensure maximum consolidation of material under the pipe location.
- C. The pipe trench shall then be excavated in the prescribed manner as though in undisturbed soil.

3.5 Excavation Near Existing Structures:

- A. Excavation near an existing structure shall not be allowed closer to the structure than the depth of the excavation below the bottom of the foundation without shoring the excavation with sheeting.
- B. The CONTRACTOR'S attention is directed to the fact that site piping and other underground utilities may exist within or immediately adjacent to the areas of proposed construction. Some of the site piping is indicated on the Drawings; however, no attempt has been made to show all piping, and the completeness and accuracy of the information is supplied for the purpose of providing the CONTRACTOR with an indication as to the approximate locations of site piping at the work areas so that he will be made aware of their presence.
- C. All utility lines shall be located by the CONTRACTOR on the ground with pipe locator equipment and by means of test pits well ahead of the work at all times. All such locations shall be plainly marked by coded paint symbols on pavement or by marked stakes in the ground. Such locations shall be established at least 24 hours in advance of all excavation. All such location work shall be provided by the CONTRACTOR, to the satisfaction of the ENGINEER, at no extra cost.
- D. As the excavation approaches pipe, conduits, or other underground structures, digging by conventional trenching machine methods shall be discontinued. Manual methods of excavating shall be employed around buried structures. The CONTRACTOR shall include manual excavation in the work to be done under this contract. No additional compensation shall be paid to the CONTRACTOR for excavations by hand.

3.6 Protection of Existing Structures:

- A. All existing pipes, poles, wires, fences, curbing, property line markers, and other structures which, in the opinion of the OWNER, must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from damage by the CONTRACTOR. In case of damage, the CONTRACTOR shall notify the property owner so that the proper steps may be taken to repair any and all damage done. When the property owners do not wish to make the repairs themselves, all damage shall be repaired by the CONTRACTOR; or, if not promptly done by him, the owner may have the repairs made at the expense of the CONTRACTOR.
- B. All existing piping shall be supported by suitable means so that the piping does not fail when tamping and settling occurs. No separate item is provided for timber piping supports.

C. The CONTRACTOR shall not be compensated for any additional work involved if existing piping or underground structures cross the trench line transversely above or below the utility line.

3.7 Relocation and Replacement of Existing Structures:

A. If, in the course of construction, the CONTRACTOR encounters existing piping and/or structures of any kind not indicated on the Drawings, or otherwise provided for, which encroach upon or are encountered near and substantially parallel to the edge of the excavation and which, in the opinion of the ENGINEER, will impede progress to such an extent that satisfactory construction cannot proceed, they shall be relocated, removed (later to be restored), or replaced as follow:

1. Whenever the CONTRACTOR encounters any of the conditions as described above and is so ordered in writing, he shall do the whole of or such portions of the work as directed; change the location of, remove and later restore, or replace such structures; or assist the OWNER thereof in so doing. For such work the CONTRACTOR shall be issued a change order for extra work.

2. In removing existing pipes or structures as described above, the CONTRACTOR shall use care to avoid damage to materials, and the OWNER shall include for payment only those new materials which, in his judgement, are necessary to replace those unavoidably damaged.

3.8 Backfilling and Compaction - General:

A. Backfilling shall be done as promptly as is consistent with non-injury to the work but no backfilling shall be done without the ENGINEER'S permission.

B. A bulldozer or other blade shall not be used in placing backfill; however, placement of backfill by mechanical equipment with various type buckets may be permitted at the ENGINEER'S approval.

C. The backfill material shall be free from cinders, ashes, refuse, boulders, rocks or stones, unsuitable organic material or other material which in the opinion of the ENGINEER is unsuitable. Where excavated material or any portion thereof is deemed unsuitable for backfilling material, the CONTRACTOR shall procure and place approved materials, as ordered by the ENGINEER.

D. Where the excavation is in a paved area, an area to be paved, an unpaved vehicular traveled way, or the shoulder of a paved roadway, a suitable pavement base shall be provided if shown on/specified within the Drawings.

3.9 Backfilling in Open Trench:

A. As soon as practicable after the pipe has been placed and the pipe joints have been properly made, the backfilling shall begin, and shall continue without delay. If bedding material is not used, the backfill material shall be placed simultaneously on both sides of the pipe, so that there will be no displacement of pipe alignment in strict conformance with manufacturers recommendation. In placing the material, care shall be taken that stones do not strike the pipe.

B. The backfill at the sides of the pipe up to the top of the pipe shall be hand placed and thoroughly compacted using approved hand tampers.

C. The backfill up to a level of one foot above the top of the pipe shall be placed in four inch (4") layers, leveled along the length and width of the trench and thoroughly compacted with approved hand tampers.

D. Care shall be taken in the use of mechanical tampers not to injure or move the pipe or to cause the pipe to be supported unevenly. Mechanical tampers shall not be used within one foot of the top of the pipe.

E. The backfill in the remainder of the excavation above the tamped backfill, or above the top of the bedding material, if used, shall be placed in appropriate machine methods. Tamping will not be required in earth surface areas not subject to vehicular traffic. Backfilling or tamping with trenching machines is prohibited.

F. No large masses of backfilling material shall be dropped into the tamped layers of backfill until one foot of earth backfill has been placed over the top of the pipe.

G. Compaction by water jetting will not be permitted.

H. Whatever method of compacting backfill is used, care shall be taken that stones and lumps shall not become nested and that all voids between stones shall be completely filled with fine material.

I. No compacting shall be done when the material is too wet to be compacted properly; at such times the compacting work shall be suspended until the previously placed materials have dried out sufficiently to permit proper compacting, or such other precautions shall be taken as necessary to obtain proper compacting.

J. All backfilled trenches in traveled areas shall be thoroughly surface tamped with a kinetic energy tamping machine approved by the ENGINEER.

K. All backfilled trenches shall be compacted in eight inch (8") maximum loose lifts to within 1% below to 3% above optimum moisture content and as follows:

1. Paved Areas - at least 95% Standard Proctor Density (ASTM D698)
2. Grassed Areas - at least 90% Standard Proctor Density (ASTM D698).

3.10 Excavated Material:

A. General:

1. Excavated material shall be placed so as minimize the inconvenience to occupants traveling on streets and driveways or adjoining properties. Excavated material shall not be deposited on private property unless written consent of the owner or owners thereof has been filed with the ENGINEER.

2. Suitable excavated material will be used as backfill, fill for embankments, or other parts of the work in accordance with the appropriate sections of the Specifications.

3. Surplus excavated material, if any, shall be disposed of by the CONTRACTOR in a legal and environmentally sound manner.

B. Clean Up and Restoration of Work Site:

1. Upon completion of the backfilling, the streets or property shall be cleaned, surplus material removed, and the surfaces restored to the condition existing before ground was broken. If the CONTRACTOR fails to promptly remove such surplus material, the ENGINEER may have the same done, and charge the cost thereof as money paid to the CONTRACTOR.

2. Material excavated from private property shall be disposed of by the CONTRACTOR at his own expense. If the CONTRACTOR fails to remove such surplus material, the ENGINEER may have the same done, and charge the cost thereof as money paid to the CONTRACTOR.

3.11 Borrow: Should material excavated under the work of this Contract be unsuitable or of insufficient quantity for completion of the necessary backfilling operations, the CONTRACTOR shall furnish approved backfill material. Approved backfill to supplement insufficient quantity for completion shall not be paid for separately and shall be considered as a subsidiary obligation under this Contract.

END OF SECTION 312333

SECTION 31 25 14 - EROSION CONTROL AND SOIL STABILIZATION

PART 1 - GENERAL

1.1 Scope: This Section covers the installation of erosion control and soil stabilization materials consisting of temporary seeding, permanent sodding, and fertilizing in disturbed or designated areas. Refer to Drawings for limits of sodding.

1.2 Reference Standard: Work shall conform to the following Sections of the State of Louisiana, Department of Transportation and Development, Standard Specifications for Roads and Bridges, 2006 Edition; except as modified herein:

Section 714 - Sodding
Section 718 - Fertilizer and Agricultural Lime

All references made therein to Measurement and Payment are deleted.

1.3 Submittals: Submittals shall be provided in accordance with Section 01 33 00 – Submittal Procedures.

1.4 Planting Time: Place lawns during normal planting seasons of the project locale. If project finish out occurs during weather conditions that are not suitable to planting, planting shall be deferred until suitable and sustained weather conditions exist. This deferment shall have no effect on the substantial completion of other work.

1.5 Replacement Provisions:

A. Lawns: Warrant lawns until the date of acceptance at the end of the specified maintenance period.

B. Replace unsatisfactory landscape materials (those dead or lacking vigor) with healthy, vigorous materials. Plant only during next occurring specified planting season.

1.6 Maintenance: Maintain lawns from immediately after planting until the latest of: substantial completion of the project, or 60 days after date when hydroseeding is substantially complete, or until an acceptable lawn is established.

PART 2 - PRODUCTS

2.1 General:

A. Materials related to erosion control and soil stabilization shall conform to the following subsections of the Reference Standard:

1)	Sodding	Common Bermuda or St. Augustine
2)	Seed	Common Bermuda
3)	Water.....	714.07
4)	Fertilizer	1018.16
5)	Agricultural Lime	1018.17

B. Topsoil:

1. Provide friable clay loam surface soil.

2. Satisfactory Topsoil: Fertile agricultural soil, typical for locality, capable of sustaining vigorous plant growth; free of subsoil, rocks larger than 2" in diameter, clay, toxic mater, plants, weeds and roots.

3. Unsatisfactory Soil Material: silty soils, clayey soils, peat.

PART 3 - EXECUTION

3.1 General:

A. The CONTRACTOR shall neatly dress and prepare areas designated for erosion control work as specified in the appropriate sections of these Specifications.

B. Prepare only those areas that will be planted presently.

C. Preparation of stripped areas: Till subgrade to a depth of at least two inches (2").

D. Fine-grade, roll, rake and drag lawn areas cutting down high spots and filling low spots, leaving a smooth, even surface of fine-textured soil complying with required grades.

E. The CONTRACTOR shall be required to furnish and apply water on the newly placed sod as necessary to maintain a healthy stand of vegetation until Paragraph 1.6 of this Section is satisfied.

3.2 Seeding: Seeding for temporary erosion control work shall be in conformance with Reference Standard (LDOTD – Section 717). There will be no separate measurement or payment for watering.

3.3 Sodding: Sodding work shall be in conformance with the Reference Standard (Section 714) and these Specifications. Areas to receive sod shall be graded to allow for two inches (2") of sod thickness. Finished sod elevation shall generally match elevation of adjacent pavement/surface. Limits of required sod is shown and/or noted on the Drawings.

3.4 Fertilizer: Fertilizer shall be installed in conformance with the Reference Standard (LDOTD - Section 718) and these Specifications.

3.5 Agricultural Lime: The top six (6) inches of embankment material shall have a pH between seven (7) and eight (8) which will support adequate vegetation. If required, the material shall be treated with agricultural lime to promote support of adequate vegetation.

3.6 Water: Water for irrigation purposes may be obtained from any source, except that chemically contaminated or oily water shall not be used.

3.7 Maintenance:

A. Apply a starter fertilizer with a ratio of 1:1:1 (nitrogen:phosphorous:potassium) after grass seed has germinated and growth has begun (or sod has sufficiently rooted), at a rate of one (1) pound of nitrogen per 1,000 square feet. Apply fertilizer at the above rate every month thereafter, thoroughly watering in for each application until Paragraph 1.6 of this Section is satisfied.

B. Mowing shall begin once grass reach 3" tall, if applicable for the required maintenance period. Care shall be taken to ensure that not more than one-third (1/3) of the leaf blade is removed in a single mowing.

C. Watering, fertilizing and mowing operations shall continue on the newly sodded and hydroseeded areas until Paragraph 1.6 of this Section is satisfied.

- END OF SECTION -

SECTION 313116 - TERMITE CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Soil termite treatment.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.3 SUBMITTALS

- A. Product Data: For each type of product. Include the EPA-Registered Label for termiticide products.
- B. Product certificates.
- C. Soil Treatment Application Report: Include the following:
1. Date and time of application.
 2. Moisture content of soil before application.
 3. Termiticide brand name and manufacturer.
 4. Quantity of undiluted termiticide used.
 5. Dilutions, methods, volumes used, and rates of application.
 6. Areas of application.
 7. Water source for application.

1.4 WARRANTY

- A. Soil Treatment 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, including Formosan termites (*Coptotermes formosanus*). 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: One (1) year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOIL TREATMENT

- A. Termiticide: EPA-Registered termiticide acceptable to authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Syngenta ; Demon Max, or a comparable product by one of the following:
 - a. BASF Corporation.
 - b. Bayer Environmental Science.
 - c. Ensystex, Inc.
2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than five years against infestation of subterranean termites.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Remove 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.

3.2 APPLYING SOIL TREATMENT

- A. Application: Mix soil treatment termiticide solution to a uniform consistency. Distribute treatment uniformly. Apply treatment at the product's EPA-Registered Label volume and rate for maximum specified concentration of termiticide to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction.
 1. Slabs-on-Grade and Basement Slabs: Underneath ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
 2. Foundations: Soil adjacent to and along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing.
 3. Crawlspace: Soil under and adjacent to foundations. Treat adjacent areas, including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.
 4. Masonry: Treat voids.
 5. Penetrations: At expansion joints, control joints, and areas where slabs and below-grade walls will be penetrated.
- B. Post warning signs in areas of application.
- C. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

END OF SECTION 313116

SECTION 316329 FOUNDATION SHAFTS

PART 1 – GENERAL

1.1 GENERAL REQUIREMENTS

- A. The provisions of all of the Contract Documents are hereby made a part of this Section.

1.2 WORK INCLUDED:

- A. Install machine drilled, cast in place, foundation shafts as shown on the drawings. Locations, diameters of shafts, bottom elevations, top elevations, and details of construction shall be as indicated.

1.3 SUBMITTALS:

- A. Submit records which have been compiled and attested to by an experienced technician employed by the approved and selected testing laboratory.

1.4 QUALITY ASSURANCE:

- A. Installer qualifications: Not less than three successfully completed contracts with similar soil conditions, shaft sizes, depths and volumes of work contained in this project. Submit satisfactory proof of compliance to Architect.
- B. Survey Work: Conduct layout work for each shaft to lines and levels required before excavation, and actual measurements of each shaft's horizontal axial location, diameter, bottom and top elevation, deviations from specified tolerances, and other data as required. Record and maintain information pertinent to each shaft and cooperate with other testing and inspection personnel to provide data for required reports.

1.5 JOB CONDITIONS:

- A. Site Information: Report of Geotechnical Investigation Services, Proposed North Webster Parish School Improvements, Springhill, Louisiana, prepared by Goldman Geotechnical Consulting, LLC, Bossier City, LA, report number G25-01-018, dated February 28, 2025 is included in the Project Manual. Data on subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that the Owner will not be responsible for interpretations or conclusions drawn therefrom by the Contractor. The data is made available for convenience of the Contractor.
- B. Attempt to determine the existence of and the actual physical locations of existing underground utilities and/or existing storm drains which are in the area of all shaft work. Carefully locate the lines by hand excavation before starting machine excavation operations. If utilities are to remain in place, provide protection from damage during shaft operations. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult Architect immediately for directions as to procedure. Cooperate with Owner, and public or private utility companies in keeping their respective service and facilities in operation. Repair damaged utilities to the satisfaction of utility owner. Do not interrupt existing utilities serving facilities occupied and used by Owner or others, except when permitted in writing by Architect and then only after acceptable temporary utility services have been provided.

PART 2 PRODUCTS

2.1 CONCRETE AND RELATED MATERIALS:

- A. Concrete, reinforcing steel, and related materials shall be as specified in Section 033000, Cast-In-Place Concrete. Concrete for footing shafts shall have a slump of 6", +/- 1".

2.2 CONTRACTOR EQUIPMENT:

- A. Contractor equipment shall be standard to this type of foundation installation. It shall be maintained in good working condition so as not to delay the progress of the work.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS:

- A. General: Excavate holes for footing shafts to required lengths or tip elevation as shown on drawings. Excavate holes for closely spaced shafts, and those occurring in fragile stratum or sand, only after adjacent holes are filled with concrete and allowed to set. Shaft design dimensions shown are minimums. If required, and as directed by the Architect in writing, install temporary casings as excavation proceeds so that earth walls are maintained without caving into shaft.

- B. Tolerances: Centerline of shafts to be at the locations with respect to structure centerlines as shown by plan details.

- 1. Shaft centerline tolerances:
 - a. 2" max. variation for shafts up to 18" dia.
 - b. 3" max. variation for shafts 20" to 42" dia.
 - c. Shaft variation to Plumb: 3" per 10', for full depth.

If above tolerances are exceeded, provide additional or corrective construction to compensate for excessive eccentricity. Submit proposed corrective construction methods to Architect for review before proceeding.

- C. Temporary shaft protections: If required by Architect, provide watertight steel casings, length as required, and of sufficient thickness to withstand compressive, displacement, and withdrawal stresses, and to maintain shaft walls. Payment for temporary casings will be made in accordance with unit prices; per size, per shaft; which are to be included with contractor's proposal form.
- D. Dewatering: Provide and maintain pumping equipment to keep excavations free of water before placing concrete. If excessive water is encountered and drilling operations must be halted, consult with Architect before using alternate methods of construction.
- E. Inspection: Each shaft must be inspected before placing concrete. Provide facilities and lights required to allow inspection of excavations, and cooperate with inspecting personnel to expedite work. Notify Architect at least 24 hours prior to time excavations will be ready for inspection.
- F. Overexcavation: No payment will be made for extra length, when shafts are excavated to a greater depth than required or authorized by Architect, due to overdrilling by Contractor. Complete shaft and fill extra depth with concrete, if other conditions are satisfactory.

- G. Remove excavated material and dispose of it legally off site. Excavated materials shall not be used beneath building and pavement slabs.

3.2 REINFORCING STEEL:

- A. Before placing, clean reinforcing steel and dowels of loose rust, scale, dirt, grease and other material which could reduce or destroy bond.
- B. Fabricate and erect reinforcing cages in shafts as one continuous unit. Place reinforcement accurately and symmetrically about axis of hole and hold securely in position during concrete placement, so as to fall in proper position in future construction.
- C. Protect exposed ends of dowels from mechanical damage.

3.3 CONCRETE PLACEMENT:

- A. General: Fill shafts with concrete immediately after inspection and approval by the Architect's representative. Use plywood protection sheets (cut out to receive concrete) over excavation openings, extending at least 12" beyond edges. Place concrete continuously and in a smooth flow without segregating the mixed materials. Provide mechanical vibration for consolidation of at least top 10' of each shaft. Place concrete by means of a bottom discharge bucket, or flexible drop chute, elephant trunk hopper, or tremie. Place concrete in-the-dry. If water occurs, and it is impracticable to dewater shaft excavation, and reasonable attempts to seal off water flow have failed, allow water level to attain its normal level and place concrete by tremie method. Control placement operations to ensure that tremie is not broken during continuous placing from bottom to top. Maintain a sufficient head of concrete to prevent reduction in diameter of shaft by earth pressure and to prevent extraneous material from mixing with fresh concrete. Stop concrete placement at cut-off elevation shown, screed level, and apply a scoured rough finish.
- B. Place concrete immediately upon delivery. Keep exposed concrete surfaces, and formed shaft extensions moist by fog sprays, wet burlap or other effective means.

END OF SECTION 316329

DIVISION 32 – EXTERIOR IMPROVEMENTS

320190.29 TOPSOIL MANAGEMENT
321623 CONCRETE WALKS AND INCIDENTAL PAVING
323119 CHAIN LINK FENCE AND GATES

SECTION 32 01 90.29 - TOPSOIL MANAGEMENT

PART 1 - GENERAL

1.1 Scope: This Section includes the location, removal, stockpiling, protection and re-use of existing topsoil, as available, to be used for this project.

1.2 Application Publications:

- A. United States Department of Agriculture Soil Conservation Service and Forest Services - Soil Survey of Rapides Parish, Louisiana, issued March 1980.
- B. Geotechnical Investigation Services – A New Multipurpose Building for Minden High School, Minden, Webster Parish, Louisiana. Refer to Section 02 00 00 – Subsurface Exploration.

1.3 Location and Determination of Topsoil: The Contractor will be responsible locating and determining characteristics of available on-site topsoil to be managed for re-use on this project.

PART 2 - PRODUCTS

2.1 Topsoil: Available on-site topsoil is defined as non-plastic silty loam located in the first zero to four (0" - 4") inches of the natural surface, having a pH of 5.9 to 6.6 and an organic matter content greater than two percent (2%) by weight. Generally, the upper part of the soil that is richest in organic matter is most valuable. Topsoil shall be free of debris, noxious weeds, toxic substances, muck, and rocks one half (½") inch and larger, clay, debris and any other undesirable matter that would be detrimental to the intended use of the topsoil for this project.

2.2 Soil Amendments: Refer to Section 31 25 14 – Erosion Control and Soil Stabilization.

PART 3 - EXECUTION

3.1 Spreading Thickness: Topsoil shall be respread not less than four inches (4") thick in all grassed areas. The thickness specified herein is compacted thicknesses.

3.2 Stripping: Strip topsoil from those areas that will be disturbed by excavation and filling operations. The entire site shall NOT be stripped at once. Stripping shall progress as earthwork demands. Stripping depths varies but is anticipated to be six inches (6") thick over the site. Contractor shall be responsible for determining the depth of stripping.

3.3 Stockpiling: Topsoil for re-use shall be stockpiled in areas to be determined by the Contractor. Generally, resspreading is easier and more economical when topsoil is stock-piled in small piles near the area(s) where it will be re-used. Stockpiles shall not exceed slopes of 2:1 and shall not be higher than five feet (5') to prevent compaction. Stockpiles shall contain similar type soils. Do not mix topsoils from different areas where they are to be returned.

3.3.1 Stockpile Maintenance: Protect topsoil stockpiles by temporarily seeding as soon as possible and in NO case any later than fifteen (15) days after the formation of the stockpile. If stockpiles are to remain unused for a period greater than three (3) months they shall be permanently stabilized with appropriate vegetation to control erosion, contamination and weeds. All stockpiles shall be protected with silt fences regardless of storage time in conformance with the Storm Water Pollution Prevention Plan.

3.4 Installation: The top six inches (6") of the subgrade or area to receive topsoil shall have a pH of 5.1-7.1 to support adequate vegetation. CONTRACTOR shall provide soil amendments in conformance with Section 31 25 14 – Erosion Control and Soil Stabilization. This is a requirement for all areas disturbed due to construction whether the site yields sufficient quantities of topsoil or not. In general, any areas requiring topsoil, seeding, sprigging and/or sodding shall be prepared accordingly. Once the area meets the aforementioned requirements and immediately prior to spreading the topsoil, loosen the subgrade a minimum of six inches (6") by disking and/or scarifying to ensure bonding of the prepared subgrade and topsoil. Spread the topsoil to the thicknesses specified in Paragraph 3.1 of this Section. Compact the topsoil enough to ensure good contact with the prepared subgrade, but avoid excessive compaction as it increases run off and inhibits germinations. Do not install topsoil in areas that are wet, muddy, frozen, compacted and/or dried hard. Lightly disk immediately prior to seeding.

3.5 Seeding Rates: Refer to Section 31 25 14 – Erosion Control and Soil Stabilization.

3.6 Watering: Refer to Section 31 25 14 – Erosion Control and Soil Stabilization.

END OF SECTION 320190.29

SECTION 32 16 23 - CONCRETE WALKS AND INCIDENTAL PAVING**PART 1 - GENERAL**

1.1 Scope: The CONTRACTOR shall furnish all labor, materials, tools and equipment, and perform operations necessary for the construction of Portland Cement concrete walkways, sidewalks and incidental paving in accordance with these Specifications and in conformity with the lines and grades as shown on the Drawings or established by the ENGINEER.

1.2 Reference Standard: Conform to the following sections of the State of Louisiana, Department of Transportation and Development, Standard Specifications for Roads and Bridges, 2006 Edition, except as modified herein:

- Section 706 - Concrete Walks, Drives, and Incidental Paving
- Section 1005 - Joint Materials for Pavements and Structures
- Section 1009 - Reinforcing Steel and Wire Rope
- Section 1011 - Concrete Curing Materials, Admixtures and Special Finishes

All references made therein to Measurement and Payment are deleted.

1.3 Submittals: Submit product data in accordance with provisions of Section 01 33 00 – Submittal Procedures.

PART 2 - PRODUCTS

2.1 Portland Cement Concrete: Portland Cement concrete for walkways, sidewalks, sidewalk ramps, landings, drainage flumes/swales and incidental concrete pavement shall be Minor Structural Class “M” as specified in Section 03 30 53 - Cast-in-Place Concrete.

2.2 Joint Materials:

A. Joint Material: Material shall conform to Section 1005.01 (a) of the Reference Standard.

A. Sidewalk and Pavement Isolation and Butt Joints: Closed cell polypropylene joint filler (1/2” thickness).

B. Sidewalk and Pavement Expansion Joints: Redwood (3/4” thickness) with removable strip to allow for sealant reservoir. **Note: Sealant reservoir not required for sidewalk expansion joints.**

2.3 Steel Reinforcing: Steel reinforcing shall be grade 60 ksi and shall conform to Section 1009.01 of the Reference Standard.

2.4 Fiber Reinforcement: **(None Required This Project)** Concrete shall be reinforced with the use of polypropylene, collated, fibrillated fibers. The fibers shall be used at a rate of one- and one-half pounds (1½ lbs.) per cubic yard and in strict accordance with the manufacturer’s recommendations. The fiber manufacturer or approved distributor shall provide the services of a qualified technician at job startup.

2.5 Curing Compound: This material shall conform to AASHTO Designation: M148 and be on the LDOTD Qualified Products list and conform to Subsection 1011.01. The curing compound shall be white pigmented.

2.6 Concrete Stain: **(None Required This Project)** Integral concrete stain shall be provided at areas of contrasting concrete color as detailed on the Drawings. Acceptable manufacturers shall be Kemiko Concrete Stains, H&C Concrete or approved equal.

PART 3 - EXECUTION

3.1 General: Concrete walks, ramps, landings, drainage flumes/swales and incidental paving shall be constructed by the CONTRACTOR in the best workmanlike manner. The underlying subgrade as well as the finish surface shall conform to the requirements of these Specifications and of the Drawings.

3.2 Paving work shall be performed in accordance with Section 706 - "Concrete Walks, Drives and Incidental Paving" of the Reference Standard.

3.3 Walks shall be constructed on compacted subgrade as shown on the Drawings. Subgrade shall be compacted in conformance with Section 31 22 10 - Excavation, Filling and Backfilling.

3.4 Finishing concrete by either machine or hand may be used, conforming to Section 706.03(d).

3.5 Expansion, isolation and dummy joints shall be constructed as detailed on the Drawings.

3.6 Pavement surface shall be finished with a broom finish.

3.7 All pavement shall receive white pigmented spray sealant curing compound upon completion of finish work.

3.8 Concrete Cylinder Testing: The Portland Cement concrete used for walks and incidental paving shall be tested for seven (7) and 28-day compressive strength by a geotechnical engineer/laboratory. Concrete cylinders shall be molded at a frequency of three (3) cylinders per 50 cubic yards of concrete placed or portion thereof. Costs for required concrete cylinder testing shall be borne by the OWNER.

END OF SECTION 321623

SECTION 32 31 13 - CHAIN LINK FENCE AND GATES

PART 1 - GENERAL

1.1 Scope: This Section covers the furnishings of all labor, materials, tools and equipment and related incidentals as required to perform all operations necessary to install new chain link fencing, gates and related accessories as indicated on the Drawings and as directed by the ENGINEER. **Note: Both galvanized and vinyl coated chain link fence and gates are required for this Project (see Drawings).**

1.2 Submittals: Submit product data in conformance with Section 01 33 00 – Submittal Procedures.

1.3 Applicable Publications: The publications listed below form a part of this Specification to the extent referenced. The publications may be referred to in the text by designation only.

American Society for Testing and Materials (ASTM) Publications:

A90	Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A176	Specification for Stainless and Heat-Resisting Chromium Steel Plate, Sheet and Strip
A392	Specification for Zinc-Coated Steel Chain- Link Fence Fabric
A478	Specification for Chromium Nickel Stainless and Heat Resisting Steel Weaving and Knitting Wire.
A817	Specification for Metallic-Coated Steel Wire for Chain-Link Fence Fabric and Marcellled Tension Wire
A824	Specification for Metallic-Coated Steel Marcellled Tension Wire for Use with Chain-Link Fence
F567	Standard Practice for Installation of Chain-Link Fence
F626	Specification for Fence Fittings
F900	Specification for Industrial and Commercial Swing Gates
F1043	Specification for Strength and Protective Coatings on Metal Industrial Chain-Link Fence Framework
F1083	Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures

1.4 Quality Assurance and Qualifications:

A. Installer Qualifications: Installer shall have at least three (3) years experience and have completed at least five (5) chain link fence projects with same material and of similar scope to that indicated for this Project with a successful construction record of in-service performance.

B. Single-Source Responsibility: Obtain chain link fences and gates, including accessories, fittings and fastenings, from a single source.

PART 2 - PRODUCTS

2.1 Steel Chain-Link Fence Fabric: Steel chain-link fence fabric shall be fabricated in one-piece widths for fencing twelve (12) feet and less in height to comply with Chain Link Fence Manufacturers Institute (CLFMI) "Product Manual". The core fabric diameter shall be 9 gauge prior to coating (8 gauge after coating, if vinyl coated) as indicated on the Drawings, with 2-inch diamond mesh pattern and selvage knuckled finish on top and bottom. The fabric coating shall meet the requirements of ASTM A817, Type 2, Class 1 (1.2 oz/sq ft) zinc coating. The zinc coating shall be applied after weaving ("Galvanized after Weaving").

2.2 Round Posts and Rails: Round posts and rails shall be standard weight (schedule 40) galvanized-steel pipe conforming to ASTM F 1083, and to the heavy industrial requirements of ASTM F 669, Group IA, with minimum yield strength of 30,000 psi, not less than 1.2 oz. of zinc per sq. ft. The posts shall have Type A coating inside and outside according to ASTM F 1043, as determined by ASTM A 90, and weights per foot as follows (as applicable):

<u>Actual OD (inches)</u>	<u>Weight (lb/ft)</u>	<u>NPS Size (inches)</u>
1.660	2.27	1-1/4
1.900	2.72	1-1/2
2.375	3.65	2
2.875	5.79	2-1/2
3.500	7.58	3
4.000	9.11	3-1/2
4.500	10.79	4
5.563	14.62	5
6.625	18.97	6
8.625	28.55	8

A. Top, Bottom and Brace Rails: Rails shall be 1.660 inch OD Type I for 4 ft. through 10 ft. tall fence and 1.900 inch OD Type 1 for fence heights greater than 10 ft., unless otherwise shown on the Drawings. Rails shall be manufacturer's longest lengths (17 to 21 feet) with swedged-end or expansion-type coupling, approximately 6 inches long for joining. Provide rail ends or other means for attaching top rail securely to each post. **Note: Bottom rails only required for new ballfield fencing on this Project.**

B. Line Posts: Line posts shall be 2.375 inch OD Type I for 4 ft through 6 ft. tall fence, 2.875 inch OD Type I for 8 ft. tall fence and 4.000 inch OD Type I for 10 ft. tall fence, as applicable.

C. End, Corner, Pull and Gate Posts: Gate posts to support a gate leaf shall meet the requirements of ASTM F 900. End, corner, pull and gate posts shall be 4.000 inch OD pipe for 4 ft through 10 ft. tall fence.

2.3 Fittings and Accessories:

A. Material: Fittings and accessories shall meet the requirements of ASTM F 626. Unless specified otherwise, hot-dipped galvanized pressed steel or cast-iron fence fitting and accessories with at least 1.2 oz. of zinc per square foot as determined by ASTM A 90.

B. Tension or Stretcher Bars: Tension or stretcher bars shall be hot-dipped galvanized steel with a minimum length 2 inches less than the full height of fabric, a minimum cross section of 3/16 inch by 3/4 inch, and a minimum of 1.2 oz. of zinc coating per square foot. Provide one bar for each gate and end post, and two for each corner and pull post.

C. Tension Wire: Tension wire shall be 7 gage metallic-coated steel marcelled tension wire conforming to ASTM A 824 with finish to match fabric. The wire shall have a Type II, Class 1 zinc coating, conforming to ASTM A 90, with a minimum coating weight of 0.80 oz. per square foot of uncoated wire. **Note: Bottom tension wire required for all new fencing on this Project, except ballfield fencing.**

D. Hog Rings: Hog rings shall be 12½ gage galvanized steel rings. **Note: Hog rings required (on bottom tension wire) for all new fencing on this Project, except ballfield fencing.**

2.4 Fence Gates:

A. General: Fabricate gates from same material and finish as fence framework. Fabric shall be the same as for fence unless otherwise indicated. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware, and accessories. Secure fabric at vertical edges with tension bars and bands and to top and bottom of frame with hog rings.

B. Swing Gates: Swing gates shall comply with ASTM F 900. Perimeter frames for swing gates shall be fabricated of 1.660 inch (min.) OD Type I steel pipe for 4 ft. through 6 ft. tall fence and 1.900 inch (min.) OD Type I steel pipe for 8 ft. tall fence, as applicable.

C. Gate Hardware: Provide galvanized hardware and accessories for each gate as indicated on the Drawings.

2.5 Galvanizing Repair Paint: Zinc dust paint, complying with SSPC – Paint 20 or MIL P-21035B, Type I or II.

2.6 Concrete for Post Footings: Refer to Section 03 30 53 - Cast-In-Place Concrete.

2.7 Aluminum Fence Ties: Tie wire for securing chain link fabric to posts and rails shall be #9 gauge, aluminum ties.

2.8 Ground Rods: Ground rods shall be 5/8" nominal diameter x 8' long Copperweld rod, Burndy type GAR.

2.9 PVC (Vinyl) Coating: All components used for vinyl coated chain link fence and gate construction shall be fusion bonded vinyl over galvanized surface with a PVC coating of 6 to 10 mils for fabric (8 gauge after coating of 9 gauge core wire) and 10 to 14 mils for pipe and fittings in accordance with ASTM –F668 Class 2b. Powder coating of posts and hardware shall be an acceptable alternative to vinyl coating. Color of vinyl coating, and powder coating (if applicable), to be "BLACK".

PART 3 - EXECUTION

3.1 Installation:

A. General: Install chain link fence, gates and related appurtenances in conformance with ASTM F 567. Do not begin installation and erection before final grading is completed.

B. Excavation: Drill or hand-excavate (using post-hole digger) holes for posts to diameters and spacings indicated, in firm, undisturbed or compacted soil.

C. Placing Posts: Space line posts for a maximum of ten feet (10') or as indicated on the Drawings. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment and hold in position during placement and finishing operations. Top of concrete footing to terminate

3" (min.) below finished ground surface to allow filling with topsoil and establishment of vegetative turf.

D. Top and Brace Rails: Run rail continuously between line posts. Terminating into rail end attached to posts or post caps fabricated to receive rail. Provide expansion couplings as recommended by fencing manufacturer.

E. Fabric: Leave approximately 1 inch between finish grade and bottom selvage. Pull fabric taut and tie to posts, rails, and tension wires (as applicable). Install fabric and anchor to framework so that fabric remains under tension after pulling force is released.

F. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not over 15 inches on center.

G. Hog Rings: Chain link fence fabric shall be securely attached to tension wire (as applicable) with 12½ gauge galvanized steel hog rings. Hog rings shall be spaced approximately 12" on center.

H. Aluminum Fence Ties: Aluminum tie wires for securing chain link fabric to posts and rails shall be spaced approximately 12" on center.

I. Galvanized Steel Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts for added security.

J. Gates: Install gates according to manufacturer's instructions. Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary. After repeated operation of completed installation equivalent to 3 days' use by normal traffic, readjust gates for optimum operating condition and safety. Lubricate operating equipment and clean exposed surfaces.

L. Grounding Devices: Grounding devices shall be installed at a maximum of two hundred fifty (250') feet on centers, at overhead utility crossings and at gate locations on the new chain link fence.

END OF SECTION 323113

DIVISION 33 - UTILITIES

330100	PROTECTION OF EXISTING UTILITIES
334125	BEDDING MATERIAL
334205	HDPE/PVC DRAINAGE PIPE AND PVC DRAIN BASINS

SECTION 33 01 00 - PROTECTION OF EXISTING UTILITIES

PART 1 - GENERAL

1.1 Scope: This section describes the work required to allow for the location of existing underground utilities for the entire project site.

1.2 General: The locations of existing underground utilities shown on the Drawings, if any, are approximate. The location of the existing utilities shown on the Drawings, if any, has in part, been determined by information compiled and furnished by others.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 General:

A. It shall be the responsibility of the CONTRACTOR to locate all underground utilities that may conflict with the proposed work. The CONTRACTOR shall be responsible for repairing all damage to underground utilities as a result of construction activities, at no cost to the OWNER. The CONTRACTOR shall contact Louisiana One Call by phone at 811 in order for their personnel to mark the field location of underground utilities that participate in the Louisiana One Call system.

B. The OWNER will assist the CONTRACTOR in locating OWNER'S utilities; however, it shall be the CONTRACTOR'S responsibility for protecting the utilities once located.

C. The CONTRACTOR shall be responsible for repairing all damage done to any underground utilities as a result of construction activities, at no cost to the OWNER.

3.2 Test Pits: Test pits for the purpose of locating existing underground utilities shall be excavated and backfilled in accordance with Section 31 23 17 - Test Pits.

END OF SECTION 330100

SECTION 33 41 25 - BEDDING MATERIAL

PART 1 - GENERAL

1.1 Scope: This Section covers all operations necessary to provide bedding material for all drainage conduits and drainage structures to provide a stable working table.

1.2 Reference Standard: Work shall conform to the following Section of the State of Louisiana, Department of Transportation and Development, "Louisiana Standard Specifications for Roads and Bridges", 2006 Edition, except as may be modified herein:

Section 726 - Bedding Material

All references made therein to Measurement and Payment are deleted.

Except for the Retaining Wall Drainage, the placement of bedding material in a geotextile envelope will not be used on this project.

PART 2 - PRODUCTS

2.1 Bedding Material: Bedding material shall conform to subsection 1003.08 of the Reference Standard and/or as approved by the ENGINEER.

PART 3 - EXECUTION

3.1 General: Bedding material shall be installed as described in the Reference Standard where authorized by the ENGINEER, except any requirements on the use of geotextile fabric underlayment or envelopes will be deleted.

3.2 Bedding Material: Bedding material shall be compacted to 95% Standard Proctor at plus or minus 3 percent optimum moisture content (ASTM D698). The material shall be shaped to conform to the bottom of the pipe.

END OF SECTION 334125

SECTION 33 42 05

HDPE/PVC DRAINAGE PIPE AND
PVC DRAIN BASINS

PART 1 - GENERAL

1.1 Scope: This Section covers the requirements for High Density Polyethylene (HDPE) and Polyvinyl Chloride (PVC) drainage conduits and PVC drain basins including all related appurtenances in conformance with the lines and grades as shown on the Drawings, as outlined within this Specification, and to the satisfaction of the OWNER.

1.2 Quality Assurance: To ensure unity of responsibility, all drainage conduit, pipe fittings, connectors, catch basins risers, joints, etc. shall be the standard product of a single manufacturer having a minimum of five (5) years experience in the manufacturing of plastic drainage systems conforming to this Specification.

1.3 Submittals: Submit product data in accordance with provisions of Section 01 33 00 – Submittal Procedures.

1.4 Reference Standard: Work shall conform to the following Section of the State of Louisiana, Department of Transportation and Development, "Louisiana Standard Specifications for Roads and Bridges", 2006 Edition, except as may be modified herein:

Section 701 - Culverts and Storm Drains

1.5 Applicable Publications: The publications listed below form a part of this Specification to the extent referenced. The publications may be referred to in the text by basic designation only.

A. American Association State Highway Transportation Officials (A.A.S.H.T.O.)

- | | |
|--------|---|
| M252 | Corrugated Polyethylene Drainage Tubing |
| M294 | Corrugated Polyethylene Pipe, 300 mm to 1,200 mm |
| MP7-97 | Corrugated Polyethylene Pipe 1,350 mm to 1,500 mm |

B. American Society for Testing and Materials (A.S.T.M.)

- | | |
|------|--|
| F477 | Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe |
| F810 | Specification for Smooth Wall Polyethylene (PE) Pipe |
| F405 | Specification for Corrugated Polyethylene (PE) Tubing and Fittings |

F667	Specification for Large Diameter Corrugated Polyethylene (PE) Tubing and Fittings
D1149	Test Method of Rubber Deterioration - Surface Ozone Cracking in a Chamber
D2321	Practice for Underground Installation of Flexible Thermoplastic Pipe for Sewers and Other Gravity Flow Applications
D3350	Specifications for Polyethylene Plastic Pipe and Fittings Materials

PART 2 - PRODUCTS

2.1 HDPE Drain Pipe and Fittings:

A. Pipe (Solid): HDPE drain pipe of all sizes and lengths shown on the Drawings shall have smooth interior ("Smooth Lined") and annular exterior corrugations. HDPE pipe shall meet the requirements of AASHTO M252 or M294. Material must be high density polyethylene meeting ASTM D 3350 minimum call classification 335420 C. HDPE drain pipe shall be N-12 (dual wall) as manufactured by ADS (Advanced Drainage System) of Lafayette, Louisiana (337) 981-0898, Hancor, or approved equal.

B. Fittings: HDPE fittings shall meet the requirements of paragraph 2.1.A and conform to AASHTO M252 or M294. Fabricated fittings shall be factory welded at all accessible interior and exterior junctions. Drain pipe fittings shall be by the same manufacturer as specified herein for drain pipe as manufactured by ADS, Hancor, or approved equal.

C. Joints: Pipe shall be joined with integral bell and spigot joints meeting AASHTO M252, M294 or MP7-97. The joint shall be rated watertight (WT). Rubber gaskets shall meet the requirements of ASTM 477 and be omni directional. Gaskets shall be installed by the pipe manufacturer and covered with a removable wrap to ensure the gasket is free from debris. A joint lubricant shall be supplied by the pipe manufacturer to be used on the gaskets at the time of installation. The sealing area of the pipe bell shall be reinforced with a 2" polymer composite collar. The joint design be N-12 ST WT Watertight Joint as manufactured by ADS, Hancor, or approved equal.

2.2 PVC Drain Pipe and Fittings:

A. Pipe (Solid): PVC pipe shall be in accordance with ASTM D3034, SDR 26.

B. Joints: PVC pipe joints shall be in accordance with ASTM D3212 using restrained gasket conforming to ASTM F477.

C. Fittings: PVC pipe fittings shall match pipe material, classification and thickness as specified in Paragraph 2.2.A herein.

2.3 Plastic Filter Cloth: Plastic filter cloth for HDPE pipe joints shall be in conformance with Section 1019 of the Reference Standard.

2.4 PVC Drain Basins: Plastic catch basins shall be factory fabricated AASHTO H-20 heavy duty PVC one piece units of the size and geometrics as shown on the Drawings. The catch basins shall be custom fitted for this project and shall be provided by the HDPE drain pipe manufacturer to ensure a single source of responsibility for the plastic drainage system. Catch basins shall be constructed to specifically adapt to frame and grate sizes shown on the Drawings. Catch basins that require separate transitions to fit the frame and grate will not be acceptable. Catch basins shall be the "Drain Basin" type as manufactured by ADS, Hancor, or approved equal.

2.5 Drain Basin Grates: Drain basin grates shall be a one (1) piece unit factory fabricated and specifically designed to instantly install on the exposed end of the vertical pipe drain basin. Type and size are as indicated on Drawings.

2.6 Drainage Service Connection: Drainage service connection shall be a three (3) piece connection consisting of a PVC hub, rubber sleeve and stainless steel band. Connection shall be a compression fit into the cored end of a mainline pipe. Hub shall be manufactured from heavy-duty PVC material. Stainless steel clamping assembly shall be made from 301 grade steel (min.). Rubber sleeve and gasket shall meet the requirements of ASTM F477. Drainage Service Connection shall be Inserta Tee as manufactured by ADS or approved equal.

2.7 Backfill: Backfill material required for the drainage system shall be in conformance with Section 31 23 33 - Excavation, Backfill and Compaction for Trenches.

2.8 Bedding Material: Refer to Section 33 41 25 - Bedding Material.

PART 3 - EXECUTION

3.1 General: Install drainage facilities as recommended by the manufacturer and in conformance with the grades designated on the Drawings.

3.2 Deflections: The maximum deflection of any drain pipe either solid or perforated shall be one and one half ($1\frac{1}{2}^\circ$) degrees at each joint. The maximum radius of the deflections combined is seven hundred sixty five (765') feet. Any turns, bends, angles, etc., in the drainage system that exceed this criteria shall be constructed using fittings. The plastic drainage system (HDPE pipe and fittings) shall be installed in conformance with the manufacturer's recommendations.

3.3 HDPE/PVC Pipe Installation: HDPE/PVC pipe and PVC drain basin installation shall be in accordance with Section 31 23 33 - Excavation, Backfill and Compaction for Trenches and as detailed on the Drawings.

3.4 Drainage Service Connection Installation: Drainage service connection installation shall be in accordance with the manufacturer's recommended installation guidelines.

- END OF SECTION -